

Farming  
a Few Acres  
of Herbs:

An Herb Grower's Handbook

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## Art Credits

Bee Balm

USDA-NRCS PLANTS Database / Britton, N.L., and  
A. Brown. 1913. Illustrated flora of the northern states  
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Blue Vervain

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Borage

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Feverfew

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Evening Primrose

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Chinese Milkvetch

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Joe Pye Weed

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Marsh Mallow

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Milk Thistle

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A. Brown. 1913. Illustrated flora of the northern states  
and Canada. Vol. 3: 555.

Mullein

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A. Brown. 1913. Illustrated flora of the northern states  
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Narrow-leaved Coneflower

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Oregano

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Pluerisy Root

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Purple Coneflower

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A. Brown. 1913. Illustrated flora of the northern states  
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Red Clover

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and Canada. Vol. 2: 355.

Round-headed Lespedeza

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Sheep Sorrel

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and Canada. Vol. 1: 653.

Skullcap

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A. Brown. 1913. Illustrated flora of the northern states  
and Canada. Vol. 3: 106.

St. John's Wort

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Stinging Nettle

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A. Brown. 1913. Illustrated flora of the northern states  
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Valerian

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and Canada. Vol. 3: 286.

Yarrow

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and Canada. Vol. 3: 515.

Self Heal

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A. Brown. 1913. Illustrated flora of the northern states  
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## Why grow herbs?

There are many reasons to grow herbs. You may want to keep a few plants around the yard for personal culinary or medicinal use. Or you may have heard about high prices for some herb products and see them as a potentially valuable cash crop for the farm.

### Medicinal herbs in Kansas

Kansas agricultural producers are exploring the production and marketing of medicinal herbs. They may be exploring alternative crops because of low prices of traditional commodity crops. This interest is shared by many across the country as well as around the world including Canada, Australia and South Africa. Countries with low labor costs such as China, India, Thailand, South Korea, Brazil, Mexico, Egypt, Indonesia, Kenya and the Philippines also grow a variety of medicinal herbs. European and Mediterranean countries also grow herbs, but are net importers.

Medicinal plants have been used throughout history. There are 35,000 different plant species used for medicinal purposes. In the United States, consumer interest in medicinal herbs is increasing. Herbs are sold as capsules, tablets, extracts and teas, and included as ingredients in foods. Surveys show that consumers are beginning to understand and accept dietary supplements, including herbs. Natural foods markets carry the largest selection, with hundreds of products including whole herbs, tinctures, extracts and standardized products.

### Markets for herbs

The global retail market for medicinal herbs is \$14 billion per year. Demand for medicinal herbs in the United States has a retail value of more than \$4 billion per year. Retail sales in the United States increased steadily from 1994 until 1998, then leveled off, remaining steady for the past three years. Compared to 1999, sales in 2000 increased slightly in natural food and health food stores but decreased in food stores, drug stores and mass market retailers.

While demand has stabilized, the medicinal herb supply has increased. Markets are overstocked with raw materials with low demand. A significant market risk is associated with growing medicinal herbs because of limited markets. Current demand can be met quickly by overproduction. For example, the price for Echinacea roots has been as low as \$2.50 per pound of dried root in the last three years, compared with more than \$20 per pound in 1998. The current market price is \$6 to \$8 per pound.

## Potential for herb production

Several factors make it difficult to determine the potential for profitable herb production:

- An uncertain market size.
- Low-cost producers who dominate world production.
- Difficulty assessing market information.
- Lack of quality control procedures.
- Little available agronomic information for herbs.
- Mixed acceptance by the medical community.

Kansas has an ideal climate for growing herbs, and many medicinal herbs are native species. Kansas State University's Department of Horticulture, Forestry and Recreation Resources is conducting research trials to see how various herbs perform in Kansas. This research may provide insight about competitive advantages for Kansas producers in raising superior herbs over producers in other states and throughout the world. Details from K-State research trials are published in Appendix A. Recent price ranges for several herbs are found in Appendix B.

Do medicinal herbs offer potential as an alternative crop in Kansas? For individuals willing to invest significant time, effort and capital, the answer is a cautious, "maybe." Herbs are certainly not get-rich-quick crops. The long-term answer for some may involve becoming a low-cost, efficient producer. For others, it will mean selling smaller amounts of high-quality product at the best possible price. For others, it may mean developing a value-added product, like an herb tea blend or line of herb tinctures.

A word of caution for those wanting to make a quick profit: At times there are good prices for some herbs, but prices fluctuate from year to year and season to season, and high prices don't usually stay high for long. Generally, contracts are needed to get those high prices, and these are secured after establishing a track record as a grower and building relationships with one or more buyers. Herbs are a high-value crop, but also require high inputs including seed, land, fertility and pest control. Some herbs also require a lot of hand labor, and harvesting and postharvest handling labor and quality control procedures can be expensive. Also, the trend in herb production is for organic certification, and there are costs to this service, including membership dues, inspectors' fees, and the learning curve and three-year transition period required before certification is granted.

In spite of these cautions, herbs have the potential to be an additional cash crop for Kansas

farmers. Because these are high-value crops, a farm can range from ½ acre to more than 1,000 acres in size. These crops are relatively new to Kansas, and beginning farmers are encouraged to try these crops, as are farmers with experience in other crops.

The term “herb” simply means “a plant,” so describing the production and marketing requirements of this diverse family requires explanation. In fact, the production and harvesting requirements for herbs are probably even more diverse than for fruits and vegetables. For example, growing and harvesting a watermelon is much different than growing and harvesting a carrot.

### How to use this handbook

The following sections go into detail, emphasizing the economic and agronomic, or specific growing requirements for herbs. Marketing strategies are separated into local direct marketing and growing for a marketing chain or network. Cultural practices include information on how the plant is harvested because harvesting equipment limits what is grown on an individual farm more than planting or weeding equipment. Root crops are probably the most labor intensive because they may require several seasons to reach a marketable size. Digging, washing and drying

equipment or space are required. Plants harvested for their aboveground biomass (tops) may be harvested by hand or mechanized, but drying equipment or space is necessary. Some of these plants may be harvested once, and others are perennials and can be harvested multiple times, similar to alfalfa or grass hay. Some herb crops can be grown for their flowers or seeds. Flowers might be too labor intensive to grow in the United States because they are grown in other countries where labor is less expensive. It is unlikely that a U.S. grower could compete at current market prices. Growers may want to consider seed crops, however, because harvests can be mechanized. Some seed crops are from annuals, which must be replanted, but others are from perennials, which offer the possibility of multiple harvests.

As much as possible, Kansas data and experience have been used to illustrate local production potential. More than 30 different herbs are being tested in experimental plots in four Kansas locations. These data are found in Appendix A. Data from the 2000 through 2002 growing seasons are included in this handbook. Future editions will add 2003 and 2004 data and cover more species. Also, grower experiences from Kansas and the Great Plains will supplement the field-trial experimental data.

**Table 1. Common Culinary Herbs**

Common Name	Latin Name	Part Used	Comments
<b>Annuals</b>			
Basil (many sub-types)	<i>Ocimum basilicum</i>	Leaf	Sell fresh in large quantities for pesto. Avoid refrigeration to reduce discoloration of leaves.
Coriander	<i>Coriandrum sativum</i>	Leaf and seed	Called cilantro when used green.
Dill	<i>Anethum graveolens</i>	Leaf and seed	Many uses besides pickles.
Garlic	<i>Allium sativum</i>	Bulb	Plant cloves in fall for June/July harvest (winter annual).
<b>Perennials</b>			
Chives	<i>Allium schoenoprasum</i>	Leaf and flower	Primarily used for garnish, but also adds flavor. Purple flower.
Garlic chives	<i>Allium tuberosum</i>	Leaf	Flat-leaved cousin of chives from Japan. White flower. Great in salads and stir-fry.
Lemongrass	<i>Cymbopogon citratus</i>	Inner core of leaf whorl	Tender perennial, must be brought inside for the winter in pots.
Marjoram	<i>Origanum vulgare (sometimes listed as Marjorana hortensis)</i>	Leaf/flower	Similar to oregano in flavor, though not as strong.
Mint	<i>Mentha spp.</i>	Leaf	Many varieties, adds flavor to many dishes, not just for tea.
Oregano	<i>Origanum vulgare hirtum</i>	Leaf	Greek oregano is used for pizza. Another species, <i>Lippia graveolens</i> (also known as Mexican oregano), is sold in the United States as oregano.
Parsley	<i>Petroselinum crispum</i>	Leaf (root is medicinal)	This plant has medicinal and culinary uses. Flat-leaved (Italian) type is best for cooking. Curly leaf used more for garnish.
Rosemary	<i>Rosmarinus officinalis</i>	Leaf	Tender perennial. Bring inside for the winter in a pot or as cuttings.
Sage	<i>Salvia officinalis</i>	Leaf	Medicinal and culinary uses.
Tarragon	<i>Artemisia dracunculus sativa</i>	Leaf	French tarragon is recommended for its flavor. Russian tarragon may be easier to grow, but lacks flavor.
Thyme	<i>Thymus vulgaris</i>	Leaf	Medicinal and culinary uses. Small leaves will strip off the stem easily when dried.

Because wholesale price data is nearly impossible to find, Appendix B summarizes retail prices for about 300 species that will grow in Kansas. These are organized into tables by plant type (tree, shrub, etc.). The highest and lowest retail prices were multiplied by 0.5 to estimate possible wholesale prices and gross profit to growers. Calculations for each of the 30 species are included in Appendix A.

## Herbs for local markets (Direct marketing)

A variety of herbs can be grown and sold at farmers' markets or to local shops and stores. These include culinary herbs, herbs for teas, salves and other medicinal uses, and herbs or plants used for decoration or floral design. This publication focuses mostly on medicinal herbs because this is an active area of inquiry at K-State, and horticulture specialists receive many requests for information on this topic. Herbs for other uses will be covered briefly in this section. Popular magazines and books also cover this topic.

## Culinary herbs

Herbs for cooking can be harvested and sold fresh in bunches or packets, or dried. Dried herbs must compete with the international market where labor is cheap, while fresh herbs usually are not oversupplied and underpriced. Table 1 lists some culinary herbs that grow well in Kansas. Recipes provided at the point of sale might encourage those who don't have experience with herbs.

## Herbs for tea

Herbs for tea are easy to grow, harvest and sell to a local market. An herb tea may be a pleasant beverage, possess medicinal properties or both. When growing medicinal plants, make sure to grow the correct species and avoid plants with potentially toxic side effects. The species listed in Table 2 are widely used and considered safe. Some individuals may have sensitivities or allergies and should be careful when trying new products. For more information on herb tea, see K-State Research and Extension publication MF-2579, *Growing Herbs for Home Use*.

**Table 2. Herbs Commonly Used in Herb Tea**

Common Name	Latin Name	Part Used	Comments
<b>Annuals</b>			
Chamomile – German	<i>Matricaria chamomilla</i>	Flower	Best one for tea.
Chamomile – Roman	<i>Chamaemelum nobile</i>	Flower	More often used as an oil.
Stevia	<i>Stevia rebaudiana</i>	Leaf	Is 300 times sweeter than sugar. Only need a small amount. Can be used as fresh or dried leaf, though an extract is sold commercially.
<b>Perennials</b>			
Alfalfa leaf	<i>Medicago sativa</i>	Leaf	Mild flavor, often overlooked, healthful plant.
Bergamot	<i>Monarda fistulosa</i>	Leaf/flower	Strong but pleasant flavor. Great butterfly plant.
Catnip	<i>Rhannus purshiana</i>	Leaf	Not just for cats! Great for tea.
Comfrey	<i>Symphytum officinale</i>	Leaf	Recent warnings of liver damage with prolonged use. Might not want to sell this one commercially.
Dandelion	<i>Taraxacum officinale</i>	Leaf/root	Can be slightly bitter in tea, but has many health-promoting properties. Best in a blend with other herbs.
Hibiscus flowers	<i>Hibiscus sabdariffa</i>	Flower	Adds color and tartness to tea.
Lemon balm	<i>Melissa officinalis</i>	Leaf	Medicinal herb with a nice flavor.
Lemon verbena	<i>Aloysia triphylla</i>	Leaf	Bring inside during the winter. Tender perennial.
Lemongrass	<i>Cymbopogon citratus</i>	Leaf	Tender perennial. Bring inside.
Licorice root	<i>Glycyrrhiza glabra</i> , <i>Glycyrrhiza uralensis</i> (Chinese), <i>Glycyrrhiza lepidota</i> (N. Am.)	Root	These will spread. Adds sweet flavor to tea. Not recommended for people with high blood pressure.
Mint (several types)	<i>Mentha piperita</i> (peppermint) <i>Mentha spicata</i> (spearmint)	Leaf	These will spread. A classic tea plant. Available in flavors, including chocolate.
Raspberry leaf	<i>Rubus idaeus</i>	Leaf	Included in many women's teas. Worth investigating.
Red clover flowers	<i>Trifolium pratense</i>	Flower	Popular in women's teas. Has some estrogenic properties.
Rosehips	<i>Rosa canina</i>	Fruit	Contains vitamin C. May need to boil slightly to extract flavor.
Stinging nettle	<i>Urtica dioica</i>	Leaf	Mineral rich and flavorful tea, sometimes recommended as a spring tonic.
Yarrow	<i>Achillea millefolium</i>	Leaf	Surprisingly nice tea. Do not make it too strong.

## Herbs for salves and creams

A third group of herbs can be grown for use in salves, creams or other topical uses (Table 3). Infused oils, salves and creams are not difficult to make. It is possible to learn how to make them from a class or from books. See page 22 for more information. Some herbs in this category can be used internally and some cannot, so be familiar with each plant and its uses.

## Herbs for fragrance and decor

Another group of herbs is used for fragrance, dried flower arrangements, potpourri or other decorative uses (Table 4). Some of these are harvested on a commercial scale for their essential oils. This is only economically feasible where a processing plant exists or there are enough growers to support processing. This market is already somewhat saturated, so this will probably not be a competitive area for new, large-scale growers. These may be profitable for small-scale growers who sell locally. These herbs may not be safe for internal use, but a few, such as mint, have internal uses.

## Promoting and marketing herbs

Herbs sold directly to consumers can be promoted in a variety of ways. Herbs are categorized as dietary supplements by the FDA, which are regulated separately from food and drugs. There are some special rules that apply. First, health claims cannot be made about the herbs. As with food items, all herbs should be clean, well labeled and sold unprocessed, unless you have a certified commercial kitchen and/or have sought the advice of the local or state health department.

Labels for herbs may include the name as well as culinary and folk uses. Keep reference books handy so customers can read more about the herbs. These resources also keep the herb seller from assuming the role of an unlicensed health care provider.

Providing recipes or suggestions of herb tea blends is nice for people trying culinary herbs for the first time. Other marketing ideas include writing articles about herbs for newspapers or newsletters or inviting a speaker to the local garden club or farmers' market association to talk about herbs. When selling herbs, the more educated the consumer the better. Education will help growers know how to safely use herbs, and how important it is to find a high-quality, fresh, local source.

## Herbs for commercial markets

Deciding which herbs to grow for the commercial market may be much tougher than for the local direct market. For a local market, a grower can try a few things, see what customers like and educate consumers. In the commercial market, the grower is several steps away from the consumer and must be aware not only of what consumers and manufacturers want, but what buyers for the manufacturers want as well. There is a lot of international competition in the commercial market. An herb that must be hand harvested or is time consuming to grow may be more competitive coming from another country. Herbs that grow in tropical climates will not be considered here, except for those that may be grown successfully in unheated greenhouses, or tender tropical perennials that could be grown as annuals. For

Table 3. Herbs for homemade salves and creams

Common Name	Latin Name	Part Used	Comments
<b>Annuals</b>			
Calendula	<i>Calendula officinalis</i>	Flower	High resin varieties available. Pick when flower is at its prime.
Chickweed	<i>Stellaria media</i>	Leaf	Harvest when young and tender.
<b>Perennials</b>			
Aloe	<i>Aloe barbadensis</i>	Leaf	Mucilaginous gel in the fresh leaf used in hand creams and other products. Grow indoors as a houseplant or set out during the summer for rapid growth.
Arnica	<i>Arnica montana</i>	Flower	Maybe difficult in Kansas. In high demand from herbalists.
Burdock	<i>Arctium lappa</i>	Root/leaf	Easy to grow. Wild type also found in Kansas.
Comfrey	<i>Symphytum officinale</i>	Leaf/root	Easy to grow. Propagate by root divisions
Mint	<i>Mentha spp.</i>	Leaf	Easy to grow. Will spread. Essential oil <sup>1</sup> or infused oil <sup>2</sup> of mint more likely in skin products than whole leaf.
Plantain	<i>Plantago lanceolata, P. major</i>	Leaf	This common sidewalk weed often used for skin ailments.
St. John's wort	<i>Hypericum perforatum</i>	Flower	Often found in skin creams and oils, as well as for internal use.

<sup>1</sup> Essential oil has been extracted through the use of heat and pressure, usually involving a steam distillation process. These oils are highly concentrated and used in very small quantities, like a few drops. These are usually not made at home, but could if one had a distillation unit. When sold commercially, these bring a very high price, or are sometimes diluted and sold at a lower price.

<sup>2</sup> Infused oil can easily be made at home, using a process of soaking the fresh or dried herb in olive or other vegetable oil. See reference section for books that describe the process in detail.

example, stevia, originally from Paraguay, does well as an annual in Kansas. (For more information, see the fact sheet, *Stevia*, MF-2630, in Appendix A.)

More than 30 herbs have been screened for production potential in Kansas field test plots. Results for herbs screened for two years or more are found in Appendix A, which is a compilation of fact sheets for each species. As more species are evaluated, new fact sheets will be written. Table 5 summarizes K-State's experiences and recommendations with herbs in Kansas. It includes 30 species in the fact sheets, plus information on species that were observed in gardens.

These recommendations should be interpreted for a specific growing site, considering whether the field is exposed or protected, irrigated or non-irrigated, etc. Table 5 is organized by plant part/harvest method because harvest may limit more growers than any other factor. Though some herbs have markets for more than one plant part (for example, leaves and roots), they are listed in the table under the most common use. Information on equipment and business planning are in the next section of this handbook. Site-specific data from each year are found on the K-State Research and Extension horticulture Web site: [www.oznet.ksu.edu/ks/herbs](http://www.oznet.ksu.edu/ks/herbs).

## Equipment and capitalization

### Growing the crop

Equipment for planting and cultivating an herb crop will be similar to equipment for grain and vegetable crops. Harvesting may be different

and will be discussed later. If herbs are the first enterprise on a farm, this equipment will need to be purchased, rented or borrowed, but if adding herbs to an existing farm, many of these items will already be available or in use. When calculating budgets, make sure to include depreciation, repairs and other equipment costs for a fair accounting.

If the crop can be direct seeded, standard planting equipment may work. For example, medium-sized seeds such as milk thistle and Echinacea can be planted with a wheat drill or planter. Smaller-seeded species such as red clover could be seeded using the forage seeder box on a standard planter. Some very small seeded species, such as chamomile or St. John's wort, will need to be seeded in the greenhouse and put into the field as transplants, or seeded by hand and then thinned. Field crop farmers might need to purchase equipment and facilities to grow transplants and place them in the ground. Transplants for some species can be purchased or contracted from another local grower who already has the facilities. On a small scale, purchasing a transplanter does not make sense, but on a large scale, a transplanter can save on labor costs.

With each purchase, evaluate the capital investment, the opportunity cost of that money, the interest if the money is borrowed, the expected life of the equipment and the cost of the labor that the equipment will displace. This calculation should be performed for everything from a tractor to a root digger. Tables 6 through 8 (page

*continued on page 10*

**Table 4. Herbs for fragrance, oils and decoration**

Common Name	Latin Name	Part Used	Comments
<b>Perennials</b>			
Bergamot	<i>Monarda fistulosa</i>	Flower/leaf	Flowers and leaves may be dried.
Bittersweet	<i>Solanum dulcamara</i>	Vine/berries	Can be harvested from the wild in Kansas. Used for decoration but has medicinal properties.
Lavender	<i>Lavandula angustifolia</i>	Flower/leaf	Dried flowers and stems are used.
Mints	<i>Mentha spp.</i>	Leaf	Many types available.
Orris Root	<i>Iris germanica var. florentina</i>	Root	The dried root of this variety is fragrant.
Patchouli	<i>Pogostemon patchouli</i>	Leaf	Tender perennial. Fragrant plant.
Pine cones	<i>Pinus spp.</i>	Cone	Many types may be collected and added to potpourri mixtures.
Rattlesnake master	<i>Eryngium yuccafolium</i>	Whole plant	Unusual native plant found only in virgin prairie.
Roses	<i>Rosa spp., Rosa canina (rosehips)</i> <i>Rosa centifolia, Rosa gallica</i>	Flower petals and buds	Many types, old-fashioned musk type have the most aromatic petals. Rosehips, petals or whole flowers may be dried and preserved.
Rosemary	<i>Rosmarinus officinalis</i>	Leaf/flower	Decorative and useful culinary and medicinal herb.
Scented geraniums	<i>Pelargonium spp.</i>	Leaf	Many types available.
Sumac	<i>Rhus glabra</i>	Berries	Sumac berries may be used in tea or decoration. Woody plant, wild in Great Plains.
White sage	<i>Salvia apiana</i>	Leaf and stem	Used for incense or potpourri, not cooking.
Yarrow	<i>Achillea millefolium</i>	Leaf and flower	Flowers dry nicely for arrangements

Table 5. Herbs for the Commercial Market - Organized by Harvest Method for Primary Crop

Common Name	Latin Name	Life Cycle	Sun	Harvest	KSU trials <sup>1</sup>	Recommendations <sup>2</sup>	Comments <sup>3</sup>
<b>Pollen/Stamens</b>							
Saffron	<i>Crocus sativus</i>	Perennial	Partial shade	Pollen/stamens – by hand	No	G	Very expensive and tedious to harvest. Imported from Spain.
<b>Flowers/petals</b>							
Borage	<i>Borago officinalis</i>	Annual	Sun	Flowers (also stems and leaves). Harvest during flowering period	Yes MF-2608	G/L	For borage oil, the fatty oil of the seeds, though other parts also used medicinally. Flowers added to salads. Good for gardens. Limitations are flowers hard to harvest and limited market for other parts of the plant.
Calendula	<i>Calendula officinalis</i>	Annual	Sun	Flowers	Yes MF-2610	G/F	Grows well here. Time necessary to harvest flowers is a limitation.
Chamomile – German	<i>Matricaria chamomilla</i>	Annual	Sun	Flower rake	Yes (no fact sheet yet)	G/L	Easy to grow and tedious to harvest. Don't confuse with Roman chamomile, <i>Chamaemelum nobile</i> , which is primarily grown for its oil and not for tea.
Elderberry	<i>Sambucus nigra</i>	Woody perennial	Sun, partial shade	By hand (flowers and/or fruit)	Yes (no fact sheet yet)	F/G	Market for elderberry now at a winery in Mulvane, Kan. Native plant, well adapted.
Red clover	<i>Trifolium pratense</i>	Perennial	Sun	Blossoms	Yes MF-2625	F/G/L	Easy to grow but time consuming to harvest. Better to grow a large field of it or rotate with other crops as a cover crop. If only growing a few plants, rabbits may be a problem.
St. John's Wort	<i>Hypericum perforatum</i>	Perennial	Sun	Flowers and/or top 6 inches in full flower, could clip tops	Yes MF-2629	G/F	Well adapted, best yields might be during second year. Need to replant periodically. Gets shrubby. Pretty in garden. Could partially mechanize the harvest. Big market for this crop, especially if high quality.
<b>Fruit</b>							
Elderberry	<i>Sambucus nigra</i>	Woody perennial	Sun, partial shade	By hand (flowers and/or fruit)	Yes (no fact sheet)	F/G	Market for elderberry now at a winery in Mulvane, Kan. Native plant, well adapted.
Hawthorn	<i>Crataegus laevigata</i> , also <i>C. monogyna</i>	Woody perennial	Sun	Fruit (also flower and leaf)	Observation	G/F	Cardiac stimulant and antioxidant. Now imported from Poland, Chile, Bulgaria and France. Well adapted to Kansas landscape.
<b>Seeds</b>							
Evening primrose	<i>Oenothera biennis</i>	Biennial	Sun	Small seeds	Yes MF-2611	N	Medicinal part is the fatty oil extracted from the ripe seeds and fresh plant gathered at the beginning of the flowering season. Did not do well in our trials and seed shatters easily.
Milk thistle	<i>Silybum marianum</i>	Normally a winter annual	Sun	Can use combine	Yes MF-2618	N (if from transplants)	Can plant with wheat drill. Plant very early – February/March – to get a crop in Kansas. Tentative recommendation until direct seeding trials have been conducted.
<b>Leaf</b>							
Alfalfa	<i>Medicago sativa</i>	Perennial	Sun	Leaf and seed, could mechanize both	No	F	Common forage crop in Kansas. Well adapted to local climate. Marketing the crop and working out quality control details are limitations.

<sup>1</sup>Fact sheet number if available.

<sup>2</sup>Recommendation code: G = good for gardens; N = not adapted to Kansas; F = could be a good field crop; L = limitations (labor-intensive, insect or disease, etc.)

<sup>3</sup>Comments are generally about growing conditions or marketing potential. Occasionally mention medicinal uses to give one a sense of whether this plant has market potential in the future.

**Table 5. Herbs for the Commercial Market - Organized by Harvest Method for Primary Crop (continued)**

Common Name	Latin Name	Life Cycle	Sun	Harvest	KSU trials <sup>1</sup>	Recommendations <sup>2</sup>	Comments <sup>3</sup>
<b>Bee balm</b>	<i>Monarda fistulosa</i>	Perennial	Sun	Leaf/flower	Yes MF-2605	G/F	<i>M. fistulosa</i> did well in field trials, but <i>M. didyma</i> did not.
<b>Blue vervain</b>	<i>Verbena hastata</i>	Perennial	Sun	Leaf/whole herb	Yes MF-2606	G/F	Nice plant, though had heavy insect damage in some years.
<b>Boneset</b>	<i>Eupatorium perfoliatum</i>	Perennial	Sun	Leaf/above ground portion	Yes MF-2607	G/F	Nice white flowers, does well under field conditions, even when dry.
<b>Feverfew</b>	<i>Tanacetum parthenium</i>	Perennial	Sun	Flowering tops/leaves	Yes MF-2614	G/F	Grow this plant like an annual rather than a perennial. Poor winter survival.
<b>Ginkgo</b>	<i>Ginkgo biloba</i>	Woody perennial	Sun	Leaves	No	G/F	Limitations are market and harvest method. Adapted landscape tree common in Kansas.
<b>Heal all</b>	<i>Prunella vulgaris</i>	Perennial	Sun	Leaves	Yes MF-2636	G/F	Attractive plant. Did OK in field trials, but may be difficult to harvest. Low growing.
<b>Heartsease/wild violet/wild pansy/Johnny-jump-up</b>	<i>Viola tricolor</i>	Annual to perennial	Sun or shade	Fresh aerial parts, 2 to 3 harvests per year possible	No	G	Approved by Commission E for inflammation of the skin, used both internally and externally. Often a weed in flower beds.
<b>Lemon balm</b>	<i>Melissa officinalis</i>	Perennial	Sun, partial shade	Collect leaves before flowering and/or branching	Yes	G/F	Great in tea. Seems to be expanding market. Winter hardy in a moderately protected area.
<b>Lemon verbena</b>	<i>Aloysia triphylla</i>	Tender perennial, somewhat woody shrub	Sun, partial shade	Lateral branches harvested in the fall	Observation	G	Propagated by runners or cuttings. Used to flavor teas. Probably not hardy in Kansas. Bring inside each winter.
<b>Mullein</b>	<i>Verbascum thapsus</i>	Biennial	Sun (needs good drainage)	Leaves for tea, flowers for infused oil	Yes MF-2619	G/F	Attractive, adapted plant for garden or field. Harvest leaves first year and flowers in second.
<b>Oregano</b>	<i>Origanum vulgare</i>	Perennial	Sun	Leaves	Yes MF-2621	G/F	Adapted to Kansas.
<b>Round-headed Lespedeza</b>	<i>Lespedeza capitata</i>	Perennial	Sun	Whole herb tops	Yes MF-2626	G/F	Native to Kansas. Looks good in the field. Small market now.
<b>Sheep sorrel</b>	<i>Rumex acetosella</i>	Perennial	Sun	Whole herb top and/or leaves	Yes MF-2627	G/F	Great as a salad and tea herb. Picking such a low growing herb may be a limitation. Spreads a lot.
<b>Skullcap</b>	<i>Scutellaria lateriflora</i>	Perennial	Sun	Harvest aerial part of 3- to 4-year-old plants in June	Yes MF-2628	G/F	Did great in field trials. Attractive plant. Market for tops now, roots in future.
<b>Stevia</b>	<i>Stevia rebaudiana</i>	Tender perennial	Sun	Aerial portions.	Yes MF-2630	G/F	Did great in field trials. A tropical plant from Paraguay, so grow like an annual.

<sup>1</sup>Fact sheet number if available.<sup>2</sup>Recommendation code: G = good for gardens; N = not adapted to Kansas; F = could be a good field crop; L = limitations (labor-intensive, insect or disease, etc.)<sup>3</sup>Comments are generally about growing conditions or marketing potential. Occasionally mention medicinal uses to give one a sense of whether this plant has market potential in the future.

Table 5. Herbs for the Commercial Market - Organized by Harvest Method for Primary Crop (*continued*)

Common Name	Latin Name	Life Cycle	Sun	Harvest	KSU trials <sup>1</sup>	Recommendations <sup>2</sup>	Comments <sup>3</sup>
Stinging nettle	<i>Urtica dioica</i>	Perennial	Partial shade	Leaves (also a market for roots)	Yes MF-2631	F	A bit “stingy” for the garden but grows well, even in full sun.
White sage	<i>Salvia apiana</i>	Tender perennial. Grow as an annual.	Sun	Whole tops	Yes MF-2633	G/F	Attractive in the garden. Used for ceremony, not cooking or other herbal preparations. Not winter hardy.
Yarrow	<i>Achillea millefolium</i>	Perennial	Sun	Flowering tops	Yes MF-2634	G/F	Attractive in the garden. Did well in the field.
<b>Root</b>							
Black cohosh	<i>Actaea racemosa</i>	Perennial	Shade	By hand – root	No	G	Difficult to germinate seeds and grow in Kansas, but is an endangered species in the wild. Expanding market.
Blue cohosh	<i>Caulophyllum thalictroides</i>	Perennial	Shade	By hand – root	No	G	Difficult to germinate seeds and grow in Kansas, but is an endangered species in the wild. Expanding market.
Burdock	<i>Arctium lappa</i>	Biennial	Sun	Root is most marketable, fresh or dried, but leaves and seeds also used	Yes MF-2609	G/F	Does well in Kansas. Harvesting is the major limitation.
Chinese milkvetch	<i>Astragalus membranaceus</i>	Perennial	Sun	By hand, or use root digger to loosen soil first	Yes MF-2612	G/F	Used for its anti-viral and immune-stimulating properties in many formulations. Potential for high demand. Grows well in Kansas, but difficult to dig this root. Poor survival in soils that are not well drained. Attractive plant.
Dandelion	<i>Taraxacum officinale</i>	Perennial	Sun	Roots and tops marketed	Yes MF-2613	G/F	Best yields under cultivated conditions, though could harvest small plants at home as “wild greens.”
Echinacea (Narrow-leaf coneflower)	<i>Echinacea angustifolia</i>	Perennial	Sun	Hand or machine dig root	Yes MF-2620	F	Direct seeding is more successful than transplanting. Poor survival.
Echinacea (Pale purple coneflower)	<i>Echinacea angustifolia var. pallida</i>	Perennial	Sun	Hand or machine dig root	Yes MF-2620	G/F	Easier to grow than <i>E. angustifolia</i> . Larger tap root. Unclear market.
Echinacea (Purple coneflower)	<i>Echinacea pupurea</i>	Perennial	Sun	Hand or machine dig root	Yes MF-2624	G/F	Easiest <i>Echinacea</i> to grow. Limited as commercial crop by aster yellows disease. Flowers can be sold to floral shops.
Garlic	<i>Allium sativum</i>	Winter annual	Sun	Hand or machine	No	G/F	Common vegetable crop in Kansas. Many varieties well adapted.
Ginseng	<i>Panax quinquefolius</i>	Perennial	50% shade	By hand	Yes – observation	N	Poor survival. Have tried for several years under simulated woodland conditions. Too hot and dry here.
Goldenseal	<i>Hydrastis canadensis</i>	Perennial	50% shade	By hand	Yes – observation	G	Better survival than ginseng. May be worth growing on a small scale. Probably not a good field crop for Kansas.

<sup>1</sup>Fact sheet number if available.

<sup>2</sup>Recommendation code: G = good for gardens; N = not adapted to Kansas; F = could be a good field crop; L = limitations (labor-intensive, insect or disease, etc.)

<sup>3</sup>Comments are generally about growing conditions or marketing potential. Occasionally mention medicinal uses to give one a sense of whether this plant has market potential in the future.

**Table 5. Herbs for the Commercial Market - Organized by Harvest Method for Primary Crop (continued)**

Common Name	Latin Name	Life Cycle	Sun	Harvest	KSU trials <sup>1</sup>	Recommendations <sup>2</sup>	Comments <sup>3</sup>
<b>Joe Pye weed</b>	<i>Eupatorium purpureum</i>	Perennial	Sun	By hand or root digger	Yes MF-2615	G/F	Attractive, and tall garden plant. Did well in field trials, even when dry, though it prefers wet locations.
<b>Licorice</b>	<i>Glycyrrhiza uralensis</i> and <i>G. glabra</i>	Perennial	Sun	By hand or root digger to loosen first	Yes MF-2616	G/F	Both did well in field trials, but be prepared for some plants to spread via rhizomes. Roots spread, making it difficult to harvest.
<b>Marsh mallow</b>	<i>Althea officinalis</i>	Perennial	Sun, partial shade	Roots, also leaves harvested.	Yes MF-2617	G/F	Attractive relative of hollyhock. Did well in the field. Few pests.
<b>Pleurisy root (Butterfly milkweed)</b>	<i>Asclepias tuberosa</i>	Perennial	Sun	Root (leaves are toxic)	Yes MF-2623	G/F	Great for gardens. Adapted to the field, but time consuming to dig.
<b>Valerian</b>	<i>Valeriana officinalis</i>	Perennial	Sun, partial shade	Hand or machine dig roots	Yes MF-2632	G	Survives in a garden setting, but poor survival in field trials. Root diseases or other problems limit this as a crop.

<sup>1</sup>Fact sheet number if available.

<sup>2</sup>Recommendation code: G = good for gardens; N = not adapted to Kansas; F = could be a good field crop; L = limitations (labor-intensive, insect or disease, etc.)

<sup>3</sup>Comments are generally about growing conditions or marketing potential. Occasionally mention medicinal uses to give one a sense of whether this plant has market potential in the future.

continued on page 10

14) should help you look at your own operation, decide what scale might be appropriate, and calculate costs associated with equipment and land.

In general, equipment for growing herbs is not that different from other crops, so details are not included in this section. For more information, see K-State Research and Extension publication MF-1115, *Farming a Few Acres of Vegetables*, and other grain and vegetable publications.

### Harvesting herbs

Some herbs are harvested much like vegetables. This is especially true of leaf crops that are harvested by hand like lettuce. Root crops can be hand dug or machine harvested with a potato or other root digger. Cleaning herb crops also may be similar to vegetable crops because customers want clean, dust- and soil-free produce.

Though some herb crops can be sold fresh, most are sold dry and priced based on dry weight. This changes how things are done at harvest and in the packing shed or processing area. Many herbs, especially root crops, are perennial rather than annual crops like carrots and potatoes. This means that roots may be longer, more twisted and harder to harvest than carrots or tubers like potatoes. Mechanical diggers may need to be modified to handle these situations.

Reference literature contains few details about herb harvesting equipment. Herb growers need to choose harvesting, digging and washing strategies best for them. Harvesting instructions in books and growers' manuals might say, "Dig with fork or root harvester." What type? How deep? The most useful information is often found on herb farm Web sites. One such site showed using a chisel plow to loosen *Echinacea* roots and using rotating barrel carrot washers to wash herb roots. The site suggested using metal screens mounted on wooden frames with a pressure washer/hose to speed root-washing for those who don't want to invest in a barrel.

Experience in digging roots in the field plots shows that some degree of mechanization may be useful. For example, loosening roots with a tractor-pulled chisel plow saves back muscles and knees, and allows deeper digging than if done by hand. However, a lot of hand work probably remains for sorting, washing and loading roots into the dryer. Other equipment recommended for handling roots includes a U-shaped bar to undercut roots or an L-shaped bar. These are sometimes used in the production of things like strawberry transplants, but probably won't go as deep as a chisel plow shank. The U-shaped bar was tested on field plots near Wichita, on a sandy soil with moderate moisture in the fall. The bar

did a nice job of cutting and lifting the roots, but the braces on the bar prevented it from going deep enough to completely uproot things like burdock. It did a nice job on the mallow roots, and even helped extract some of the licorice, which is a shallow, runner-type root. The bar was originally designed for sweet potato digging, and was fabricated locally. Also keep in mind that some roots are more fibrous, and these may be easier to dig, but harder to wash. *Echinacea pallida*, for example has a nice, carrot shaped tap-root, while *Echinacea purpurea* has a fibrous root system. Stinging nettle also has a shallow fibrous root system that is easy to dig, but hard to clean.

**Leaf crops** would be easier to mechanize because of the many types, styles and sizes of mowing equipment available. But keeping the leaf matter clean and loaded into a dryer without contaminants limits the kind of mechanization that can be used. Because most leaf crops cannot be dried in the sun, producers cannot treat a feverfew crop as they would an alfalfa hay crop by mowing, sun-drying and turning in the field before baling. Small-scale mowers with adjustable height to miss the lower, less-than-perfect leaves, might be best, and a way to catch the foliage or collect it for placement in drying rooms or frames. Leaf crops have higher moisture content than roots and should be moved out of the sun and into a shady area as quickly as possible, preferably straight into the drying area. Some herb leaves and stems bruise easily and need to be handled with special care to maintain quality. In some crops, leaves and stems can be harvested together at ground level; in others stems, will need to be separated either in the field or later on.

**Flower crops** probably provide the biggest challenge. Small-scale growers making herb products for themselves or for local sale often simply hand harvest individual blossoms, and pick each patch of calendula, red clover or chamomile several times a week during peak flowering seasons. Some even harvest St. John's wort as individual blossoms, though the commercially harvested product includes the top 6 inches or so of the plant as a clipped, rather than plucked product. Hand-picking blossoms probably does not pay a living wage, so start with some small plots and do these calculations before signing a large contract for a flower crop. Tim Blakely (see book listed in references on page 22) estimates that a fast picker can pick about 1 pound of dried red clover flowers per hour if the field is healthy, but an average picker will only pick 1/2 to 3/4 of a pound. If the price per pound is only \$5 to \$10 this is hardly a living wage when planting time, land, shipping cost, etc. are included.

There are mechanical flower harvesters available for purchase, but only the largest growers may be able to afford them. It may be possible in the future for a group or co-op to purchase equipment like this, making it more cost effective to mechanize. An in-between option is the use of “flower rakes.” Some catalogs sell a chamomile harvester, which is a small scoop held in one hand, with long, pointed metal rods welded at about the right spacing (about one stem-width) to catch small blossoms, and “pluck” them as the scoop is lifted. Stem material is also gathered with this tool, which is not desirable, but it speeds up the picking process some. It is unclear whether flower crops will be commercially viable in the United States when consumers can purchase less expensive products grown abroad.

### **Drying herbs**

Herb growing is very different from vegetable farming when it comes to handling and storage. Some vegetable growers that have diversified into cut flowers, especially everlastings or dried flowers, may be familiar with drying methods and may already have a place on the farm for storing dried herb products.

A few companies may give contracts for fresh herb delivery, and if so, you can skip this step. However, be careful to follow shipping guidelines and timing. It may be necessary to cool the crop before or during shipping so it arrives in good shape. Some essential oils are extracted from fresh plant material, so if you find a market for oils or a local extraction facility, fresh shipping/hauling may work for you.

Most herbalists buy dried product, mainly for practical reasons related to storage and shelf life. In a few herbs, compounds become more or less active when dried. A rule of thumb is that the shelf life of a properly dried and stored whole (not ground) herb is about one year. Grinding an herb reduces its shelf life because it increases the surface area, which is subject to oxidation, and leads to more volatilization of various compounds. Thus, herbs should be ground as close to the time of use as possible.

Drying herbs on farm requires that you follow a few general rules or guidelines. The herb industry is cooperating with government to draft “Good Manufacturing Process” guidelines, which for the most part, are just common sense. For example, wash your hands before handling an herb for human consumption, don’t sneeze on it, don’t allow rodents to nest in it, etc.

The drying room will vary for different farms. Extremely small quantities can be dried in a tabletop food dryer, but it will take a long time if you plan to do several pounds rather than ounces

of material. Some have modified greenhouses as drying areas, but these should be shaded, as light will fade the plant material and reduce its value. A large shed or barn with beams for hanging tied herbs could work as a drying area, as long as it is relatively rodent proof, and you don’t mind tying lots of little bundles together.

K-State’s drying ovens consist of large cabinets, which can be constructed of plywood, with a fan and heat generating unit at the bottom, and a vent at the top. A thermostat controls the heat, and the fan runs continuously. Homemade shelves made of 2-by 2-in. lumber and rigid screen are spaced at about every foot, for a total of eight to 10 shelves per cabinet. Herbs are either laid on the screen in loose layers, or small quantities are placed in brown paper bags, and dried in the bag in the oven. Other models for drying areas, especially if they are primarily used in the summer, might be to section off a corner of a garage or shed from dust and animals, install a large fan to draw air, and possibly a dehumidifier. The Kansas weather will provide the heat. Homemade shelves can be attached to walls or suspended from the ceiling. Some herb reference guides give specific drying time recommendations, but only use these as general guidelines. Drying time will depend a lot on the condition of the plant when it is brought in from the field and drying conditions, such as relative humidity, and other factors.

### **Processing and packing**

Processing and packing is another step that will take place on the farm, and it is recommended that you ask your buyer for specific information on these details. General guidelines include keeping the product away from light, dust, rodents and insects. Most herbs are stored at room temperature, but cool and dry is a good general practice. Generally packing in paper or other breathable material is better than plastic. Anything that isn’t completely dry will encourage bacteria and fungi growth, which would not only decrease the quality but may produce harmful substances. The amount of herb you have will determine how, or to whom you sell your product. Some buyers want ounces, some pounds, some tons. Burlap has been used in the past for herbs, but is not recommended at this time, as the fibers may contaminate the herb.

### **Marketing**

A marketing plan is essential when considering growing herbs. Marketing herbs is unlike conventional crops with established markets and easy access to market information. Markets exist for herbs, but the market is likely to be a small or niche market. Like most niche markets, finding

### Tips for Drying Herbs

#### Do

- Move herbs as quickly as possible from the field to the drying room.
- Either air dry, or use forced air to dry herbs as quickly as possible.
- Avoid temperatures above 120° F. Most recommend temperatures between 80 and 105°F, with some air circulation.
- Prepare a special insect- and rodent-free area to dry and/or store herbs.
- Clean herbs as much as possible before moving into the drying area.
- Slice roots (when appropriate) to speed drying.

#### Don't

- Allow herbs to heat up in the field in piles after harvesting and before drying.
- Allow UV light or other light to fade the herb.
- Sell dirty or inferior product.
- Store in plastic bags.
- Store before the herb is completely dry. This may take three days or more for some leafy crops, or three weeks for roots. Check by calculating the percentage of moisture content by oven drying (or microwaving). The percent moisture should be 11 to 15 percent for leaves and 10 to 12 percent for seeds. It can be calculated as fresh weight – dry weight = water.  $\text{Water} \div \text{fresh weight} = \text{moisture content}$ . Also, leaves should crumble easily, and roots should be hard and/or snap.
- Overdry herb seed or it will lose viability.

accurate wholesale prices is difficult. Prices for retail items are available, especially those that have been processed. Retail prices are often substantially higher than the wholesale price offered to the grower.

The driving force in the industry is the relatively few large corporations that control manufacturing, distribution and marketing of herbal products. Herb marketing involves many channels. Some growers do their own processing and market their own brands in health food stores. Some growers have a satisfactory outlet through an individual herb distributor. Often herb marketing is achieved by using brokers. Many growers sell to small dealers or brokers who sell to larger dealers or pharmaceutical manufacturers who form capsules, extract or tincture that is marketed in grocery and drugstore chains.

Growers must show an ability to produce before they can reach established markets. Buyers want assurances the grower can provide a product for several years. Neither local nor large dealers will enter into a contract with an inexperienced grower until they know what the grower can produce. A grower might raise a trial plot to supply the dealer with a product sample and build a reputation for quality and reliability. Thus a long-term commitment is required to grow herbs. Some dealers and manufacturers have minimum amounts that they will buy and will offer contracts to selected established growers.

Knowing what herbs to grow can be a problem. Trends change constantly and growers need to keep informed of current market demand. Yet,

there are few sources of information on the herb market. Two ways to keep up on market trends are reading trade magazines (see page 22) or calling potential buyers. Another way is to join trade associations or cooperatives.

To address some of these marketing concerns, the Great Plains Herb Growers Association was organized in 2001. This not-for-profit association was formed with the following objectives:

- to foster communication among herb growers, herb buyers, retailers, herbalists, health practitioners and other interested parties;
- to cultivate, foster and promote interest and participation in the growing and use of herbs;
- to further the knowledge and safe use of herbs and herbal products;
- to educate farmers and others about organic cultivation practices for medicinal plants best suited for the Great Plains by region;
- and to provide collective resources to aid in the production, processing and marketing of organically grown, high-quality herbs.

Contact information for the Great Plains Herb Growers Association and other marketing resources is listed in the reference section of this handbook.

### Economic factors

The profitability of any enterprise depends on successful marketing and knowing costs of production. But production costs for growing herbs are hard to obtain and are rarely published.

Herb producers should carefully assess enterprise budgets for specific herbs to monitor whether the enterprise is profitable.

Factors to consider include farm location, size, machinery, labor use, marketing requirements and growth habits of specific herbs. The general growing habits of herbs fit into three categories: annuals, quick perennials and long-term perennials.

Herbs classified as annuals are planted and harvested in one year. Crops such as wheat, corn, tomatoes and melons have a similar growing habit. Short-term perennials are planted one year and completely harvested at one time in the second or third year after they have reached maturity. Not many agronomic crops besides herbs fit into this growing habit category. The last growing-habit classification, long-term perennials, are harvested over a number of years and are not destroyed by harvesting. Woody and non-woody plants are in this category. Non-herb crops that fit into this category include alfalfa, asparagus, berries and apples.

A fast-growing herb may return a quicker profit, but the herb may be sold at a lower price because it is easy for others to grow, too. A longer growing perennial herb may be slower to return a profit, and two or more years of costs may be incurred before the herb is harvested. Some crops sell at a higher value per pound, allowing a producer to make as much or more per acre on a slow-growing, but higher-value crop.

### **Enterprise budget calculations**

Farm or production size is an important consideration in determining the amount of mechanization necessary to raise and harvest an herb crop successfully. Table 6 (page 14) illustrates the types of equipment relative to the scale of production. One key to profitability is to make sure the fixed-cost investment is scale-appropriate. Tables 7 and 8 (pages 14 and 15) will help calculate fixed costs for the herb portion of a business. Use the figures in Table 10 (page 16) to calculate profitability for various herbs that can be grown in Kansas.

Table 7 shows fixed-cost budget calculations. These are up-front investments with expenses that will be incurred whether a particular crop is planted or not. The standard way to account for land costs is to use either the interest on the value of the land, if purchased, or the rental cost, if rented. In this example, the land was purchased, and a per-acre-per-year cost was determined (\$80). When this number is used in an actual herb enterprise budget, take this figure times the number of (or fraction of) an acre that is used for that herb.

Building and equipment costs are assigned values based on the interest if the money was borrowed (and theoretically, the opportunity cost of the money if it wasn't borrowed), and the depreciation. Depreciation is the total cost of the building or piece of equipment divided by the number of anticipated useful years of the item. There are some standard values used for tax purposes, but for these budgets, use your best realistic estimate.

The percentage of time or space required for the herb business on your farm compared to other enterprises is also taken into account (column 2). The number of hours per year used for herbs (column 7) is used to come up with a per-hour estimate cost for the item. This value is used in Table 10. After completing Table 10, or after a field season where usage hours have been tracked, if you find that the total hours estimated in column 7 is wrong, readjust and recalculate column 8.

Now complete Table 8, using expenses and fixed inputs from your own farm. Include land, facilities and equipment that are part of the farm now, and also items that you intend to purchase if you go into the herb business.

Table 9 can be used to estimate the gross income per acre. Table 9 also illustrates how gross income will change if the price for an herb drops from \$10 per pound to only \$6 per pound, for example, or how income would change in a drought year if the marketable yield was only 600 pounds per acre, rather than the estimated 1,000 pounds. Considering these scenarios is important when estimating risk. Some of these scenarios could also be explored using Table 10 as a template.

Make additional copies of Table 10 to work out production and marketing costs for several herbs and yield and price scenarios. Making a business plan for the whole farm would also be a good idea. More ideas on whole-farm planning can be found in K-State Research and Extension publication MF-2403 *Whole-Farm Planning for Economic and Environmental Sustainability*.

**Table 6. Mechanization appropriate for farm size and operation intensity**

	Range of Mechanization			
	None	Low	Medium	High
<b>Tillage</b>	Hand/shovel	Small rototiller	Large rototiller	Tractor mounted plow, spader, rotovator
<b>Weeding</b>	By hand, combined with mulch, flame, etc.	Some plastic or fabric row cover, walk behind wheel hoe	Walk behind rototiller/cultivator	Tractor mounted cultivation equipment, flame
<b>Planting</b>	Hand seed, hand transplant	Push seeder, use wheel hoe to make furrow	Rototiller to make furrow, attach seeder	Tractor mounted seeder and transplanter
<b>Leaf harvest</b>	By hand	Hand with large loppers	Electric hedge trimmer	Sickle bar mower
<b>Root harvest</b>	Shovel, fork	Shovel or fork with more labor, or borrow equipment	Furrow with tractor or tiller, hand separate	Root digger (carrot or potato)
<b>Root washing</b>	By hand, hose, bucket	Mounted screens, pressure washer	Rent or borrow barrel washer	Barrel root washer
<b>Flower harvesting</b>	By hand	Hand rake (chamomile example)	Modified hedge trimmer	Commercial flower harvester
<b>Drying</b>	Air dry, small batches	Air dry, large batches	Small forced air heater/dryer	Large forced air heater/dryer
<b>Approximate size of operation (in acres):</b>	0.01 – 0.5	0.5 – 2.0	2.0 – 5.0	5.0+
<b>Equipment price range (per item):</b>	\$0 – 20	\$20 – \$100	\$100 – \$2,000	\$2,000 – \$25,000

(Note: these are not absolute categories – needs will vary, and one farm may use items from more than one column. Also, in the intermediate levels, it may make sense to rent or borrow equipment listed in the “high” category rather than to purchase it.)

**Table 7. Example of fixed-cost budget calculations for adding an herb business to an existing farm**

	1	2	3	4	5	6	7	8
<b>Item</b>	<b>Cost of item</b>	<b>Share or amount used</b>	<b>Total cost</b>	<b>Useful life (years)</b>	<b>Depreciation \$/year</b>	<b>Interest \$/yr (8% of total cost)</b>	<b>Number of hours per year used</b>	<b>Cost (\$)³</b>
<b>Land</b>								
<b>Cropland</b>	\$1,000/A	2 acres	\$2,000	na¹	na	\$160	na	\$80/A/yr
<b>Improvements and facilities</b>								
<b>Storage buildings</b>	\$5,000	10%	\$500	10	\$50	\$40	na	\$90/yr
<b>Equipment²</b>								
<b>Tractor</b>	\$12,000	50%	\$6,000	20	\$300	\$480	120	\$6.50/hr
<b>Rotovator</b>	\$3,000	100%	\$3,000	15	\$200	\$240	50	\$8.80/hr
<b>Cultivator</b>	\$500	100%	\$500	15	\$33	\$30	70	\$0.90/hr
<b>Farm truck</b>	\$25,000	2%	\$500	5	\$100	\$40	25	\$5.60/hr
<b>Storage containers</b>	\$100	100%	\$100	5	\$20	\$8	na	\$28/yr
<b>Drying frames</b>	\$200	100%	\$200	5	\$40	\$16	na	\$56/yr
<b>Hand tools</b>	\$200	90%	\$180	10	\$18	\$14	50	\$0.65/hr
<b>Total fixed costs</b>			\$12,980		\$761	\$1,028		

¹Not applicable.

²Note: gas, oil, and repairs are not included in equipment costs. A formula or percentage may be used to estimate future costs, or farm records can be used to record actual costs. These could be added to Table 10 as variable costs.

³Use the numbers in this column to complete Table 10.

**Table 8. Worksheet for calculating fixed costs**

	1	2	3	4	5	6	7	8
Item	Cost of item	Share or amount used	Total cost	Useful life (years)	Depreciation \$/year	Interest \$/yr (8% of total cost)	Number of hours per year used	Cost
<b>Land</b>								
<b>Cropland</b>								
<b>Woodland</b>								
<b>Other land</b>								
<b>Improvements and facilities</b>								
<b>Storage buildings</b>								
<b>Dryers</b>								
<b>Other</b>								
<b>Equipment<sup>1</sup></b>								
<b>Primary tillage</b>								
<b>Cultivation</b>								
<b>Harvest</b>								
<b>Total fixed costs</b>			\$		\$	\$		

<sup>1</sup>This table should include existing equipment, new equipment purchases, and used/rebuilt equipment.

**Table 9. Gross income (\$/Acre) calculated from estimated yield and price information**

	Price per pound (\$)										
	1	2	4	6	8	10	15	20	30	40	50
<b>Yield (lb/A)</b>											
50	50	100	200	300	400	500	750	1,000	1,500	2,000	2,500
100	100	200	400	600	800	1,000	1,500	2,000	3,000	4,000	5,000
200	200	400	800	1,200	1,600	2,000	3,000	4,000	6,000	8,000	10,000
400	400	800	1,600	2,400	3,200	4,000	6,000	8,000	12,000	16,000	
600	600	1,200	2,400	3,600	4,800	6,000	9,000	12,000	18,000		
800	800	1,600	3,200	4,800	6,400	8,000	12,000	16,000	24,000		
1,000	1,000	2,000	4,000	6,000	8,000	10,000	15,000	20,000	30,000		
1,500	1,500	3,000	6,000	9,000	12,000	15,000	22,500	30,000			
2,000	2,000	4,000	8,000	12,000	16,000	20,000					
3,000	3,000	6,000	12,000	18,000	24,000	30,000					
4,000	4,000	8,000	16,000	24,000							

**How to use Table 10**

- 1) Use a separate column for each herb crop, if growing a one-year annual crop. Use multiple columns for multi-year crops, especially if yield is obtained more than one year. Complete each column for the amount of herb on your farm. Convert to dollars per acre or dollars per square foot later, to compare among crops.
- 2) Supplies, such as seed, fertilizer and compost can be recorded as money actually spent in each year for each crop.
- 3) Equipment costs can be estimated by taking the number of hours of equipment use times your farm cost in dollars per hour calculated in Table 8. Land and building costs will be added at the end under fixed costs.
- 4) When calculating labor costs, separate into self-labor and hired labor. The hired labor is part of the variable cost of producing the crop, while the self-labor column will be calculated at the end of the worksheet, as the residual once all the variable and fixed costs are paid. The number of hours you put in will be divided by the total net income, to figure out your return to management/labor.
- 5) At the end of the table, compare your hourly wage raising herbs to the opportunity cost of your labor at another job for which you are qualified. Also, compare to a living wage in central Kansas, which is about \$10 per hour.

**Table 10. Worksheet for calculating profit/loss for several herb crops**

Note: Dill has been used as an example in column 1 of this table.

	Herb 1 (or Year 1)	Herb 2 (or Year 2)	Herb 3 (or Year 3)	Herb 4 (or Year 4)
<b>10.A Background information</b>				
Common name	Dill			
Latin name	<i>Anethum graveolens</i>			
Seed source	ABC Garden Seeds			
Plot dimensions	10- by 10-ft.			
Square footage	100			
% acre (ft <sup>2</sup> /43,560)	.002			
Date planted	5-1-04			
Date harvested	7-5-04			
Number of years	less than 1			
<b>10.B Yield and gross income</b>				
<b>Flower or seed</b>				
Total harvested (lb fresh/dry weight)	—			
Marketable yield (lb fresh/dry weight)	—			
<b>Leaf or herb tops</b>				
Total harvested (lb fresh/dry weight)	100 lbs fresh weight			
Marketable yield (lb fresh/dry weight)	90 lbs fresh weight			
<b>Root or bark</b>				
Total harvested (lb fresh/dry weight)	—			
Marketable yield (lb fresh/dry weight)	—			
Return (list each part of crop on separate line)				
Price per lb (fresh/dry weight)	\$2/lb fresh weight			
<b>Total sold</b>	80 lbs			
<b>Total gross income</b>	\$160			
<b>10.C Variable costs (Use per hour or per acre figures from Table 8 and your farm records)</b>				
<b>1. Soil preparation</b>				
Soil test	\$3			
Plow	—			
Chisel	—			
Disk	—			
Rototill	0.5 hr = \$4.40			
Lime	—			
Soil amendments (fertilizer, compost, manure)	compost ~ \$5			
Hired labor (hrs x rate = \$)	—			
Self labor (enter hours)	½ hr			
<b>Total soil preparation costs</b>	\$12.40			

**Table 10. Worksheet for calculating profit/loss for several herb crops (*continued*)**

	Herb 1 (or Year 1)	Herb 2 (or Year 2)	Herb 3 (or Year 3)	Herb 4 (or Year 4)
Table 10.C continued				
<b>2. Seeding and transplanting</b>				
Seeds	\$1			
Transplants (or cost to produce)	—			
Planting equipment cost	—			
Hired labor (hrs x rate = \$)	—			
Self labor (enter hours)	½ hr			
<b>Total seeding and transplanting costs</b>	<b>\$1</b>			
<b>3. Production costs</b>				
Mulches/row cover	—			
Cultivation equipment	—			
Other equipment used	—			
Other – water	2,000 gal = \$2			
Herbicide (if used)	—			
Insecticide (if used)	—			
Fungicide (if used)	—			
Irrigation	—			
Fuel and oil	—			
Misc. equip. repairs	—			
Hired labor (hrs x rate = \$)	—			
Self labor (enter hours)	weeding – 2 hrs			
<b>Total production costs</b>	<b>\$2</b>			
<b>4. Harvesting costs</b>				
Mowing/clipping	—			
Digging	—			
Root washing	—			
Seed harvest	—			
Sorting	—			
Drying	—			
Equipment	hand shears			
Bags/containers	\$2			
Grinding	—			
Hired labor (hrs x rate = \$)	—			
Self labor (enter hours)	2 hrs			
<b>Total harvesting costs</b>	<b>\$2</b>			

**Table 10. Worksheet for calculating profit/loss for several herb crops (continued)**

	Herb 1 (or Year 1)	Herb 2 (or Year 2)	Herb 3 (or Year 3)	Herb 4 (or Year 4)
<b>5. Management and marketing costs</b>				
Shipping/hauling	Drive to Manhattan – \$4			
Brokerage fee				
Accounting				
Other				
Hired labor (hrs x rate = \$)				
Self labor (enter hours)	1.5 hrs			
<b>Total marketing costs</b>	<b>\$4</b>			
<b>Total variable costs – cash</b>	<b>\$21.40</b>			
Hired labor (hrs x rate = \$)	0			
Self labor (enter hours)	6.5 hrs			
<b>10.D Fixed costs<sup>1</sup></b>				
Interest on land and buildings	$\$80/A \times .002 = \$0.16$			
Taxes on land and buildings	N/A			
Cash rent	—			
Depreciation on machinery	already included			
Interest on machinery <sup>1</sup>	already included			
Depreciation on irrigation equipment <sup>1</sup>	—			
Interest on irrigation equipment	—			
Insurance	—			
Organic Certification	—			
Operating loan/interest	—			
Other fixed costs - memberships, etc.	GPHG $\frac{1}{5} \times \$25 = \$5$			
<b>Total fixed costs</b>	<b>\$5</b>			
<b>Total fixed plus variable costs</b>	<b>\$26.40</b>			
<b>10.E Returns</b>				
Returns over variable costs	$\$160 - 21.40 = 138.60$			
Returns over total (fixed plus variable) costs	$\$160 - 26.40 = 133.60$			
Average returns per year over variable costs (for multi-year crops)	—			
Average return per year over total costs (fixed plus variable) (for multi-year crops)	—			
<b>Total hours of self labor</b>	<b>6.5 hrs</b>			
<b>\$/hr for self divided by returns over variable costs</b>	<b>\$21.32</b>			
<b>\$/hr for self divided by returns over total costs</b>	<b>\$20.55</b>			
<b>Opportunity costs (what you would have been paid for those hours at another job)</b>	$6.5 \text{ hrs} \times \$20 = \$130$			

<sup>1</sup>Divide fixed costs into amount appropriate for each crop. For example, land cost can be apportioned to the crop actually growing on the land. Insurance, organic certification and other costs might be divided by the total number of crops grown, or also apportioned according to space or size of each crop enterprise. Include all fixed costs not already allocated to individual variable cost sections.

## Conclusions

The next section of this handbook contains information on growing herbs. Table 11 lists the herbs described in Appendix A and some additional herbs that were grown in K-State observation plots. Details on seed germination requirements and our experience with the seed are listed. More growing information, as well as background information and economic projections, are found in Appendix A. Retail prices are listed in Appendix B. These provide rough estimates of the relative value of the herbs at the

time the price research was conducted. It should be noted, however, that many times there was a bigger difference in the prices of a particular herb between companies, than for different herbs within a single company. For fact sheet estimates of possible wholesale value, the lowest and highest prices were divided by two.

Good luck in your new venture, and check out [www.oznet.ksu.edu/ksherbs](http://www.oznet.ksu.edu/ksherbs) for updates to this publication. Herb resources and organizations are listed on page 22.

**Table 11. Germination requirements of herbs grown in KSU trials.**

Herb		Literature Recommendations			K-State Trials		
Latin Name	Common Name	Seed Treatment	Germination	Germ. %	Germination	Transplant Time	Comments
<i>Achillea millefolium</i>	Yarrow	Light	10-12 days	70%	6 days	8-12 weeks	Small seed
<i>Althea officinalis</i>	Marsh mallow	Stratify 7 days	3-5 weeks	70%	11 days	8 weeks	Spreads quickly
<i>Arctium lappa</i>	Burdock	No treatment	1-2 weeks	80-90%	7 days	4-8 weeks	Direct seed biennial
<i>Artemisia vulgaris</i>	Mugwort	Stratify 2 weeks	2-4 weeks	70%	n/a	10-12 weeks	Small seed
<i>Asclepias tuberosa</i>	Butterfly weed	Stratify several weeks	2-3 weeks	40%	8 days	12-16 weeks	Grows slowly
<i>Astragalus membranaceus</i>	Milk vetch	Stratify 3 weeks, Scarify and soak	4 weeks	50%	2 days (overnight soak)	12 weeks	Soak overnight
<i>Borago officinalis</i>	Borage	No treatment	7-14 days	75%	10 days	6 weeks	Direct seed
<i>Calendula officinalis</i>	Calendula	No treatment	7-10 days	80%	4 days	8 weeks	Direct seed
<i>Cnicus benedictus</i>	Blessed thistle	No treatment	7-15 days	60%	5 days	4-8 weeks	Direct seed
<i>Echinacea angustifolia</i>	Narrow-leaf coneflower	Stratify 90 days, light	10-20 days	50%	15 days	12 weeks	Direct seed in fall
<i>Echinacea pallida</i>	Pale purple coneflower	Stratify 60 days, light	10-20 days	50%	4 days	8-12 weeks	Direct seed in fall
<i>Echinacea purpurea</i>	Purple coneflower	No treatment	10-20 days	70%	9 days	8-12 weeks	Direct seed
<i>Eupatorium perfoliatum</i>	Boneset	Stratify 7 days, light	2-3 weeks	80-90%	13 days	8-12 weeks	Small seed
<i>Eupatorium purpureum</i>	Joe Pye weed	Stratify 7 days, light	3-4 weeks	n/a	12 days	8-12 weeks	Likes moisture
<i>Glycyrrhiza glabra</i>	Licorice	Soak and scarify	7-14 days	70-80%	7 days	12-16 weeks	Soak overnight
<i>Glycyrrhiza uralensis</i>	Licorice	Soak and scarify	7-14 days	70-80%	7 days	12-16 weeks	Soak overnight
<i>Hypericum perforatum</i>	St. John's wort	Light	3-4 weeks	70%	3 weeks	12 weeks	Small seed
<i>Hyssopus officinalis</i>	Hyssop	No treatment	10-20 days	70%	6 days	10-12 weeks	Small seed
<i>Inula helenium</i>	Elcampane	No treatment	3-4 weeks	50%	6 days	8-12 weeks	Direct seed
<i>Leonurus cardiaca</i>	Mother wort	Stratify several weeks	2 weeks	75%	15 days	10-12 weeks	Small seed
<i>Lespedeza capitata</i>	Round-headed lespedeza	Stratify for 2 months. Remove hulls or scarify seed.	n/a	n/a	n/a	n/a	n/a
<i>Levisticum officinale</i>	Lovage	Stratify 1-2 weeks	2 weeks	5%	12 days	8-12 weeks	Poor germination
<i>Marrubium vulgare</i>	Horehound	No treatment	2-3 weeks	70%	9 days	8-12 weeks	Small seed
<i>Matricaria recutita</i>	Chamomile	No treatment	7-14 days	70%	n/a	8-10 weeks	Quick crop
<i>Monarda fistulosa</i>	Monarda	Stratify 3 months	2-3 weeks	60-70%	8 days	8-weeks	Spreads quickly
<i>Nepeta cataria</i>	Catnip	Stratify 2-3 weeks	2-3 weeks	50%	n/a	2-3 months	Spreads quickly
<i>Oenothera biennis</i>	Evening primrose	Stratify several weeks	2 weeks	80%	8 days	8-10 weeks	Biennial
<i>Origanum vulgare</i>	Oregano	Stratify 1 week	7-14 days	70%	n/a	8 weeks	Spreads quickly

**Table 11. Germination requirements of herbs grown in KSU trials. (continued)**

Herb		Literature Recommendations			K-State Trials		
Latin Name	Common Name	Seed Treatment	Germination	Germ. %	Germination	Transplant Time	Comments
<i>Passiflora incarnata</i>	Passion flower	Stratify 1 week	3 weeks	40%	n/a	8-10 weeks	Difficult to germinate
<i>Prunella vulgaris</i>	Self heal	Stratify 1 month	3 weeks	70%	12 days	8 weeks	Spreads quickly
<i>Rumex acetosella</i>	Sheep sorrel	No treatment	7-10 days	70%	7 days	8 weeks	Spreads quickly
<i>Ruta graveolens</i>	Garden rue	Stratify 1 week	7-10 days	50%	14 days	8-10 weeks	Handle with gloves
<i>Salvia apiana</i>	White sage	Stratify 1 week	2-3 weeks, 80°	40%	9 days	10-12 weeks	Annual in Kansas
<i>Scutellaria lateriflora</i>	Skullcap	Stratify 1 week	2-4 weeks	75%	13 days	10-12 weeks	Spreads quickly
<i>Silybum marianum</i>	Milk thistle	No treatment	10-14 days	90%	10 days	4 weeks	Direct seed
<i>Spilanthes oleracea</i>	Toothache	High temperature	10 days	100%	4 days	4-8 weeks	Spreads quickly
<i>Stevia rebaudiana</i>	Stevia	No treatment, bottom heat	2-3 weeks	30%	4 days	8-10 weeks	Difficult to germinate
<i>Tanacetum parthenium</i>	Feverfew	Stratify 1 week, Light	10-14 days	70%	7 days	8 weeks	Will reseed readily
<i>Taraxacum officinale</i>	Dandelion	Stratify 1 week, light	10-14 days	90%	7 days	8 weeks	Deer love this herb
<i>Trifolium pratense</i>	Red clover	Stratify 7 days	7-14 days	75%	9 days	4-8 weeks	Deer love this herb
<i>Urtica dioica</i>	Stinging nettle	Stratify 1 week, light	10-15 days	50%	4 days	8-12 weeks	Handle with gloves
<i>Valeriana officinalis</i>	Valerian	No treatment	2-3 weeks	70%	14 days	8-12 weeks	Root rot problems
<i>Verbascum thapsus</i>	Mullein	Plant on surface	10-20 days	80%	14 days	8-12 weeks	Needs a lot of space
<i>Verbena hastata</i>	Blue vervain	Stratify 2 weeks	2-3 weeks	75%	10 days	4-8 weeks	High seed production
<i>Withania somnifera</i>	Ashwagandha	No treatment	7-14 days	70%	13 days	12 weeks	Needs a lot of space

Includes plants listed on fact sheets and also new plants that will be covered in future fact sheets.

Kansas State University herbs propagated in greenhouse at a daytime temperature of 70°F, nighttime temperature of 68°F. Seed started in 3-inch cavity cell with a media mix of Jiffy Mix® and compost at a 1-1 ratio. Seedlings transplanted into 4-inch square containers using a media of high porosity mix and compost at a 1-1 ratio. Fish emulsion used for fertilizer. Beneficial insects and soap and water for insect control.

## Glossary\*

- abortifacient** – A drug or chemical that induces abortion.
- adaptogen** – A preparation that acts to strengthen the body and increase resistance to disease.
- alterative** – Any drug used to favorably alter the course of an ailment and to restore health. To improve the excretion of wastes from the circulatory system.
- annual** – A plant that completes its growth cycle in one year.
- anthelmintic** – An agent or drug that is destructive to worms.
- balm** – Topical, usually includes oil, somewhat viscous.
- bitter** – An alcoholic liquid prepared by maceration or distillation of a bitter herb or herb part that is used to improve appetite or digestion.
- deciduous** – A tree that sheds its leaves at the end of the growing season.
- decoction** – A liquid substance prepared by boiling plant parts in water or some other liquid for a period of time.
- extraction** – The portion of a plant that is removed by solvents and used in drug preparations in solid or liquid form.
- homeopathic** – Substances that are administered in minute amounts with the theory that substances that may cause or mimic a disease in larger amounts can be used to treat or prevent disease if given in small amounts.
- inflorescence** – The spatial arrangement of flowers along the axis. The mode of disposition of flowers or the act of flowering.
- infusion** – The process of steeping or soaking plant matter in liquid to extract its medicinal properties without boiling.
- mucilage** – A viscid substance in a plant consisting of a gum dissolved in the juice of the plant. A soothing application made from plant gums.
- perennial** – A plant that grows for three or more years.
- rhizome** – An underground stem.
- salve** – Topical, made with infused oil, and sometimes thickened with beeswax.
- tincture** – An alcoholic or hydroalcoholic mixture prepared from plant parts.
- tonic** – A medication used to fortify and provide increased vigor.

\*From the *Physicians Desk Reference for Herbal Medications*

## Disclaimer

Please consult reference texts and a health-care practitioner(s) before taking herb products to treat a medical condition. This handbook is intended to provide herbal information to gardeners, not medical advice.

## References

- American Botanical Council. HerbalGram 41, 51, 53. Articles of Incorporation of Great Plains Herb Growers Association.
- “Commercial Medicinal Herb Enterprise” Alberta Agriculture Food and Rural Development. Available online at [http://www.agric.gov.ab.ca/agdes/200/263\\_830-2.html](http://www.agric.gov.ab.ca/agdes/200/263_830-2.html)
- “Market Report on Herbs and Spices” Herb Market Report April 2000. Agribusiness in Sustainable Natural African Plant Products.
- “Medicinal Herbs” Agricultural Notes Series No. AG0673.
- “The US Market for Medicinal Herbs” Rural Agricultural Incomes with a Sustainable Environment, March 2001.

## For more information

### American Botanical Council

Nonprofit educational organization, publishes the quarterly trade magazine *Herbalgram*  
PO Box 144345, Austin, TX 78714-4345  
Phone: 512-926-4900  
Fax: 512-926-2345  
[www.herbalgram.org](http://www.herbalgram.org)

### ATTRA, Appropriate Technology Transfer for Rural Areas

Many fact sheets on herbs in general and also specific popular herbs. Many other fact sheets of interest to farmers looking for alternative crops.  
PO Box 3657, Fayetteville, AR 72702.  
1-800-346-9140.  
[www.attra.org](http://www.attra.org)

### Kansas State University

[www.oznet.ksu.edu](http://www.oznet.ksu.edu), especially publication MF-2532  
*Economic Issues with Echinacea*  
[www.kansassustainableag.com](http://www.kansassustainableag.com) for links to other herb Web sites

### North Carolina

[www.ces.ncsu.edu/depts/hort/hil/](http://www.ces.ncsu.edu/depts/hort/hil/)  
Check out the specialty crop fact sheets for information on culinary and medicinal herbs.

## Seed Sources

### Horizon Herbs, LLC

Seeds grown by well-known herbalist/writer Richo Cech and his family  
PO Box 69, Williams, OR 97544  
Phone: 541-846-6704  
Fax: 541-846-6233  
E-mail: [hhcustserv@HorizonHerbs.com](mailto:hhcustserv@HorizonHerbs.com)  
[www.horizonherbs.com](http://www.horizonherbs.com)

### Johnny's Seeds

Sells vegetable seed to gardeners and professional growers. Good selection of culinary and medicinal herb seed, including some organically grown seed.  
184 Foss Hill Rd, Albion, ME 04901  
Phone: 207-437-4301  
[www.johnnyseeds.com](http://www.johnnyseeds.com)

### Prairie Moon Nursery

Large selection of seeds for prairie plantings and restoration, including medicinal plants from the prairie.  
Route 3, Box 1633, Winona, MN 55987-9515  
Phone: 507-452-1362  
Fax: 507-454-5238  
E-mail: [pmnrsv@luminet.net](mailto:pmnrsv@luminet.net)  
[www.prairiemoonnursery.com](http://www.prairiemoonnursery.com)

### Richters Herbs

Company founded in 1970 to sell bedding plants and herbs. Good selection and informative catalog and Web site.  
Phone: 905-640-6677  
Fax: 905-640-6641, Goodwood, Ontario, Canada.  
L0C 1A0  
[www.richters.com](http://www.richters.com)

### Seedman.com

Jim Johnson, Seedman

Carries large and varied selection of seeds from around the world.

3421 Bream St., Gautier, MS 39553  
Phone: 800-336-2064  
Fax: 228-497-5488  
E-mail: [support@seedman.com](mailto:support@seedman.com)  
[www.seedman.com](http://www.seedman.com)

## Associations

### Great Plains Herb Growers Association

For those considering commercial-scale herb production. One-year membership, newsletter \$25. Send to Rhonda Janke, Department of Horticulture, Forestry, and Recreation Resources, 2021 Throckmorton, KSU, Manhattan, KS 66506. Make checks payable to GPGH. For more information, visit [www.oznet.ksu.edu/ksherbs](http://www.oznet.ksu.edu/ksherbs).

To join a free mailing list for herb workshop updates, contact Christy Dipman, Phone: 785-532-6173; E-mail: [cdipman@oznet.ksu.edu](mailto:cdipman@oznet.ksu.edu)

### The Herb Growing & Marketing Network

Non-members can learn a lot from visiting this Web site, reading their newsletters. Member benefits include Web site design and hosting, listing your herb business in the Herbal Green Pages Online and discounted rates for product liability insurance. Membership prices start at \$40/year and higher.

PO Box 245, Silver Spring, PA 17575  
Phone: (717) 393-3295  
Fax: (717) 393-9261  
[www.herbnet.com](http://www.herbnet.com) and [www.herbworld.com](http://www.herbworld.com)  
E-mail: [HERBWORLD@aol.com](mailto:HERBWORLD@aol.com)

*There are many other herb associations, but these will help you get started.*

## Books – General

### The Bootstrap Guide to Medicinal Herbs in the Garden, Field, and Marketplace

Lee Sturdivant and Tim Blakley (1999)  
San Juan Naturals, PO Box 642, Friday Harbor, WA 98250-0642  
Great guide to herb growing and marketing by two individuals who are actually doing it.

### The Complete Book of Herbs – A practical guide to growing and using herbs

Lesley Bremness (1988)  
Penguin Books: N.Y.  
Lots of information about growing herbs.

### Complete Illustrated Guide to the Holistic Herbal

David Hoffmann (1996)  
HarperCollins Publishers, London  
Nice photographs, good listing of herbs.

### The Complete Medicinal Herbal

Penelope Ody (1993)  
Dorling Kindersley: N.Y.  
Great photos, some history, nice reference tables in second section.

### Field Guide to Medicinal Wild Plants

Bradford Angier (1978)  
Stackpole Books: Cameron and Kelker Streets, Harrisburg, Pa.

*Farming a Few Acres of Herbs: An Herb Grower's Handbook*

### **Flora of the Great Plains**

R.L. McGregor, T.M. Barkley, R.E. Brooks, and E.K. Schofield (1986)  
University of Kansas Press: Lawrence, Kan.

### **The Green Pharmacy**

James A. Duke (1997)  
St. Martin's Paperbacks, St. Martin's Press: New York, N.Y.  
This affordable book offers scientific insight and practical herbal remedies for everything from baldness to bad breath. James Duke was a research scientist for the USDA in Beltsville, Md.

### **The German Commission E Monographs**

Translated by Mark Blumenthal, available through American Botanical Council  
Recommendations of a scientific council, based on published research, for herbal supplements that may be prescribed by physicians in Germany.

### **Growing 101 Herbs That Heal**

Tammi Hartung (2000)  
Storey Books: Schoolhouse Road, Pownal, Vt.  
Good section on germination and growing requirements for 100+ herbs.

### **Handmade Medicines - Simple Recipes for Herbal Health**

Christopher Hobbs (1998)  
Interweave Press, Inc: Loveland, Colo.

### **Herbs for First Aid – Simple Home Remedies for Minor Ailments and Injuries**

Penelope Ody (1997)  
Keats Publishing: Los Angeles

### **The Honest Herbal – 3rd Edition**

Varro E. Tyler (1993)  
Haworth Press, Inc: New York  
Provides some information about using herbs, some well researched, and some anecdotal. This book is written by a skeptic, but is fairly balanced.

### **Medicinal Wild Plants of the Prairie, an Ethnobotanical Guide**

Kelly Kindscher (1992)  
University of Kansas Press: Lawrence, Kan.

### **Peterson Field Guides: Eastern/Central Medicinal Plants and Herbs - 2nd Edition**

Steven Foster and James A. Duke (2000)  
Houghton Mifflin Company: Boston

### **Physicians' Desk Reference for Herbal Medicines – 2nd Edition (2000)**

Medical Economics Company: Montvale, N.J.  
The most thorough reference for describing herbs, supplements derived from herbs, summarizing herb efficacy, and warning about side effects and drug/herb interactions.

### **The Village Herbalist**

Nancy and Michael Phillips (2000)  
Chelsea Green Publisher  
See [www.herbsandapples.com](http://www.herbsandapples.com) for more information.  
A great book. Discusses the "how" of herbalism at the home and village scale, as well as providing some information about the plants.

### **Books - for Large-Scale Growers**

#### **Herb and Spice Production Manual**

Connie Kehler (1999)  
Produced by the Saskatchewan Herb and Spice Association, Print It Centre, Regina, Sask. (available through Richters Catalog)

#### **Grower's Crop Monographs**

Frontier Organic Research Farm, Norway, IA  
Available through Frontier's Web site  
[www.frontiercoop.com/about/farm.html](http://www.frontiercoop.com/about/farm.html)

### **Database and reference Web sites**

**HerbMed®** is an interactive, electronic herbal database that provides hyperlinked access to the scientific data underlying the use of herbs for health. It is an impartial, evidence-based resource for professionals, researchers and the general public, provided by the nonprofit Alternative Medicine Foundation, Inc.  
[www.herbmed.org](http://www.herbmed.org)

**Kansas State University** provides online publications on herbs, data from field sites, and links to the Great Plains Herb Growers Association calendar and newsletters. Also provides hot-links to herb Web sites of interest.  
[www.oznet.ksu.edu/ksherbs](http://www.oznet.ksu.edu/ksherbs)

**Plants for a Future** is a registered charity based in Devon, Great Britain. They are compiling a database, which currently consists of approximately 7,000 species of plants. They conduct research and provide information on edible and otherwise useful plants suitable for growing outdoors in a temperate climate. There are now 1,500 species of edible plants growing at "The Field" in Cornwall demonstration gardens since 1989.  
[www.pfaf.org](http://www.pfaf.org)

**Phytochemical and Ethnobotanical databases**, compiled by Dr. James Duke. Searchable database includes: plant searches (chemicals and activities in a particular plant, high concentration chemicals, chemicals with one activity, ethnobotanical uses, list chemicals and activities for a plant), chemical searches (plants with a chosen chemical, activities of a chosen chemical, list activities and plants for a chemical), activity searches (plants with a specific activity, search for plants with several activities, chemicals with a specific activity, lethal dose (LD) information for a chemical, search for plants/chemicals with one or more activities, search for plants/chemicals with a superactivity), ethnobotany searches (ethnobotanical uses for a particular plant, plants with a particular ethnobotanical use) and database references and reference citations.  
[www.ars-grin.gov/duke](http://www.ars-grin.gov/duke)



## Appendix A

The plants described in the following fact sheets were grown in K-State test plots in either Hays, Colby, Wichita or Olathe, Kan. Four replications of each species were generally included at a site, though not all species were screened at each site, or screened each year. The number of replications of location-years is included in the summary table with each fact sheet, and the detailed data can be found at [www.oznet.ksu.edu/ksherbs](http://www.oznet.ksu.edu/ksherbs).

All plants were grown from seed in the greenhouse and transplanted in the field in late May or early June. Depending on the location/year, either five or 10 plants per plot were established. All plants at each location were used to determine the percent survival, vigor rating and insect and disease ratings. Three plants per plot were measured for height, and only one plant per plot was harvested for yield each year. Cultivating four plots allowed researchers to estimate yield from four plants at each location/year.

The plants were dried and weighed, and top and root weights are recorded in grams. The grams per plant are converted to kg/A, and also lb/A for purposes of estimated field scale yield. Herbs are usually marketed based on dry weight per pound or kilogram. The population density used to calculate field yields was the optimal population density (determined by the average size of the plants) multiplied by the actual percent survival as measured in the field. There was generally some loss due to transplant shock, and for some species, significant winter loss as well.

Plant spacing recommendations on each sheet are for within a row. The distance between rows will depend on the farming operation and equipment used. The minimum row spacing will be the same as the plant spacing recommendation. For example, if plants need to be 12 inches apart, the rows should be a minimum of 12 inches apart as well. However, if cultivator or root harvesting equipment is on 5-foot centers, plant rows 5 feet apart to facilitate cultivating and harvesting. Adjust estimated plant density per acre on the worksheets, if trying to estimate gross yield and net income.

In addition to yield, some semi-quantitative ratings were done on plants in the field, including vigor rating (1 = very poor, 3 = slightly above average, 5 = very good, well adapted), maturity rating (1 = vegetative, 2 = early bud, 3 = early flower, 4 = full flower, 5 = seed production, 6 = senescence), insect-damage rating (scale of 0 to 5, with 0 = no damage, 5 = severe) and disease rating (scale of 0 to 5, with 0 = no damage, 5 = severe). Height was recorded in centimeters.

The prices listed on each fact sheet are from Appendix B. To calculate a rough gross income potential for each herb, the estimated yield is taken times the lowest and the highest retail price, divided by two. This is a rough estimation of wholesale price. Actual prices should be determined if you enter into a contract, and small on-farm plots can be used to determine yield before investing money in large-scale herb production.

In our field trials, only organic production methods were used. None of the land was certified organic, but compost was used as the fertility source, and weeds were controlled mechanically, by hand or with the use of fabric and straw mulches. Insects and diseases were not controlled to determine if there was significant pest pressure on these species in Kansas. Higher prices are often offered for herbs that are grown organically, and in the future, non-organic herbs may be difficult to sell to a health-conscious consumer. For these, and other reasons, only organic methods were used in test plots and greenhouse. In the greenhouse, standard seed starting peat mix, pots and greenhouse conditions were used. However, compost was added to the transplant soil mix, fish emulsion used for fertility, and biological predators and soap were used for pest control.

The medicinal benefits section of each fact sheet is not intended to be a guide for use, but to help growers understand more about what consumers might want the herb for, and to give a general idea of the usefulness, and potential market for the herb. It may be confusing in some places to find that a single species could have varied uses. This seems somewhat contradictory at first. How can an herb be used for the liver and also for a head cold, for example? But, as clinical trials catch up to folklore, researchers find a lot of cross-reactivity, that is, plants that were used by Native Americans for snakebite also have activity in anti-cancer screening trials, for example.

The following fact sheets cover more than 30 herbs that were tested in Kansas between 2000 and 2002, in the first three years of K-State trials. Additional species and new data for these 30 will be added in later editions and updates.

## Herb Fact Sheets

Common Name	Latin Name	Fact Sheet Number
Bee balm	<i>Monarda fistulosa</i>	MF-2605
Blue vervain	<i>Verbena hastata</i>	MF-2606
Boneset	<i>Eupatorium perfoliatum</i>	MF-2607
Borage	<i>Borago officinalis</i>	MF-2608
Burdock	<i>Arctium lappa</i>	MF-2609
Butterfly milkweed	<i>Asclepias tuberosa</i>	MF-2623
Calendula	<i>Calendula officinalis</i>	MF-2610
Chinese milkvetch	<i>Astragalus membranaceus</i>	MF-2612
Coneflower – narrow-leaved	<i>Echinacea pallida</i> <i>Echinacea angustifolia</i>	MF-2620
Coneflower – purple	<i>Echinacea purpurea</i>	MF-2624
Dandelion	<i>Taraxacum officinale</i>	MF-2613
Feverfew	<i>Tanacetum parthenium</i>	MF-2614
Evening primrose	<i>Oenothera biennis</i>	MF-2611
Heal all/Self heal	<i>Prunella vulgaris</i>	MF-2636
Joe Pye weed	<i>Eupatorium purpureum</i>	MF-2615
Licorice	<i>Glycyrrhiza uralensis</i> <i>Glycyrrhiza glabra</i>	MF-2616
Marsh mallow	<i>Althea officinalis</i>	MF-2617
Milk thistle	<i>Silybum marianum</i>	MF-2618
Mullein	<i>Verbascum thapsus</i>	MF-2619
Oregano	<i>Origanum vulgare</i>	MF-2621
Red clover	<i>Trifolium pratense</i>	MF-2625
Round-headed lespedeza	<i>Lespedeza capitata</i>	MF-2626
Sheep sorrel	<i>Rumex acetosella</i>	MF-2627
Skullcap	<i>Scutellaria lateriflora</i>	MF-2628
St. John's wort	<i>Hypericum perforatum</i>	MF-2629
Stevia	<i>Stevia rebaudiana</i>	MF-2630
Stinging nettle	<i>Urtica dioica</i>	MF-2631
Valerian	<i>Valeriana officinalis</i>	MF-2632
White sage	<i>Salvia apiana</i>	MF-2633
Yarrow	<i>Achillea millefolium</i>	MF-2634

## Appendix B

Market research is very difficult in the herb business. There are no governmental statistics, and the industry is reluctant to reveal quantities, prices or even exports vs. imports purchased. Many companies require growers to sign a confidentiality agreement when making purchases, and brokers don't like to reveal the price they are getting from the company or the company making the purchase.

So market researchers are left with data on retail, but not wholesale prices. A number of major (and some minor) companies' catalogs and Web sites were gleaned for price information for many of the herbs that may grow in Kansas. Some of these herbs are plants that are already abundant, such as walnut trees. Some are grown in flower gardens, such as lavender and lily of the valley. A few may not be welcome in yards, such as stinging nettle, burdock and dandelion, but they all have value in the medicinal herb market.

This price list can help you determine if it is worth the effort to gather, clean, dry, and market the plant or plant part on the list. A fair assumption is that the price you get will be at least half, or maybe even less, than the retail price (unless you are retailing it yourself). Some of the prices are for whole herbs, but many are for cut and sifted (coarse ground), or powdered. Ironically, in some cases the whole herb is worth more than the processed, which means that equipment purchased for grinding would not pay for itself. Some of these details are not included in the table because it is already nine pages long, with just the bare minimum of price info. You can check these details by going directly to the retailer's Web site.

When there are organic options, the organic price is in bold type. Some companies only offer organic herbs. See Table B1 for this information. Pricing information is out-dated almost as soon as it is compiled. This table was put together using spring 2003 catalogs and Web sites. We recommend using these tables only as a starting point. As you can see, the range for herb prices is large even within a particular species. In many cases, there is a tenfold difference between the highest and lowest price for an herb. The difference is partly explained by quality and source. The lower price probably represents imported herbs, of unknown source and unknown quality. The higher prices are for organically grown, ethically wildcrafted, and probably marketed by a small company with a good reputation among herbalists. If you find yourself thinking about growing a particular herb for the market, go back to these sources, find some current prices and then see if you can find a market. You won't al-

ways be able to lock in a market or prices without sending in some sort of sample, but it will give you a little experience in marketing and a way to get started.

### **Herb Price Research: Sources of Other Herb Price Info Sites**

#### **Agriculture Canada**

[www.agr.gc.ca/misb/infohort/data/herbs\\_spices](http://www.agr.gc.ca/misb/infohort/data/herbs_spices)

#### **Herbal Green Pages**

[www.herbworld.com](http://www.herbworld.com)

[www.HerbNet.com](http://www.HerbNet.com)

#### **Health Food Stores**

People's Grocery, 17<sup>th</sup> and Yuma, Manhattan, Kan.

Community Mercantile, 9th and Iowa, Lawrence, Kan.

Several in Wichita, see yellow pages in phone book.

#### **Local Broker**

David Hall

"Future in Herbs"

Wichita, Kan.

316-775-1613

#### **Kansas Center for Sustainable Agriculture and Alternative Crops**

**(includes links to many other sites)**

[www.kansassustainableag.org](http://www.kansassustainableag.org)

### **Table Index**

- B.1. Bulk herb sources
- B.2. Trees
- B.3. Shrubs and vines
- B.4. Woodland herbs
- B.5. Weedy sun-loving perennials
- B.6. Other sun-loving perennials
- B.7. Medicinals also grown as culinary species
- B.8. Flowers sold as medicinals
- B.9. Medicinal animal feed market
- B.10. Alpine herbs
- B.11. Herbs for essential oil and fragrance markets

**Table B1. Bulk Herb Sources**

<b>Name</b>	<b>Comments</b>	<b>Address</b>	<b>Web site</b>
<b>Ameri-Herb, Inc.</b>	Mentioned as a reasonable source of bulk herbs by another Web site, catalog only, no Web site.	PO Box 1968 Ames, IA 50010-1968 1-800-267-6141	No Web site, but see <a href="http://www.racehorseherbal.com/Suppliers/suppliers">www.racehorseherbal.com/Suppliers/suppliers</a> for reference
<b>Blessed Herbs</b>	Bulk botanicals, sold as (w) wildcrafted, (org) certified organic, and (h) high-quality herbs whose growing conditions we cannot verify. Purchase from a network of wildcrafters and organic growers, and only sell herbs that are not fumigated, irradiated or treated with synthetic chemicals. More than 600 products on list.	109 Barre Plains Road Oakham, MA 01068 1-800-489-4372 <a href="mailto:blessedherbs@blessedherbs.com">blessedherbs@blessedherbs.com</a>	<a href="http://www.blessedherbs.com">www.blessedherbs.com</a>
<b>Bouncing Bear Botanicals</b>	Sells about 24 herb products, most not on KSU trial list. Not listed as organic.	PO Box 3895 Olathe, KS 66063-3895 <a href="mailto:orders@bouncingb.com">orders@bouncingb.com</a>	<a href="http://www.bouncingbearbotanicals.com">www.bouncingbearbotanicals.com</a>
<b>Desert Bloom</b>	Sells about six locally wildcrafted desert herbs.	Desert Bloom Herbs 505 N. Bullard St. Silver City, NM 88061 1-800-583-2976	<a href="http://www.desertbloomherbs.com">www.desertbloomherbs.com</a>
<b>Frontier Herb Coop</b>	Products include organic bulk herbs, also many other products in recent years. Can find bulk herbs with common name search, Latin name also available. Source of herb not listed.	Frontier Cooperative Herbs 3021 78 <sup>th</sup> St. P.O. Box 299 Norway, IA 52318-0299 319-227-7996	<a href="http://www.frontiercoop.com">www.frontiercoop.com</a>
<b>Herbal Advantage, Inc.</b>	Sells several herbal products in addition to bulk herbs. Appear to make their own tinctures. Also, the farm grows a new variety of stevia, sweeter and less bitter than older varieties.	131 Bobwhite Rd. Rogersville, MO 65742 417-753-4000 800-753-9199	<a href="http://www.herbaladvantage.com">www.herbaladvantage.com</a>
<b>Jean's Greens</b>	Bulk herbs by the ounce or by the pound, maximum order 2 pounds. List of herbs notes if organic or wildcrafted. Source of herb not listed.	119 Sulphur Spring Road Norway, NY 13416 315-845-6500	<a href="http://www.jeansgreens.com">www.jeansgreens.com</a>
<b>Horizon Herbs</b>	Offers growing guide and catalog of many herb seeds. Also offers many books by founder, Richo Cech. Sells herb extracts, but not bulk herbs. Certified organic by Oregon Tilth.	Horizon Herbs, LLC PO Box 69 Williams, OR 97544 541-846-6704	<a href="http://www.horizonherbs.com">www.horizonherbs.com</a>
<b>In Harmony Herbs and Spices</b>	250 dried herbs, many certified organic. Prices not listed on Web site.	PO Box 7555 San Diego, CA 92167 619-223-8051	<a href="http://www.inharmonyherbs.com">www.inharmonyherbs.com</a>
<b>Mountain Rose Herbs</b>	Bulk herbs, essential oils, other herbal products and equipment to make your own. Bulk herbs are either certified organic or sustainable wildcrafted/grown, no chemicals.	PO Box 50220 Eugene, OR 97405 800-867-3337	<a href="http://www.mountainroseherbs.com">www.mountainroseherbs.com</a>
<b>Pacific Botanicals</b>	Oregon Tilth Certified Organic. Carries 175 medicinal herbs and spices in whole, cut, tea bag and powder. Grown on 114-acre certified organic farm and eight contract growers.	4350 Fish Hatchery Rd. Grants Pass, OR 97527 541-479-7777	<a href="http://www.pacificbotanicals.com">www.pacificbotanicals.com</a>
<b>Planet Herbs</b>	Herbs, roots, barks, and Native American ceremonial and ritual items. Lists common and Latin names, not necessarily organic.	815 2 <sup>nd</sup> Ave. Marlinton, WV 24954 1-888-480-4372	No Web site.
<b>Prairie Moon Nursery</b>	Catalog and cultural guide for many herb species, but they specialize in native plants for wetland, prairie, savanna and woodland. Seeds only, no bulk herbs.	Route 3 Box 163 Winona, MN 55987-9515 507-452-1362	<a href="http://www.prairiemoonnursery.com">www.prairiemoonnursery.com</a>
<b>Richters Herbs</b>	Established company for diverse herb seeds and plants, new species each year. Some bulk herbs, but primary business is seeds. Great Web site with photos, growing tips, etc.	Richters Herbs, 357 Hwy 47, Goodwood Ontario LOC 1AO, CANADA 1-905-640-6677	<a href="http://www.richters.com">www.richters.com</a>
<b>San Francisco Herb and Natural Food Company</b>	Bulk herbs offered, listed by common and Latin name, source (country), only a few available as organic.	47444 Kato Rd. Fremont, CA 94538 510-770-1215	<a href="http://www.herbspicetea.com">www.herbspicetea.com</a>
<b>Snake Root Man</b>	Sells only wildcrafted <i>Echinacea angustifolia</i> roots, cut and sifted.	The Snake Root Man PO Box 242 Bison, KS 67520 <a href="mailto:elfenquarters@yahoo.com">elfenquarters@yahoo.com</a>	No Web site.

**Table B1. Bulk Herb Sources (continued)**

Name	Comments	Address	Web site
<b>Trinity House</b>	Wholesale only supplier, supporting herbal retailers, practitioners and manufacturers. Does not sell to individuals. Web site offers links to companies that carry its products.	P.O. Box 1001 Graton, CA 95444 707-824-2040 888-874-4372	<a href="http://www.trinityherb.com">www.trinityherb.com</a>
<b>Wild Weeds</b>	Family-run, mail-order business. Offer organically grown herbs when available. Since 1987.	233 Red Rock Lane Fieldbrook, CA 95519 800-553-9453 (ph/fax)	<a href="http://www.wildweeds.com">www.wildweeds.com</a>
<b>Years to Your Health (YTYH)</b>	Catalog includes common name only, priced by the ounce, a few listed as organic. Source not listed.	503 E. 2 <sup>nd</sup> St. Irving, TX 75060 972-579-7042	<a href="http://www.yearstoyourhealth.com/herbs">www.yearstoyourhealth.com/herbs</a>

### Notes for Tables B2 through B11

These are prices from Web sites in dollars per pound dry weight (\$/lb), usually using the per pound price, not the bulk rate, but also not the more expensive per ounce rate.

The prices are for cut and sifted products in most cases (a very coarse grind), and in a few situations, for whole item (especially berries). Powdered products generally run \$1 to \$3 more per pound than cut and sifted. In a few cases, powdered products bring a lower price. For some roots, the whole root (licorice) or sliced root (astragalus) brings a better price than cut and sifted. Check individual catalogs for details. When an organic and a conventional source were listed side by side in the same catalog, both prices are listed divided by a slash. The first price is the organic price (in bold) and the second price

is nonorganic. In all of these cases, organic means certified organic. In some catalogs, it is assumed that all herbs are wildcrafted and/or nonorganic, and in some it is stated that most are organic, and in some, each item is coded. Check individual catalogs for details.

This list is not exhaustive. It was accurate when it was compiled (April 2003), but some prices have changed. Also, not everything makes sense, for example, the prices at People's Grocery, a Manhattan, Kan., health food store, should be linked to Frontier's price, the wholesale supplier for People's Grocery (according to the labels on the bulk jars). However, the price when People's Grocery bought the herb may have been different than the day the prices were checked at the store.

**Table B2. Trees with market as medicinal species**

Common Name	Species	Herb Part	YTYH	San Francisco	Mtn Rose	Richters	Frontier	Jean's Greens	Wild Weeds	Blessed Herb	People's Grocery
Black walnut	<i>Juglans nigra</i>	Leaf	17.60	—	<b>7.50</b>	—	—	<b>13.00</b>	—	—	—
Black walnut	<i>Juglans nigra</i>	Hull pwd	14.40	3.50	<b>7.00</b>	—	11.00	<b>9.00</b>	<b>12.00</b>	<b>12.10</b>	—
Black walnut	<i>Juglans nigra</i>	Bark	—	4.90	—	—	—	—	—	<b>14.30</b>	—
Butternut	<i>Juglans cinerea</i>	Inner bark	21.60	—	—	—	—	—	—	—	—
Cedar	<i>Thuja occidentalis</i>	Chips Tips	10.40 20.00	2.50	—	— 21.79	7.00 16.75	— <b>9.00</b>	<b>5.50</b> —	—	—
Chaste tree	<i>Vitex agnus-castus</i>	Berry	28.80	4.40	<b>11.00</b>	25.42	12.60	<b>17.00</b>	<b>16.00</b>	<b>12.70</b>	—
Cherry – wild	<i>Prunus virginiana/</i> <i>(P. serotina)</i>	Bark	16.80	5.10	<b>9.00</b>	17.25	16.25	<b>12.00</b>	<b>14.00</b>	<b>10.45</b>	13.35
Chestnut	<i>Castanea sativa/</i> <i>dentata</i>	Leaf	6.40	3.25	—	—	15.50	—	—	—	—
Elm – slippery	<i>Ulmus rubra</i>	Inner bark	45.60	12.95	<b>22.00</b>	28.60	<b>39.79/</b> <b>30.15</b>	<b>27.00</b>	<b>25.00</b>	<b>15.15</b>	28.05
Fringe tree	<i>Chionanthus virginicus</i>	Bark	—	—	—	—	—	<b>68.00</b>	—	—	—
Ginkgo	<i>Ginkgo biloba</i>	Leaf	21.60	3.50	<b>9.50</b>	46.31	<b>26.85/</b> <b>13.95</b>	<b>30.00</b>	<b>30.00</b>	<b>17.60</b>	25.85
Horse chestnut	<i>Aesculus hippocastunum</i>	Nut/seed leaf	— 20.00	9.50	<b>24.00</b>	—	13.45	<b>28.00</b>	—	<b>13.20</b>	—
Linden	<i>Tilia europaea</i>	Leaf and flower	38.40	7.65	<b>16.00</b>	31.78	24.35	<b>25.00</b>	<b>25.00</b>	<b>17.05</b>	—
Oak – white	<i>Quercus alba</i>	Bark	14.40	2.75	<b>9.00</b>	36.32	<b>22.25/</b> <b>12.75</b>	<b>10.00</b>	<b>11.00</b>	<b>10.45</b>	—
Persimmon	<i>Diospyros virginiana</i>	Leaf (trad. bark)	—	6.90	—	—	—	—	—	—	—
Pine – white	<i>Pinus strobus</i>	Bark	13.60	3.00	—	19.52	15.90	—	<b>6.00</b>	<b>9.70</b>	—
Poplar	<i>Populus tremuloides</i>	Bark	32.00	—	—	20.43	—	—	—	—	—
Willow – black	<i>Salix nigra</i>	Bark	42.40	—	—	—	—	—	—	<b>10.30</b>	—
Willow – white	<i>Salix alba</i>	Bark	16.80	5.20	<b>13.50</b>	36.32	<b>17.00/</b> <b>11.15</b>	<b>10.00</b>	<b>11.00</b>	<b>9.90</b>	15.95

When organic and nonorganic herbs are available, organic prices are shown in bold type.

**Table B3. Shrubs and vines with a market as medicinal species**

Common Name	Species	Herb Part	YTYH	San Francisco	Mtn Rose	Richters	Frontier	Jean's Greens	Wild Weeds	Blessed Herb	People's Grocery
Barberry	<i>Berberis vulgaris</i>	Root bark	32.80	4.75	<b>9.00</b>	—	17.70	<b>21.00</b>	<b>21.00</b>	<b>13.20</b>	—
Bayberry	<i>Myrica cerifera</i>	Root bark	48.80	7.80	<b>15.00</b>	34.50	42.65	<b>40.00</b>	—	<b>18.15</b>	—
Bilberry	<i>Vaccinium myrtillus</i>	Fruit	69.60	16.50	<b>32.50</b>	44.49	42.55	—	—	<b>25.40</b>	—
Bilberry	<i>Vaccinium myrtillus</i>	Leaf	21.60	5.85	<b>21.00</b>	—	19.15	<b>20.00</b>	—	<b>16.50</b>	—
Bittersweet	<i>Solanum dulcamara</i>	Leaves and stems	54.40	—	—	—	—	—	—	—	—
Blackberry	<i>Rubus fruticosus</i> <i>(villosus)</i>	Leaf Root	20.00 29.60	4.05	<b>11.00</b> <b>22.00</b>	— 20.43	— —	<b>16.00</b> <b>23.00</b>	— —	— <b>10.45</b>	— —
Black haw	<i>Viburnum prunifolium</i>	Bark	26.40	—	<b>18.25</b>	—	—	<b>20.00</b>	<b>23.00</b>	—	—
Blueberry	<i>Vaccinum spp.</i>	Leaf	28.80	4.90	<b>9.50</b>	—	—	<b>25.00</b>	<b>24.50</b>	—	—
Buckthorn	<i>Rhamnus frangula</i> <i>(cathartica)</i>	Bark	16.00	—	<b>9.00</b>	22.25	12.80	<b>11.00</b>	—	<b>11.30</b>	—
Cascara sagrada	<i>Rhamnus purshiana</i>	Bark	19.20	7.50	<b>9.25</b>	22.25	17.25	<b>17.00</b>	<b>17.00</b>	<b>10.30</b>	—
Cramp bark	<i>Viburnum opulus</i>	Bark	52.80	14.00	<b>21.00</b>	—	45.00	<b>40.00</b>	<b>40.00</b>	<b>18.15</b>	49.69

**Table B3. Shrubs and vines with a market as medicinal species (continued)**

Common Name	Species	Herb Part	YTYH	San Francisco	Mtn Rose	Richters	Frontier	Jean's Greens	Wild Weeds	Blessed Herb	People's Grocery
Elderberry	<i>Sambucus nigra</i>	Berry	17.60	4.60	<b>10.00</b>	—	21.65/ 12.50	<b>19.00</b>	—	<b>12.65</b>	—
Elderberry	<i>Sambucus nigra</i>	Flower	27.20	9.00	<b>10.00</b>	25.42	20.40	<b>20.00</b>	<b>20.00</b>	<b>15.15</b>	—
Elderberry	<i>Sambucus nigra</i>	Leaf	50.40	—	—	—	—	—	—	—	—
Elderberry	<i>Sambucus nigra</i>	Root	54.40	—	—	—	—	—	—	—	—
Forsythia (Chinese)	<i>Forsythia suspensa</i>	Fruit									
Hawthorn	<i>Crataegus laevigata/monogyna</i>	Leaf and Flower	28.00	—	<b>11.00</b>	—	21.45	<b>24.00</b>	—	<b>17.60/ 15.15</b>	—
Hawthorn	<i>Crataegus laevigata/monogyna</i>	Berry	9.60	5.00/ 3.50	<b>10.50</b>	17.71	12.50	<b>20.00</b>	<b>18.00</b>	<b>13.60/ 11.55</b>	9.15
Honeysuckle	<i>Lonicera japonica</i>	Flower	53.60	—	<b>16.00</b>	—	oil only	<b>24.00</b>	—	—	—
Hops	<i>Humulus lupulus 'Hallertauer'</i>	Flower	27.20	6.00	<b>23.00</b>	25.42	34.90	<b>26.00</b>	<b>26.00/ 16.50</b>	<b>18.15/ 12.70</b>	na
Hydrangea	<i>Hydrangea arborescous</i>	Root	30.40	—	<b>10.00</b>	23.61	18.35	<b>16.00</b>	—	<b>11.40</b>	—
Jasmine	<i>Jasminum officinale</i>	Flower	30.40	7.90	<b>9.00</b>	—	17.60	—	—	<b>18.15</b>	
Juniper	<i>Juniperus communis</i>	Berry	19.20	5.50	<b>10.00</b>	25.42	26.85	<b>17.00</b>	<b>17.00</b>	<b>20.35/ 12.10</b>	14.45
Jujube – Chinese	<i>Ziziphus spinosa/ jujuba</i>	Whole dates/ seeds	21.60 34.40	— 13.25	—	— 363.20	—	<b>9.00</b>	—	<b>12.65</b>	—
Oregon grape	<i>Mahonia aquifolia</i>	Root	26.40	9.50	<b>9.00</b>	19.52	—	<b>24.00</b>	—	<b>14.85</b>	27.95
Passion flower – American	<i>Passiflora incarnata</i>	Herb	26.40	4.25	<b>14.75</b>	20.43	2-30	<b>18.00</b>	<b>17.00</b>	<b>11.55</b>	17.35
Raspberry – red	<i>Rubus idaeus</i>	Leaf	14.40	2.95	<b>10.00</b>	30.42	24.75/ 13.13	<b>18.00</b>	<b>18.00</b>	<b>15.15</b>	21.65
Red root/ Jersey tea	<i>Ceanothus americanus</i>	Root	30.40	—	<b>14.00</b>	—	25.10	<b>21.00</b>	—	<b>14.85</b>	—
Sassafras	<i>Sassafras albidum</i>	Root bark Leaf	56.80	12.75	<b>25.00</b>	34.96	47.00 26.25	<b>36.00</b>	<b>32.00</b>	<b>24.75</b>	47.05
Schisandra	<i>Schisandra chinensis</i>	Berries	34.40	6.00	<b>18.00</b>	23.61	17.80	<b>15.00</b>	<b>18.00</b>	<b>10.90</b>	—
Seabuckthorn	<i>Hippophae rhamnoides</i>	Berries	—	—	—	—	—	—	—	—	—
Sumac – sweet	<i>Rhus aromatica</i>	Root bark	—	—	—	55.39	—	—	—	—	—
Wahoo	<i>Euonymus atropurpurea</i>	Leaves Root bark	150.40	—	—	44.49	—	—	—	— <b>21.45</b>	—
Witch hazel	<i>Hammamelis virginiana</i>	Bark	20.80	5.90	<b>11.00</b>	20.43	22.50	<b>15.00</b>	<b>20.00</b>	<b>10.45</b>	—
Witch hazel	<i>Hammamelis virginiana</i>	Leaves	32.00	—	<b>13.00</b>	20.88	23.90	<b>16.00</b>	—	<b>12.10</b>	—
Wolfberry – Chinese	<i>Lycium barbarum</i>	Berries	39.20	—	<b>10.00</b>	—	37.50	<b>24.00</b>	<b>24.00</b>	<b>13.75</b>	—

When organic and nonorganic herbs are available, organic prices are shown in bold type.

**Table B4. Woodland herbs with a market for medicinal species (Difficult to grow in the Great Plains)**

Common Name	Species	Herb Part	YTYH	San Francisco	Mtn Rose	Richters	Frontier	Jean's Greens	Wild Weeds	Blessed Herb	People's Grocery
Black cohosh	<i>Cimicifuga racemosa</i>	Root	28.80	4.70	<b>16.00</b>	19.07	41.63/ 31.63	<b>22.00</b>	<b>22.00</b>	<b>18.15/ 11.55</b>	28.65
Blue cohosh	<i>Caulophyllum thalictroides</i>	Root	21.60	6.50	<b>12.50</b>	19.07	26.25	<b>19.00</b>	<b>18.50</b>	<b>10.45</b>	—
False unicorn	<i>Chamaelirium luteum</i>	Root	225.60	only tincture	<b>94.00</b>	146.19	—	—	<b>96.00</b>	<b>82.50</b>	—
Ginseng – American	<i>Panax quinquefolius</i>	Root	280.00 (dom) <sup>1</sup> 1896.00 (wld) <sup>1</sup>	53.00	<b>70.00</b>	309.00	360.00/ 180.00	<b>128.00</b>	—	<b>163.00 (wo)<sup>1</sup> 825.00 (wld)<sup>1</sup></b>	93.00
Ginseng – Korean/Asian	<i>Panax ginseng (P. pseudoginseng)</i>	Root	200.00 to 634.00**	16.00 to 34.00	—	—	62.00 to 144.00	—	—	<b>50.00</b>	—
Ginseng – Siberian (Eluthero)	<i>Eleutherococcus senticosus</i>	Root	41.60	3.70	<b>12.00</b>	15.89	18.75	<b>17.00</b>	<b>9.50</b>	<b>18.15/ 16.50</b>	—
Goldenseal	<i>Hydrastis canadensis</i>	Root	186.40	19.10	<b>144.00</b>	280.00	240.00	<b>160.00</b>	<b>144.00</b>	<b>142.69/ 72.60</b>	280.25
Goldenseal	<i>Hydrastis canadensis</i>	Top	105.60	31.00	—	127.12	81.00	<b>56.00</b>	—	<b>35.75</b>	—
Gotu Kola (tropical annual)	<i>Centella asiatica</i>	Herb	20.00	3.50	<b>12.00</b>	72.64	25.10	<b>22.00</b>	<b>24.50</b>	<b>17.55/ 14.85</b>	n/a
Pipsissewa	<i>Chimaphila umbellata</i>	Herb	29.60	—	<b>19.00</b>	27.24	—	<b>34.00</b>	<b>32.00</b>	<b>15.15</b>	—
Spikenard	<i>Aralia racemosa</i>	Root	40.00	12.25	<b>22.25</b>	30.42	31.95	<b>28.00</b>	—	<b>19.25</b>	—
Uva Ursi	<i>Aretostaphylos uva ursi</i>	Leaf	31.20/ 26.40	7.50	<b>11.00</b>	12.72	21.35/ 19.15	<b>16.00</b>	—	<b>17.35/ 14.85</b>	17.95

<sup>1</sup> wo = woodland organic, wld = wildcrafted, dom = domestic  
When organic and nonorganic herbs are available, organic prices are shown in bold type.

**Table B5. Weedy sun-loving perennials with a potential for medicinal herb market**

Common Name	Species	Herb Part	YTYH	San Francisco	Mtn Rose	Richters	Frontier	Jean's Greens	Wild Weeds	Blessed Herb	People's Grocery
Burdock	<i>Arctium lappa</i>	Root	33.60/ 18.40	3.60	<b>9.00</b>	19.07	20.40	<b>14.00</b>	<b>14.50</b>	<b>13.59</b>	20.40
Burdock	<i>Arctium lappa</i>	Leaf	10.05	—	—	—	—	—	—	—	—
Chickweed	<i>Stellaria media</i>	Herb	25.60	4.35	<b>8.00</b>	25.42	14.90	<b>13.00</b>	<b>13.50</b>	<b>12.70</b>	13.95
Chicory	<i>Chicorium intybus</i>	Root	16.00	3.90	<b>7.50</b>	24.06	11.25	<b>6.00</b>	—	<b>12.10</b>	16.05 (roasted)
Cleavers	<i>Galium aparine</i>	Herb	20.00	5.50	<b>9.00</b>	22.25	13.45	<b>17.00</b>	<b>16.50</b>	<b>11.55</b>	—
Clover – sweet	<i>Mellilotis officinalis</i>	Herb	—	—	—	24.06	—	—	—	<b>11.20</b>	—
Clover – red	<i>Trifolium pratense</i>	Flowers Herb	29.60 52.80/ 16.00	5.70	<b>42.00 8.00</b>	15.44	24.70/ 19.55	<b>12.00</b>	<b>14.50</b>	<b>47.03 10.21</b>	16.65
Coltsfoot	<i>Tussilago farfara</i>	Leaf	20.80	4.75	<b>9.00</b>	25.42	20.55/ 16.15	<b>18.00</b>	<b>17.00</b>	<b>14.85/ 12.10</b>	—
Couchgrass	<i>Triticum repens</i>	Rhizome	—	3.90	<b>10.00</b>	—	—	<b>36.00</b>	—	<b>16.50</b>	—
Dandelion	<i>Taraxacum officinale</i>	Leaf Root	21.60 23.20	4.10 4.10	<b>8.00 10.00</b>	— 30.42	20.40 23.45	<b>19.00 20.00</b>	<b>16.00 19.00</b>	<b>15.53 15.53</b>	19.65 30.85
Dock – yellow/curley	<i>Rumex crispus</i>	Root	16.80	3.20	<b>18.00</b>	20.88	19.80	<b>28.00</b>	<b>13.00</b>	<b>9.90</b>	—
Goldenrod	<i>Solidago virgaurea</i>	Herb	13.60	3.50	<b>11.00</b>	—	—	<b>14.00</b>	—	<b>10.30</b>	—
Horsetail	<i>Equisetum arvense/hyemale</i>	Herb	16.80	3.25	<b>11.00</b>	22.25	17.20	<b>24.00</b>	<b>16.50</b>	<b>15.40/ 10.75</b>	16.05
Kudzu	<i>Pueraria lobata</i>	Root	33.60	4.90	—	25.42	14.80	<b>17.00</b>	—	<b>12.10</b>	—

**Table B5. Weedy sun-loving perennials with a potential for medicinal herb market (continued)**

Common Name	Species	Herb Part	YTYH	San Francisco	Mtn Rose	Richters	Frontier	Jean's Greens	Wild Weeds	Blessed Herb	People's Grocery
Lettuce – wild	<i>Lactuca verosa</i>	Herb	29.60	6.95	<b>11.00</b>	38.14	—	<b>20.00</b>	—	<b>13.55</b>	—
Marsh mallow	<i>Althea officinalis</i>	Root	28.00	8.80/5.00	<b>12.00</b>	19.07	27.30	<b>19.00</b>	<b>19.00</b>	<b>13.06</b>	18.45
		Leaf	36.00	3.90	—	—	—	—	—	<b>11.50</b>	—
Mullein	<i>Verbascum thapsis</i>	Leaf	3.50	3.90	<b>15.00</b>	20.43	19.95	<b>19.00</b>	<b>19.50</b>	<b>10.45</b>	9.95
Nettles	<i>Urtica dioica</i>	Leaf	3.25	3.25	<b>10.00</b>	19.52	18.90	<b>14.00</b>	<b>18.00</b>	<b>11.50</b>	15.95
		Root	—	4.50	<b>11.00</b>	—	18.50	—	—	<b>12.54</b>	—
Plantain	<i>Plantago major</i>	Leaf	17.60	5.15	<b>9.00</b>	—	—	<b>16.00</b>	<b>12.00</b>	—	—
Plantain	<i>Plantago lanceolata</i>	Leaf	—	—	—	22.70	19.15	—	—	<b>12.70</b>	—
Pokeweed	<i>Phytolacca americana</i>	Root	21.60	8.50	—	20.43	—	<b>15.00</b>	<b>15.00</b>	<b>9.90</b>	—
Puncture vine	<i>Tribulus terrestris</i>	Weed	—	7.50	—	317.80	—	—	—	—	—
Shepard's purse	<i>Capsella bursa pastoris</i>	Herb	18.40	3.50	<b>8.00</b>	20.43	14.80	<b>13.00</b>	<b>16.00</b>	<b>12.65</b>	—
Sorrell	<i>Rumex acetosa</i>	Herb	31.20	6.30	<b>11.00</b>	15.89	33.00	<b>30.00</b>	<b>30.00</b>	<b>22.47/15.68</b>	—
Yucca	<i>Yucca glauca</i>	Root bark	34.40	8.50	<b>14.25</b>	54.48	35.00/24.90	<b>18.00</b>	—	<b>13.75</b>	—

When organic and nonorganic herbs are available, organic prices are shown in bold type.

**Table B6. Other sun-loving perennials with a potential for medicinal herb market**

Common Name	Species	Herb Part	YTYH	San Francisco	Mtn Rose	Richters	Frontier	Jean's Greens	Wild Weeds	Blessed Herb	People's Grocery
Alfalfa	<i>Medicago sativa</i>	Leaf	23.20	1.90	<b>6.00</b>	—	13.80	<b>8.00</b>	<b>13.20</b>	<b>8.50</b>	8.85
		Seed	10.40	4.75	—	—	10.50	<b>12.00</b>	—	—	9.19
Angelica	<i>Angelica archangelica</i>	Root	29.60	4.00	<b>16.50</b>	34.96	24.88	<b>21.00</b>	<b>23.50</b>	<b>22.55/15.15</b>	—
Ashwagandha	<i>Withania somnifera</i>	Root	33.60	8.90	<b>25.00</b>	31.33	28.95	<b>44.00</b>	—	<b>16.50</b>	—
Bergamot – wild	<i>Monarda fistulosa</i>	Herb	—	—	—	23.61	—	—	—	<b>9.79</b>	—
Blessed thistle	<i>Cnicus benedictus</i>	Herb	13.60	4.00	<b>9.00</b>	18.61	22.05/12.60	<b>14.00</b>	<b>17.00</b>	<b>11.40</b>	10.85
Boneset	<i>Eupatorium perfoliatum</i>	Herb	19.20	—	<b>10.25</b>	23.15	15.00	<b>14.00</b>	—	<b>10.36</b>	—
Borage	<i>Borago officinalis</i>	Herb	23.20	4.70	<b>7.00</b>	30.42	—	<b>25.00</b>	<b>26.00</b>	<b>17.24</b>	—
Bupleurum	<i>Bupleurum chinense</i>	Root	48.00	9.75	<b>8.00</b>	38.14	—	<b>30.00</b>	—	<b>19.40</b>	—
Burdock	<i>Arctium lappa</i>	Root	33.60/18.40	3.60	<b>9.00</b>	19.07	20.40	<b>14.00</b>	<b>14.50</b>	<b>13.59</b>	20.40
		Leaf	10.05	—	—	—	—	—	—	—	—
Butterfly milkweed	<i>Asclepias tuberosa</i>	Root	46.40	8.50	<b>22.00</b>	25.42	—	<b>25.00</b>	<b>28.00</b>	<b>15.68</b>	—
Calamus (sweetflag)	<i>Acorus calamus</i>	Root	22.40	5.75	<b>12.00</b>	22.25	21.50	<b>17.00</b>	<b>18.50</b>	<b>12.40</b>	—
Calendula	<i>Calendula officinalis</i>	Flower	24.00	4.80	<b>27.00</b>	36.77	18.50	<b>39.00</b>	<b>32.00/8.00</b>	<b>25.89/10.97</b>	23.75
Celandine	<i>Chelidonium majus</i>	Herb	31.20	6.25	<b>15.25</b>	25.42	—	<b>31.00</b>	—	—	—
Chamomile – German	<i>Matricaria recutita</i>	Flowers	21.60	9.90/3.50	<b>12.00</b>	30.42	25.10	<b>12.00</b>	<b>23.00/11.00</b>	<b>16.50</b>	25.25
Chinese milkvetch	<i>Astragalus membranaceus</i>	Root	40.00	7.50	<b>17.00</b>	54.03	38.00/20.80	<b>56.00</b>	<b>52.00</b>	<b>16.50</b>	35.25
Comfrey	<i>Symphytum officinale</i>	Leaf	27.20/1.20	8.90/3.90	<b>10.00</b>	36.32	<b>19.63/12.45</b>	<b>12.00</b>	<b>13.50</b>	<b>12.10</b>	13.85

**Table B6. Other sun-loving perennials with a potential for medicinal herb market (continued)**

Common Name	Species	Herb Part	YTYH	San Francisco	Mtn Rose	Richters	Frontier	Jean's Greens	Wild Weeds	Blessed Herb	People's Grocery
Comfrey	<i>Symphytum officinale</i>	Root	36.80/ 17.60	8.70/3.95	<b>11.25</b>	36.32	<b>24.75/</b> 13.35	<b>18.00</b>	<b>18.00</b>	<b>14.05</b>	13.95
Dong Quai	<i>Angelica polymorpha</i>	Root pwd/ slice	31.20	8.75	<b>12.00</b>	34.96	29.05 47.75	<b>17.00</b> <b>40.00</b>	<b>8.90</b>	<b>18.15</b> <b>27.50</b>	— 43.05
Echinacea – narrow leaf	<i>Echinacea angustifolia</i>	Leaf Root	— 95.20	— 21.00	— <b>20.00</b>	— 73.09	32.15 70.00	— <b>80.00</b>	— <b>50.00</b>	<b>14.39</b> <b>38.4</b>	— 99.99
Echinacea – pale purple	<i>Echinacea pallida</i>	Leaf Root	— —	14.00	—	—	—	—	—	<b>22.47</b>	—
Echinacea – Purple coneflower	<i>Echinacea purpurea</i>	Leaf Root	54.40 65.60	— 18.50	— <b>12.00</b>	17.71 63.56	16.00 40.15	<b>14.00</b> <b>46.00</b>	— <b>28.20</b>	— <b>18.29</b>	— 38.65
Elecampane	<i>Inula helenium</i>	Root	20.00	4.75	<b>10.50</b>	25.42	14.20	<b>22.00</b>	<b>14.60</b>	<b>11.85</b>	—
Evening primrose	<i>Oenothera biennis</i>	Herb Seed	—	7.50 —	—	34.96	—	—	—	—	—
Feverfew	<i>Tanacetum parthenium</i>	Herb w/ Flowers	40.00	6.75	<b>9.00</b>	27.69	22.55	<b>16.00</b>	<b>16.00</b>	<b>14.39</b>	—
Fo-Ti (plant)	<i>Polygonum multiflorum</i>	Root	20.80	4.75	<b>11.00</b>	29.06	16.15	<b>15.00</b>	<b>16.50</b>	<b>14.50</b>	—
Heal-all	<i>Prunella vulgaris</i>	Herb	56.80	—	—	—	—	—	—	<b>20.35</b>	—
Horehound	<i>Marrubium vulgare</i>	Herb	16.80	4.00	<b>13.00</b>	25.42	24.35	<b>18.00</b>	—	<b>14.05</b>	24.35
Hyssop	<i>Hyssopus officinalis</i>	Herb	17.60	3.80	<b>10.00</b>	25.42	23.65	<b>21.00</b>	<b>19.70</b>	<b>12.65</b>	—
Joe Pye weed	<i>Eupatorium purpureum</i>	Root	28.00	9.50	<b>14.00</b>	25.42	21.95	<b>19.00</b>	<b>23.00</b>	<b>10.30</b>	—
Lady's mantle	<i>Alchemilla vulgaris</i>	Herb	24.80	6.25	<b>12.00</b>	34.96	22.05	<b>38.00</b>	—	<b>18.15</b>	—
Lemon balm	<i>Melissa officinalis</i>	Herb	22.40	6.25	<b>13.00</b>	25.42	28.70	<b>22.00</b>	<b>22.00</b>	<b>13.75</b>	19.85
Lemon verbena	<i>Aloysia triphylla</i>	Herb	36.80	8.90	<b>13.00</b>	72.64	28.30	<b>26.00</b>	<b>26.50</b>	—	23.05
Lespedeza – round headed	<i>Lespedeza capitata</i>	Herb	—	—	—	19.52	—	—	—	—	—
Licorice	<i>Glycyrrhiza glabra</i>	Root	14.40 cs 25.60 wh	9.65/3.35	<b>10.00</b>	22.25	16.70	—	<b>20.00/</b> <b>9.50</b>	<b>13.06/</b> <b>9.79</b>	16.70
Licorice – Chinese	<i>Glycyrrhiza uralensis</i>	Root	28.00 wh 46.40 sl	—	—	—	18.20	<b>20.00</b>	—	—	—
Lobelia	<i>Lobelia inflata</i>	Herb	43.20	5.40	<b>30.00</b>	31.33	24.63	<b>40.00</b>	—	<b>18.15</b>	34.55
Lungwort	<i>Pulmonaria officinalis</i>	Herb	32.00	—	—	30.42	24.65	—	—	—	—
Marsh mallow	<i>Althea officinalis</i>	Root	28.00	8.80/5.00	<b>12.00</b>	19.07	27.30	<b>19.00</b>	<b>19.00</b>	<b>13.06</b>	18.45
Milk thistle	<i>Silybum marianum</i>	Seed	20.00	3.20	<b>12.00</b>	19.07	24.65/ 11.95	<b>22.00</b>	<b>26.50</b>	<b>14.05/</b> <b>11.85</b>	24.65
Motherwort	<i>Leonurus cardiaca</i>	Herb	20.00	4.50	<b>17.00</b>	26.79	21.25/ 18.13	<b>22.00</b>	<b>21.00</b>	<b>13.30</b>	19.05
Mugwort	<i>Artemisia vulgaris</i>	Leaf	16.00	4.50	<b>12.50</b>	28.15	24.13/ 14.63	<b>14.00</b>	<b>16.00</b>	<b>12.10</b>	—
Mullein	<i>Verbascum thapsis</i>	Leaf	3.50	3.90	<b>15.00</b>	20.43	19.95	<b>19.00</b>	<b>19.50</b>	<b>10.45</b>	9.95
Nettles	<i>Urtica dioica</i>	Leaf Root	3.25	3.25 4.50	<b>10.00</b> <b>11.00</b>	19.52 —	18.90 18.50	<b>14.00</b>	<b>18.00</b>	<b>11.50</b> <b>12.54</b>	15.95
Patchouli	<i>Pogostemon cablin</i>	Leaf	44.80	oil only	<b>18.00</b>	38.14	22.50	—	<b>16.00</b>	<b>18.15</b>	—
Pennyroyal	<i>Menthe pulegium</i>	Herb	16.80	3.60	<b>8.00</b>	22.70	15.63	<b>17.00</b>	<b>17.00</b>	<b>15.15</b>	—
Prairie clover	<i>Petalostemum candidum/</i> <i>purpureus</i>	Roots and flowering tops	—	—	—	—	—	—	—	—	—

**Table B6. Other sun-loving perennials with a potential for medicinal herb market (continued)**

Common Name	Species	Herb Part	YTYH	San Francisco	Mtn Rose	Richters	Frontier	Jean's Greens	Wild Weeds	Blessed Herb	People's Grocery
Red clover	<i>Trifolium pratense</i>	Flowers Herb	29.60 52.80/ 16.00	5.70	<b>42.00</b> <b>8.00</b>	15.44	24.70/ 19.55	<b>12.00</b>	<b>14.50</b>	<b>47.03</b> <b>10.21</b>	16.65
Rue	<i>Ruta graveolens</i>	Herb	67.20	6.67	<b>17.00</b>	29.06	30.45	<b>18</b>	—	<b>14.05</b>	18.15
Skullcap/ scullcap	<i>Scutellaria lateriflora</i>	Herb	64.00/ 33.60	16.00	<b>16.00</b>	33.59	34.25/ 30.00	<b>24.00</b>	<b>25.00</b>	<b>17.24</b>	26.05
Soapwort	<i>Saponaria officinalis</i>	Root	—	10.00	<b>20.00</b>	—	—	—	—	—	—
Spilanthes/ Toothache Plant	<i>Spilanthes oleracea</i>	Herb	—	—	—	39.95	—	<b>39.00</b>	—	<b>27.50</b>	—
St. John's wort	<i>Hypericum perforatum</i>	Tops w/ flowers	20.00	4.50	<b>10.00</b>	24.06	25.70	<b>22.00</b>	—	<b>16.72/</b> <b>13.06</b>	25.75
Tansy	<i>Tanacetum vulgare</i>	Herb	21.60	9.00	—	15.89	—	<b>25.00</b>	—	<b>11.55</b>	—
Valerian	<i>Valeriana officinalis</i>	Root	2.95	4.50	<b>9.00</b>	31.33	31.65	<b>26.00</b>	<b>22.00/</b> <b>11.50</b>	<b>14.39</b>	30.85
Vervain – blue	<i>Verbena hastata</i>	Herb	—	4.50	<b>14.50</b>	22.25	20.30	<b>17.00</b>	<b>17.00</b>	<b>10.45</b>	—
Wormwood	<i>Artemisia absinthium</i>	Herb	16.80	3.50	<b>17.00</b>	25.42	20.00/ 11.25	<b>18.00</b>	<b>18.50</b>	<b>14.85</b>	17.55
Yarrow – 'Proa'	<i>Achillea millefolium</i>	Flower	20.00	3.40	<b>16.00</b>	20.88	24.65/ 12.90	<b>22.00</b>	<b>18.00</b>	<b>12.02</b>	11.05

When organic and nonorganic herbs are available, organic prices are shown in bold type.

**Table B7. Medicinals also grown as culinary species (annuals and perennials)**

Common Name	Species	Herb Part	YTYH	San Francisco	Mtn Rose	Richters	Frontier	Jean's Greens	Wild Weeds	Blessed Herb	People's Grocery
Asparagus tuber	<i>Asparagus cochinchinensis</i>	Root	44.00	5.90	—	—	—	—	—	—	—
Basil – sweet	<i>Ocimum basilicum</i>	Leaf	11.20	4.60	<b>8.00</b>	26.79	13.80	<b>16.00</b>	<b>14.00</b>	<b>15.40</b>	7.69
Catnip	<i>Nepeta cataria</i>	Leaf Flower	43.20/ 25.60	5.50	<b>9.00</b>	11.35	20.40/ 18.20	<b>24.00</b>	<b>20.50</b>	<b>13.30</b>	17.55
Chervil	<i>Anthriscus cerefolium</i>	Leaf	32.80	9.75	<b>18.75</b>	—	27.70	—	—	—	25.85
Chives	<i>Allium schoenoprasum</i>	Leaves (rings)	81.60	11.50	<b>40.00</b>	—	79.30	—	—	—	32.05
Cilantro	<i>Coriandrum sativum</i>	Leaf	—	<b>14.40/ 4.20</b>	<b>17.00</b>	41.31	<b>35.00/ 24.05</b>	<b>17.00</b>	—	<b>22.55</b>	26.85
Corn silk	<i>Zea mays</i>	Silk	25.60	4.95	<b>13.00</b>	—	13.25	<b>14.00</b>	—	<b>14.20</b>	12.35
Coriander	<i>Coriandrum sativum</i>	Seed	6.40	<b>4.25/ 1.95</b>	<b>7.00</b>	12.71	<b>10.55/ 4.80</b>	<b>16.00</b>	<b>11.00</b>	<b>14.05</b>	4.85
Dill	<i>Anethum graveolens</i>	Leaf	32.00	4.70	<b>14.00</b>	31.78	<b>26.25/ 18.50</b>	<b>24.00</b>	—	<b>18.15</b>	23.05
Dill	<i>Anethum graveolens</i>	Seed	7.20	3.30	<b>8.00</b>	17.71	<b>12.00/ 6.00</b>	—	—	—	12.85
Fennel	<i>Foeniculum vulgare</i>	Seed	9.60	<b>4.95/ 3.60</b>	<b>6.50</b>	6.36	<b>16.50/ 8.50</b>	<b>12.00</b>	<b>13.00</b>	<b>12.65</b>	11.25
Garlic	<i>Allium sativum</i>	Bulb/root (granules)	10.40	3.40	<b>8.00</b>	—	16.50	<b>15.00</b>	<b>15.50</b>	<b>13.60</b>	—
Ginger – tropical	<i>Zingiber officinale</i>	Root	12.80	3.50	<b>9.75</b>	30.42	18.75/ 8.75	<b>20.00</b>	<b>18.00/ 8.50</b>	<b>15.15</b>	8.35
Horseradish	<i>Armoracia rusticana</i>	Root	34.40	5.90	—	39.04	20.30	—	—	—	—
Lemongrass	<i>Cymbopogon citratus</i>	Leaf	24.00/ 12.00	3.25	<b>8.00</b>	25.42	15.25	<b>12.00</b>	<b>12.50</b>	<b>13.30</b>	13.95
Lovage	<i>Levisticum officinale</i>	Root Leaf	32.80 12.00	6.50	<b>12.00</b>	—	21.05	—	—	—	—
Oat straw	<i>Avena sativa</i>	Straw	12.80	2.50	<b>7.00</b>	20.43	19.50	<b>8.00</b>	<b>9.00</b>	<b>9.10</b>	—
Oregano	<i>Origanum vulgare</i>	Leaf/Herb	16.00	3.85	<b>9.50</b>	25.42	15.00/ 11.00	<b>13.00</b>	<b>14.00</b>	<b>12.70</b>	13.45
Parsley	<i>Petroselinum crispum</i>	Leaf	20.80	<b>6.50/ 4.10</b>	<b>14.00</b>	22.70	<b>26.25/ 18.88</b>	<b>16.00</b>	—	<b>16.35</b>	18.65
Parsley	<i>Petroselinum</i>	Root	24.00	6.50	<b>14.00</b>	—	21.25	<b>15.00</b>	—	<b>14.85</b>	—
Peppermint	<i>Mentha piperita</i>	Leaf	<b>23.20/ 11.20</b>	2.75	<b>10.00</b>	—	<b>13.65/ 8.50</b>	<b>10.00</b>	<b>14.00</b>	<b>10.45</b>	13.95
Rhubarb – common	<i>Rheum officinalis</i>	Root	—	—	—	—	15.40	—	<b>13.00</b>	—	—
Rhubarb – Turkish/Chinese	<i>Rheum palmatum</i>	Root	17.60	4.75	<b>10.00</b>	31.78	20.30	<b>27.00</b>	<b>20.00</b>	<b>18.15/ 17.05</b>	—
Sage – common	<i>Salvia officinalis</i>	Leaf	27.20	4.50	<b>10.00</b>	14.07	21.25/ 14.38	<b>16.00</b>	<b>18.00</b>	<b>12.10</b>	12.05
Spearmint	<i>Mentha spicata</i>	Leaf	10.40	2.50	<b>8.00</b>	19.52	15.80/ 7.80	<b>14.00</b>	<b>15.00</b>	<b>15.15</b>	14.35
Strawberry	<i>Fragaria vesca</i>	Leaf	18.40	3.50	<b>8.00</b>	—	—	<b>15.00</b>	<b>15.00</b>	—	—
Stevia	<i>Stevia rebaudiana</i>	Herb	24.00	6.50	<b>12.00</b>	36.77	19.15	<b>18.00</b>	<b>17.00</b>	<b>17.24</b>	31.75
Tarragon	<i>Artemisia dracuncululus</i>	Leaf	—	—	<b>11.00</b>	55.39	55.00/ 35.40	<b>25.00</b>	—	<b>27.25</b>	33.05
Thyme	<i>Thymus vulgaris</i>	Leaf	8.80	—	<b>13.00</b>	30.42	18.20/ 12.25	<b>26.00</b>	<b>23.00/ 7.00</b>	<b>17.60</b>	18.25

When organic and nonorganic herbs are available, organic prices are shown in bold type.

**Table B8. Flowers sold as medicinals**

Common Name	Species	Herb Part	YTYH	San Francisco	Mtn Rose	Richters	Frontier	Jean's Greens	Wild Weeds	Blessed Herb	People's Grocery
Blue flag iris	<i>Iris versicolor</i>	Root	54.40	—	<b>44.00</b>	—	—	<b>48.00</b>	—	<b>24.20</b>	—
Blue malva	<i>Malva sylvestris</i>	Flower	24.00	<b>12.90/6.75</b>	<b>15.00</b>	—	—	—	<b>36.00</b>	—	—
Butterfly milkweed	<i>Asclepias tuberosa</i>	Root	46.40	8.50	<b>22.00</b>	25.42	—	<b>25.00</b>	<b>28.00</b>	<b>15.68</b>	—
California poppy	<i>Eschscholzia californica</i>	Herb	—	—	<b>33.00</b>	43.13	—	<b>48.00</b>	—	<b>33.00</b>	—
Calendula	<i>Calendula officinalis</i>	Flower	24.00	4.80	<b>27.00</b>	36.77	18.50	<b>39.00</b>	<b>32.00/8.00</b>	<b>25.89/10.97</b>	23.75
Evening primrose	<i>Oenothera biennis</i>	Herb Seed	—	7.50	—	34.96	—	—	—	—	—
Fumitory	<i>Fumaria officinalis</i>	Herb	24.00	4.80	<b>12.00</b>	—	—	—	—	—	—
Hibiscus	<i>Hibiscus sabdariffa</i>	Flower	20.80	4.75	<b>11.00</b>	—	15.25	<b>21.00</b>	<b>20.00/10.50</b>	<b>15.95</b>	26.25
Hydrangea	<i>Hydrangea arborescens</i>	Root	30.40	—	<b>10.00</b>	23.61	18.35	<b>16.00</b>	—	<b>11.40</b>	—
Jasmine	<i>Jasminum officinale</i>	Flower	30.40	7.90	<b>9.00</b>	—	17.60	—	—	<b>18.15</b>	—
Lavender	<i>Lavandula officinalis (angustifolia)</i>	Flower	32.80	6.95	<b>16.00</b>	44.49	—	<b>20.00</b>	<b>32.00/22.00</b>	<b>22.00/16.35</b>	25.55
Lilly of the valley	<i>Convallaria majalis</i>	Herb	—	—	—	31.33	—	—	—	<b>18.15</b>	—
Orris root	<i>Iris germanica</i>	Root	35.20	6.10	<b>10.00</b>	24.06	21.30	<b>17.00</b>	<b>17.00</b>	—	25.05
Passion flower – American	<i>Passiflora incarnata</i>	Herb	26.40	4.25	<b>14.75</b>	20.43	2-.30	<b>18.00</b>	<b>17.00</b>	<b>11.55</b>	17.35
Peony	<i>Paeonia officinalis</i>	Root	32.80	7.50	—	—	—	—	—	—	—
Rose hips	<i>Rosa canina</i>	Fruit	12.00	2.50	<b>9.00</b>	—	10.55/8.75	<b>14.00</b>	<b>14.00</b>	<b>12.10</b>	6.95
Rose petals	<i>Rosa gallica, R. centifolia</i>	Petals, Buds	—	4.50	<b>9.00-120.00</b>	24.06	11.80	<b>8.00</b>	<b>10.00</b>	<b>18.15</b>	—
Violet	<i>Viola odorata</i>	Leaf	—	—	—	43.13	—	—	—	<b>22.40</b>	—
Violet – blue	<i>Viola tricolor</i>	Leaf	41.60	4.80	<b>22.75</b>	43.13	28.95	<b>27.00</b>	<b>25.00</b>	<b>22.40</b>	—

When organic and nonorganic herbs are available, organic prices are shown in bold type.

**Table B9. Medicinal animal feed market**

Common Name	Species	Herb Part	San Francisco	Mtn Rose	Richters	Frontier	YTYH	Jean's Greens	Wild Weeds	Blessed Herb	People's Grocery
Fenugreek	<i>Trigonella foenum-graecum</i>	Seed	3.10/1.90	6.00	30.42	<b>11.75/4.30</b>	6.40	15.00	—	11.00	11.05
		Herb	—	—	—	—	—	—	—	—	—
Goat's rue	<i>Galega officinalis</i>	Herb	7.00	—	—	—	32.00	—	—	—	—

When organic and nonorganic herbs are available, organic prices are shown in bold type.

**Table B10. Alpine Herbs - probably difficult to grow in Kansas**

Common Name	Species	Herb Part	YTYH	San Francisco	Mtn Rose	Richters	Frontier	Jean's Greens	Wild Weeds	Blessed Herb	People's Grocery
Arnica	<i>Arnica montana</i>	Flower	23.20	15.00	112.00	63.56	38.13	2,400.00 <sup>1</sup>	20.00	36.30	—
Eyebright <sup>2</sup>	<i>Euphrasia officinalis</i>	Herb	29.60	—	13.00	38.14	29.90/21.45	24.00	19.00	19.80/18.15	24.05
Gentian	<i>Gentiana lutea</i>	Root	29.60	13.50	14.00	17.71	28.50	24.00	—	21.45	—
Osha	<i>Ligusticum porteri</i>	Root	74.40	—	40.00	54.03	—	44.00	44.00	49.50/33.00	—

<sup>1</sup> Arnica flowers at \$50/oz.

<sup>2</sup> Parasitic annual, attaches to grass roots

When organic and nonorganic herbs are available, organic prices are shown in bold type.

**Table B11. Herbs for essential oil and fragrance markets**

Common Name	Species	Herb Part	YTYH	San Francisco	Mtn Rose	Richters	Frontier	Jean's Greens	Wild Weeds	Blessed Herb	Peoples Grocery
<b>Calamus (sweetflag)</b>	<i>Acorus calamus</i>	Root	22.40	5.75	<b>12.00</b>	22.25	21.50	<b>17.00</b>	<b>18.50</b>	<b>12.40</b>	—
<b>Chamomile – Roman</b>	<i>Chamaemelum nobile (Anthemis nobilis)</i>	Flowers	—	—	—	95.34	—	—	—	<b>35.20/26.95</b>	—
<b>Clary Sage</b>	<i>Salvia sclarea</i>	—	38.40	—	—	—	—	—	—	—	—
<b>Lavender</b>	<i>Lavandula officinalis (angustifolia)</i>	Flower	32.80	6.95	<b>16.00</b>	44.49	—	<b>20.00</b>	<b>32.00/22.00</b>	<b>22.00/16.35</b>	25.55
<b>Patchouli</b>	<i>Pogostemon cablin</i>	Leaf	44.80	oil only	<b>18.00</b>	38.14	22.50	—	<b>16.00</b>	<b>18.15</b>	—
<b>White sage</b>	<i>Salvia apiana</i>	Herb	32.00	7.85	<b>17.00</b>	—	23.10	<b>20.00</b>	<b>21.00</b>	—	—

When organic and nonorganic herbs are available, organic prices are shown in bold type.

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## A Grower's Guide

# Beebalm/Monarda

*Monarda spp.*

Several *Monarda* species are native to North America. They are in the mint family and have a square stem and pleasant fragrance. Historically, all have been used medicinally, but only *M. fistulosa* is currently found in the retail herb trade. This *Monarda* is native to much of North America, from the Great Plains east. It is 2 to 3 feet tall, with pink or lavender flowers. *M. didyma* can have reddish flowers, and many cultivated varieties of this species are found in garden catalogs. It is native to wetter areas of eastern North America. *M. punctata* is a biennial or short-lived perennial found on drier soils in eastern North America. It has yellowish, purple-dotted flowers in tiered whorls. *M. bradburiana*, common name “white horsemint,” has white or rose flowers with prominent purple dots and is found on rocky wooded hills in the Great Plains and Midwestern states. Only two of these species, *M. fistulosa* and *M. didyma*, were compared in K-State field trials.



**Common names:** Bergamot, horsemint, Oswego tea

**Family:** *Lamiaceae/Labiatae*  
(mint family)

**Life cycle:** Herbaceous perennial  
(Zone 4)

**Native:** North America

**Height:** 2 to 4 feet

**Sun:** Prefers full sun, but will tolerate partial shade.

**Soil:** *M. fistulosa* likes dry, well-drained soil. *M. punctata* prefers loose, sandy, dry soil, while *M. didyma* prefers rich soil and fair moisture. Field trials included *M. fistulosa* and *M. didyma*, but not *M. punctata*, although it is also grown as a medicinal herb.

**Water:** *M. fistulosa* appears to handle drought well, but *M. didyma* does not.

**Flowers:** Red, lavender, pinkish-lavender, yellow, or pink- and purple-spotted flowers bloom early to late summer in most

regions depending on species and biotype.

**Propagation:** Can grow from seeds, cuttings or root divisions. *Monarda* seed does not require any cold treatment, but germination will improve with several weeks of cold stratification. Cover seeds two times their thickness. Germinates in two to three weeks at a rate of 60 to 70 percent.

**Pests:** Significant pest pressure was not identified in the field, but *M. didyma* declined rapidly under field conditions. Some of this may have been due to disease, but also because this species is not well adapted to the hot, dry conditions of this part of the Great Plains.

**Disease:** Powdery mildew is common in late summer.

**Harvesting:** Harvest aerial parts at any time during the growing season. Can be harvested two to three times per year.

**Parts used:** Aboveground aerial parts, fresh or dried.

**Used as:** A culinary substitute for Greek oregano. Leaves smell similar to *Citrus bergamia*, which gives Earl Grey tea its distinctive taste.

**Medicinal benefits:** The Herbal PDR lists *M. punctata* and *M. didyma*, but not *M. fistulosa*, which is the *Monarda* species most used by the Native Americans and probably the best one to grow in the Great Plains. *M. punctata* contains volatile oils and has carminative, stimulant and emmenagogic effects. Folk uses are for digestive disorders, flatulence and to regulate menstruation. *M. didyma* also contains volatile oils, flavonoids and anthocyanins, and is used for the same things as *M. punctata*. It is also used for premenstrual syndrome. The essential oil may also be used to treat chronic bronchitis. The Lakotas drank a tea from the flower clusters of *M. fistulosa* as a remedy for fevers and colds. Tea leaves were also used for whooping cough and were considered good for people who had fainted. Boiled leaves, wrapped in a soft

cloth and placed on sore eyes overnight, were used to relieve pain.

**Market potential:** Low to moderate, but increasing. Retail price for *M. fistulosa* tops ranges from \$9.79 to \$23.61 per pound (lb) dry weight.

**Summary of field trial data:** Two species were tested in field trials. “Wild” bergamot, *M. fistulosa*, did well at both test sites. Over three years the number of plants increased as clumps spread. Weight per plant also increased. Insect and disease ratings were low, and vigor ratings, especially after the first year, were above average – 4.2 and 4.5 for the second and third years respectively.

This crop appears to be well adapted to the Great Plains. The yield estimate of 3,000 lbs/A dry weight may be a little high because it assumes cutting off the plant at ground level, and a marketable crop may be limited to more leaves and fewer stems. However, this is a crop that appears to have potential, as long as a market is obtained. *M. fistulosa* was only listed by two companies. Bergamot does not seem to be a widely used herb.

On the other hand, *M. didyma*, which is native to eastern North America and often cultivated in flower gardens, did not appear to be well adapted to field conditions. Vigor ratings were 2.5 and 1.3 in

years one and two, and the plants had died by the end of year three. This species was only tested at the Wichita site, which has sandy soil and some irrigation. Another problem with *M. didyma* is that although local herbalists recommend it over *M. fistulosa* for certain uses, no market price was listed in retail sources.

*M. bradburiana* and *M. punctata* were not tested in K-State field trials and would probably be considered wildflowers, so seed would need to be obtained from the wild or wildflower catalogs. These two species were not found in retail herb price lists.

**K-State Field Trial Data 2000-2002 *Monarda fistulosa***

				Average	Comments
<b>Age of plants in years</b>	1	2	3		
<b>Number of test sites<sup>1</sup></b>	3	2	2		Tested in Wichita and Olathe for three years, and tested in Colby for one year.
<b>Survival rate (%)</b>	77.7	66.5	89.0	77.7	Clumps were spreading by year three, so individual plants were probably overcounted in survival estimates.
<b>Vigor rating<sup>2</sup></b>	3.1	4.2	4.5	3.9	Above-average ratings in years two and three.
<b>Height (cm)</b>	41.7	102.5	110.5	84.9	
<b>Dry weight herb (g/plant)</b>	36.4	56.2	70.3	—	Yield per plant continues to go up. Plant numbers also go up as clumps increase in size.
<b>Dry weight root (g/plant)</b>	10.9	22.8	37.9	—	
<b>Maturity rating<sup>3</sup></b>	2.3	5.0	5.3	4.2	Plants were past full flower when harvested in the fall. Optimal biomass and quality in June or July.
<b>Insect damage rating<sup>4</sup></b>	0.3	1.2	0.4	0.6	
<b>Disease rating<sup>5</sup></b>	0.1	2.2	0.4	0.9	
<b>Estimated planting density (number of plants/A)</b>	21,780	21,780	21,780	—	1- by 2-ft. plant spacing assumed.
<b>Plant density<sup>6</sup></b>	16,923	14,484	19,384	—	
<b>kg/A dry weight (g/plant x plant number) – tops</b>	616	814	1,363	—	
<b>Estimated marketable yield (dry weight lbs/A) – tops</b>	1,357	1,793	3,002	—	
<b>Yield x ½ of low price<sup>1</sup></b>	\$6,649	\$8,786	\$14,710	—	
<b>Yield x ½ of high price<sup>1</sup></b>	\$16,026	\$21,175	\$35,454	—	

<sup>1</sup> See “How Data Were Collected,” on page 3.

<sup>2</sup> Vigor rating (1=very poor, 3=slightly above average, 5=very good, well adapted)

<sup>3</sup> Maturity rating (1=vegetative, 2=early bud, 3=early flower, 4=full flower, 5=seed production, 6=senescence)

<sup>4</sup> Insect damage rating (scale of 0 to 5; 0=no damage and 5=severe damage)

<sup>5</sup> Disease rating (scale of 0 to 5 with 0=no damage and 5=severe damage)

<sup>6</sup> Calculated as starting plant density x survival rate.

**K-State Field Trial Data 2000-2002 *Monarda didyma* (var. Panorama Red Shades)**

				<b>Average</b>	<b>Comments</b>
<b>Age of plants in years</b>	1	2	3		
<b>Number of test sites<sup>1</sup></b>	1	1	1		Only planted in Wichita, in same experiment with <i>M. fistulosa</i> for three years.
<b>Survival rate (%)</b>	53.0	13.0	6.0	24.0	Stand declined each year.
<b>Vigor rating<sup>2</sup></b>	2.5	1.3	—	1.9	Rated below average.
<b>Height (cm)</b>	20.0	48.0	—	34.0	
<b>Dry weight herb (g/plant)</b>	1.9	3.4	—	—	Very small plants.
<b>Dry weight root (g/plant)</b>	1.9	34.6	—	—	
<b>Maturity rating<sup>3</sup></b>	1.2	5.0	6.0	4.1	The few plants that were left in year three had already senesced, so insects or disease were not rated that year.
<b>Insect damage rating<sup>4</sup></b>	0.5	1.4	—	1.0	
<b>Disease rating<sup>5</sup></b>	0.4	1.3	—	0.9	

Note: Due to low yield and lack of markets, no field-scale yield or gross return (\$) was calculated for this herb.

<sup>1</sup> See "How Data Were Collected" below.

<sup>2</sup> Vigor rating (1=very poor, 3=slightly above average, 5=very good, well adapted)

<sup>3</sup> Maturity rating (1=vegetative, 2=early bud, 3=early flower, 4=full flower, 5=seed production, 6=senescence)

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<sup>5</sup> Disease rating (scale of 0 to 5 with 0=no damage and 5=severe damage)

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All plants at each location were used to determine survival percentage, vigor rating, insect damage rating, and disease rating as described above. Three plants per plot were measured for height, and only one plant per plot was harvested to measure yield each year. Because there were four plots, this allowed us to estimate yield from four plants at each location per year.

Plants were dried, and top and root weights recorded in grams. Grams per plant were converted to kilograms per acre (kg/A) and pounds per acre (lb/A) to estimate field-scale yield. The population density used to calculate field yields was the optimal population density (determined by the average size of the plants) times the actual percentage survival as measured in the field. There was generally some loss due to transplant shock and, for some species, significant winter loss as well.

Plant spacing recommendations on each fact sheet are for spacing within a row. Distance between rows will depend on the particular farming operation and equipment used. The minimum row spacing will be the same as the plant spacing recommendation. For example, if the recommendation is to set plants 12 inches apart, rows should be a minimum of 12 inches apart as well. However, if cultivator or root-harvesting equipment is on 5-foot centers, plant rows 5 feet apart to facilitate cultivating and harvesting. Adjust estimated plant density per acre on the worksheets to estimate gross yield and net income.

Prices were taken from Appendix B of K-State Research and Extension publication S-144 *Farming a Few Acres of Herbs: An Herb Growers Handbook*. To calculate a rough gross income potential for each herb, estimated yield was multiplied by the lowest and the highest retail price, divided by two. This is a rough estimate of wholesale price. Actual prices would be determined based on a contract obtained from a buyer.

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Jeanie DeArmond, extension assistant

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# A Grower's Guide

# Blue Vervain

*Verbena hastata*

The blue vervain, or *Verbena hastata*, is the most popular *Verbena* today, but its European cousin, *V. officinalis*, known simply as 'vervain,' also has medicinal properties and is used widely. If collecting seed locally, get a positive identification on the plant, because blue vervain also has several wild relatives in the Great Plains, including hoary vervain (*V. stricta*), narrow-leaved (*V. simplex*), pink (*V. pumila*), nettle-leaved (*V. urticifolia*), and fanleaf (*V. plicata*). The Dakota name for blue vervain translates as the word "medicine," and the Omaha and Ponca name translates as "herb medicine."



**Family:** *Verbenaceae*

**Life cycle:** Herbaceous perennial (Zone 3)

**Native:** North America, including Great Plains region. Found in prairies and meadows, low open woodlands, stream banks, springs, seepage areas and roadsides.

**Height:** 3 to 5 feet

**Sun:** Sun, partial shade

**Soil:** Prefers well drained soil high in organic matter

**Water:** Moderate

**Flowers:** Flowers are blue to purple spikes that stretch from spike base to the tip bloom from mid- to late summer.

**Seeds:** Stratify seeds for two weeks then plant seed two times their thickness. Germination occurs in 14 to 21 days, with about 75 percent success. Transplant by mid- to late spring, spacing 12 inches apart.

**Pests:** In some locations and seasons, this plant can be riddled with insect damage and foliar diseases that cause leaves to discolor. During other growing seasons, insect and disease damage were low. More research needs to be done on the effect of seed source, weather and timing of pest controls.

**Harvesting:** Harvest the aerial parts while the plant is in bloom.

**Parts used:** Flowering aerial parts, fresh or dried.

**Used as:** Infusion, traditional tincture, cider vinegar tincture, syrup, elixir, lozenge, ointment, salve, cream, balm, foot soak, bath herb, honey

**Medicinal benefits:** The European vervain (*V. officinalis*) is listed in the *Physicians Desk Reference for Herbal Medications*, which mentions a variety of folk uses ranging from relief for sore throat, coughs, asthma, whooping cough, treatment for nervous disorders, digestive

disorders, and to promote lactation. It should not be taken during pregnancy, because it is a uterine stimulant. The *Peterson Field Guide* (Foster and Duke) also lists these effects, and says that the European vervain is milder than the blue vervain. Animal studies have demonstrated the anti-inflammatory, cough-suppressing and milk-stimulating activity of *V. officinalis*. Blue vervain was used by Native Americans for colds, coughs, fevers, bowel complaints, dysentery and stomach cramps. The root was considered more active than the leaves.

**Market potential:** Moderate. Prices range from \$4.50 to \$22.25 per pound (lb) dry weight. Certified organic blue vervain should bring a higher price in the market than wild-harvested.

**Summary of field trial data:** This species was planted in Wichita and Olathe in 2001, and did relatively well with an average survival rate of 92 percent and vigor rating of 4.6 on a 5-point scale. The

aboveground biomass, which would be the marketable yield, was estimated at more than 3,000 lbs/A dry weight. Insect and disease pressure was relatively high that year, with a 2.4 insect rating due to heavy insect feeding by an undetermined pest, or by general leaf eaters (i.e. grasshoppers). In the second year of the trial, plants were evaluated at Wichita, with a second year survival rating of 49 percent. Aboveground biomass yields

were also down, possibly because of the extremely hot weather. This species is a potential crop in Kansas, so evaluations continued in 2003 in old and new plots. New biotypes need to be examined, and related species of vervain should be tested for biological activity and medicinal components. We cautiously recommend this as a cash crop, based on first-year data, but more screening is needed.

K-State Field Trial Data 2000-2002 <i>Verbena hastata</i>					
				Average	Comments
<b>Age of plants in years</b>	1	2	3		
<b>Number of test sites<sup>1</sup></b>	2	1	0		
<b>Survival rate (%)</b>	92.0	43.0	—	67.5	
<b>Vigor rating<sup>2</sup></b>	4.6	4.3	—	4.4	
<b>Height (cm)</b>	60.5	98.0	—	79.3	
<b>Dry weight herb (g/plant)</b>	81.3	48.8	—	—	
<b>Dry weight root (g/plant)</b>	25.6	58.5	—	—	
<b>Maturity rating<sup>3</sup></b>	4.8	5.1	—	5.0	
<b>Insect damage rating<sup>4</sup></b>	2.4	1.8	—	2.1	
<b>Disease rating<sup>5</sup></b>	1.0	1.9	—	1.5	
<b>Estimated planting density (number of plants/A)</b>	21,780	21,780	—	—	Assume 1- by 2-ft. spacing.
<b>Plant density<sup>6</sup></b>	20,038	9,365	—	—	
<b>kg/A dry weight (g/plant x plant number) – tops</b>	1,629	457	—	—	
<b>Estimated marketable yield (dry weight lbs/A) – tops</b>	3,588	1,007	—	—	
<b>Yield x ½ of low price<sup>1</sup></b>	\$8,073	\$2,266	—	—	
<b>Yield x ½ of high price<sup>1</sup></b>	\$39,934	\$11,208	—	—	
<sup>1</sup> See "How Data Were Collected," on page 3. <sup>2</sup> Vigor rating (1=very poor, 3=slightly above average, 5=very good, well adapted) <sup>3</sup> Maturity rating (1=vegetative, 2=early bud, 3=early flower, 4=full flower, 5=seed production, 6=senescence) <sup>4</sup> Insect damage rating (scale of 0 to 5; 0=no damage and 5=severe damage) <sup>5</sup> Disease rating (scale of 0 to 5 with 0=no damage and 5=severe damage) <sup>6</sup> Calculated as starting plant density x survival rate.					

### How Data Were Collected

The plants described in this fact sheet were grown in K-State test plots in Hays, Colby, Wichita, or Olathe, Kan. Generally, four replications of each species were included at a site. Not all species were screened at each site or each year. The number of locations is noted in the table. Depending on the location and year, either five or 10 plants per plot were established in each of the replications. Details can be found at [www.oznet.ksu.edu/ksherbs](http://www.oznet.ksu.edu/ksherbs). Plants were grown from seed in the greenhouse and transplanted in the field in May or June.

All plants at each location were used to determine survival percentage, vigor rating, insect damage rating, and disease rating as described above. Three plants per plot were measured for height, and only one plant per plot was harvested to measure yield each year. Because there were four plots, this allowed us to estimate yield from four plants at each location per year.

Plants were dried, and top and root weights recorded in grams. Grams per plant were converted to kilograms per acre (kg/A) and pounds per acre (lb/A) to estimate field-scale yield. The population density used to calculate field yields was the optimal population density (determined by the average size of the plants) times the actual percentage survival as measured in the field. There was generally some loss due to transplant shock and, for some species, significant winter loss as well.

Plant spacing recommendations on each fact sheet are for spacing within a row. Distance between rows will depend on the particular farming operation and equipment used. The minimum row spacing will be the same as the plant spacing recommendation. For example, if the recommendation is to set plants 12 inches apart, rows should be a minimum of 12 inches apart as well. However, if cultivator or root-harvesting equipment is on 5-foot centers, plant rows 5 feet apart to facilitate cultivating and harvesting. Adjust estimated plant density per acre on the worksheets to estimate gross yield and net income.

Prices were taken from Appendix B of K-State Research and Extension publication S-144 *Farming a Few Acres of Herbs: An Herb Growers Handbook*. To calculate a rough gross income potential for each herb, estimated yield was multiplied by the lowest and the highest retail price, divided by two. This is a rough estimate of wholesale price. Actual prices would be determined based on a contract obtained from a buyer.

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# A Grower's Guide

# Boneset

*Eupatorium perfoliatum*

This herb is called “Boneset” because its leaves were once used to treat “break-bone (or dengue) fever.” Boneset was a common remedy used by Native Americans and early settlers in the 1800s, and was widely used for flu epidemics in North America and Europe. Though little research has been conducted on this plant recently, compounds in the plant have been shown to stimulate the immune system. A European cousin of this plant, *E. cannabinum*, also appears to stimulate the immune system. However, both also contain potentially liver-harming pyrrolizidine alkaloids, so they should be used with caution.



**Family:** *Composite/Asteraceae*

**Life cycle:** Herbaceous perennial (Zone 3)

**Native:** Can be found wild on wet sites from Nova Scotia to Florida and throughout the eastern half of North America.

**Height:** 2 to 5 feet

**Sun:** Full sun to partial shade

**Soil:** Prefers a rich, moist soil

**Water:** Natural habitat is on wet sites, and plant prefers regular, deep watering. However, Boneset also appears to withstand Kansas heat and drought fairly well.

**Flowers:** White to pale purple flowers, in flat clusters, July through October

**Propagation:** Easily propagated from seeds or cuttings. Take cuttings before the plant has flowered. Seeds will germinate without stratification, but will germinate better with stratification. Seeds need light to germinate. Do not cover. Germination

is typically two to three weeks, with 80 to 90 percent germination. Older plants can be divided and replanted in the spring. Plant on 18 to 24 inch centers, with row spacing of 24 to 30 inches, because each plant will form a clump.

**Pests:** No major pests

**Harvesting:** Harvest aboveground portion when flowers are starting in early or mid-summer. Dry quickly, or it will decompose. A second, fall harvest may be possible.

**Parts used:** Aerial parts

**Used as:** Tea, tincture, homeopathic remedy

**Medicinal benefits:** The herb acts as an anti-inflammatory, a diaphoretic and a bitter, in addition to stimulating the immune system.

**Market potential:** Low to medium. This was a once popular herb for colds and flu. Most is gathered from the wild now, but buyers may prefer to buy from a known, organic source. Warnings of liver

toxicity may limit its popularity or widespread use. Current retail prices range from \$10.36 to \$23.15 per pound (lb) dry weight.

**Summary of field trial data:** This is an attractive plant that held up well under drought and dryland conditions though it prefers rich, moist soil. On a small scale, this plant could be added to a flower bed border. On a larger scale, because the aboveground portion is harvested, this has potential for mechanized harvest. However, demand is projected to be small, so this probably won't be a cash crop.

The vigor rating was fairly high on this species, averaging 3.7 on a 5-point scale, and insect and disease ratings were fairly low, with the exception of the year three insect rating of 4.5. Note also that the maturity rating that year was a 5.9, on a 6-point scale, where 6.0 is a dead, or senesced plant, so insect feeding on nearly dead plants is not surprising. The yield

in year three is also very low because it was harvested after the plant had peaked. If we had harvested in midsummer, yields would have been similar to year two. The harvest in year three was slightly earlier than in year two (Aug. 26 and Sept. 5 for Wichita and Olathe, respectively, in year three; Sept. 14 and Sept. 21 in year two). The plants flowered and/or declined faster in year three, possibly due to the maturity of the plants or the exceptionally hot, dry conditions in the summer of 2002.

K-State Field Trial Data 2000-2002 <i>Eupatorium perfoliatum</i>					
				Average	Comments
<b>Age of plants in years</b>	1	2	3		
<b>Number of test sites<sup>1</sup></b>	3	2	2		Grown in Wichita and Olathe for three years, and Colby for one year.
<b>Survival rate (%)</b>	88.7	77.5	69.5	78.6	
<b>Vigor rating<sup>2</sup></b>	3.1	4.8	3.3	3.7	
<b>Height (cm)</b>	37.3	95.5	94.0	75.6	
<b>Dry weight herb (g/plant)</b>	21.0	310.7	30.8	—	The low third-year yield as compared to the second year is because the plants had begun to senesce before harvest (see maturity index of 5.9 vs. 4.9), even though fall harvest was at about the same time, in early to mid-September.
<b>Dry weight root (g/plant)</b>	12.0	230.9	62.5	—	
<b>Maturity rating<sup>3</sup></b>	2.3	4.9	5.9	4.4	
<b>Insect damage rating<sup>4</sup></b>	1.1	1.2	4.5	2.3	The high insect rating in year 3 was also due to the late stage of growth and feeding by opportunistic insects.
<b>Disease rating<sup>5</sup></b>	0.4	2.2		1.3	
<b>Estimated planting density (number of plants/A)</b>	10,890	10,890	10,890	—	Assume 2- by 2-ft. spacing.
<b>Plant density<sup>6</sup></b>	9,659	8,440	7,569	—	
<b>kg/A dry weight (g/plant x plant number) – tops</b>	203	2,622	233	—	
<b>Estimated marketable yield (dry weight lbs/A) – tops</b>	447	5,776	513	—	
<b>Yield x ½ of low price<sup>1</sup></b>	\$2,315	\$29,920	\$2,657	—	
<b>Yield x ½ of high price<sup>1</sup></b>	\$5176	\$66,886	\$5,941	—	

<sup>1</sup> See “How Data Were Collected,” on page 3.

<sup>2</sup> Vigor rating (1=very poor, 3=slightly above average, 5=very good, well adapted)

<sup>3</sup> Maturity rating (1=vegetative, 2=early bud, 3=early flower, 4=full flower, 5=seed production, 6=senescence)

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# A Grower's Guide

# Borage

*Borago officinalis*

Bees enjoy the prolific flowers of this green and prickly plant. Young leaves taste like cucumbers. Celtic warriors drank borage-flavored wine to give them courage. Modern research has shown that the plant stimulates the adrenal glands, encouraging the production of adrenaline. The pretty blue flowers have been added to salads since Elizabethan times to “make the mind glad.” The fresh leaves may cause contact dermatitis.



**Family:** *Boraginaceae*

**Life cycle:** Herbaceous annual

**Native:** Mediterranean region of Europe

**Height:** 3 feet

**Sun:** Full sun to partial shade

**Soil:** Any soil. Well drained, moist is best.

**Water:** Moderate. Does not tolerate drought.

**Flowers:** Blue to pink star-shaped flowers in loose racemes that bloom all summer long

**Propagation:** Sow indoors or plant seed directly outdoors in late spring. Seed is easy to start and needs no special treatment. Cover seed two times their thickness and space 15 inches apart. Seed will germinate in seven to 14 days with a 75 percent germination rate. Borage will reseed easily but does not mature all at once.

**Harvesting:** Leaves, stem, flowers and seed are harvested when plant is in flower with seed beginning to form. Bee hives are needed for pollination if this crop is grown for seed.

**Parts used:** Leaves and flowers used fresh or dried. Due to high water content, some recommend drying at a higher temperature than most herbs (40°C). Seeds are harvested for their oil content.

**Used as:** Infusion, tincture, juice, syrup, lotion, crystallized, elixir, lozenge, capsules

**Food uses:** Use young leaves as a boiled pot herb, finely shredded in spring salads, and fresh or candied flowers.

**Medicinal benefits:** Borage oil used as an astringent and as a sequestering agent. The oil contains gamma-linolenic acid (17 to 25 percent) and linoleic acid. The tannins in borage leaves have an astringent effect.

In folk medicine, borage is used for coughs and throat illnesses, an anti-inflammatory agent for kidney and bladder disorders, and as an astringent to treat rheumatism. Similar to comfrey, borage leaves contain potentially liver-toxic and carcinogenic pyrrolizidine alkaloids. Risk may outweigh benefits for internal use.

**Market potential:** Moderate. Prices range from \$4.70 to \$30.42 per pound (lb) dry weight for leaves. No wholesale or retail price found for seeds.

**Summary of field trial data:** This plant appears to have good vigor at most locations in Kansas, but leaves are easily damaged by wind, insects and disease. Early summer harvest would optimize quality. Irrigation is required in dry areas. Seed yield was not estimated in this trial. Market potential is not high, because of new warnings of liver toxicity.

**K-State Field Trial Data 2000-2002 *Borago officinalis***

				<b>Average</b>	<b>Comments</b>
<b>Age of plants in years</b>	1	2	3		
<b>Number of test sites<sup>1</sup></b>	5	1	0		Borage is an annual crop. Second year were measurements of a volunteer crop.
<b>Survival rate (%)</b>	53.5	—	—	53.5	Better survival could probably be obtained if one was more attentive to irrigation needs early in the season.
<b>Vigor rating<sup>2</sup></b>	3.7	4.5	—	4.1	
<b>Height (cm)</b>	53.4	—	—	53.4	
<b>Dry weight herb (g/plant)</b>	180.0	98.3	—	139.5	
<b>Dry weight root (g/plant)</b>	7.2	5.8	—	6.5	
<b>Maturity rating<sup>3</sup></b>	4.8	4.0	—	4.4	
<b>Insect damage rating<sup>4</sup></b>	2.3	0.5	—	1.4	Significant leaf damage is observed late in the season due to insects and disease.
<b>Disease rating<sup>5</sup></b>	2.1	2.0	—	2.1	Early summer harvest could avoid most of this damage.
<b>Estimated planting density (number of plants/A)</b>	27,787	—	—	—	
<b>Plant density<sup>6</sup></b>	14,915	—	—	—	
<b>kg/A dry weight (g/plant x plant number) – tops</b>	2,685	—	—	—	
<b>Estimated marketable yield (dry weight lbs/A) – tops</b>	5,913	—	—	—	
<b>Yield x ½ of low price<sup>1</sup></b>	\$13,896	—	—	—	
<b>Yield x ½ of high price<sup>1</sup></b>	\$89,937	—	—	—	

<sup>1</sup> See "How Data Were Collected," on page 3.

<sup>2</sup> Vigor rating (1=very poor, 3=slightly above average, 5=very good, well adapted)

<sup>3</sup> Maturity rating (1=vegetative, 2=early bud, 3=early flower, 4=full flower, 5=seed production, 6=senescence)

<sup>4</sup> Insect damage rating (scale of 0 to 5; 0=no damage and 5=severe damage)

<sup>5</sup> Disease rating (scale of 0 to 5 with 0=no damage and 5=severe damage)

<sup>6</sup> Calculated as starting plant density x survival rate.

### How Data Were Collected

The plants described in this fact sheet were grown in K-State test plots in Hays, Colby, Wichita, or Olathe, Kan. Generally, four replications of each species were included at a site. Not all species were screened at each site or each year. The number of locations is noted in the table. Depending on the location and year, either five or 10 plants per plot were established in each of the replications. Details can be found at [www.oznet.ksu.edu/ksherbs](http://www.oznet.ksu.edu/ksherbs). Plants were grown from seed in the greenhouse and transplanted in the field in May or June.

All plants at each location were used to determine survival percentage, vigor rating, insect damage rating, and disease rating as described above. Three plants per plot were measured for height, and only one plant per plot was harvested to measure yield each year. Because there were four plots, this allowed us to estimate yield from four plants at each location per year.

Plants were dried, and top and root weights recorded in grams. Grams per plant were converted to kilograms per acre (kg/A) and pounds per acre (lb/A) to estimate field-scale yield. The population density used to calculate field yields was the optimal population density (determined by the average size of the plants) times the actual percentage survival as measured in the field. There was generally some loss due to transplant shock and, for some species, significant winter loss as well.

Plant spacing recommendations on each fact sheet are for spacing within a row. Distance between rows will depend on the particular farming operation and equipment used. The minimum row spacing will be the same as the plant spacing recommendation. For example, if the recommendation is to set plants 12 inches apart, rows should be a minimum of 12 inches apart as well. However, if cultivator or root-harvesting equipment is on 5-foot centers, plant rows 5 feet apart to facilitate cultivating and harvesting. Adjust estimated plant density per acre on the worksheets to estimate gross yield and net income.

Prices were taken from Appendix B of K-State Research and Extension publication S-144 *Farming a Few Acres of Herbs: An Herb Growers Handbook*. To calculate a rough gross income potential for each herb, estimated yield was multiplied by the lowest and the highest retail price, divided by two. This is a rough estimate of wholesale price. Actual prices would be determined based on a contract obtained from a buyer.

Rhonda Janke, sustainable cropping systems specialist  
Jeanie DeArmond, extension assistant

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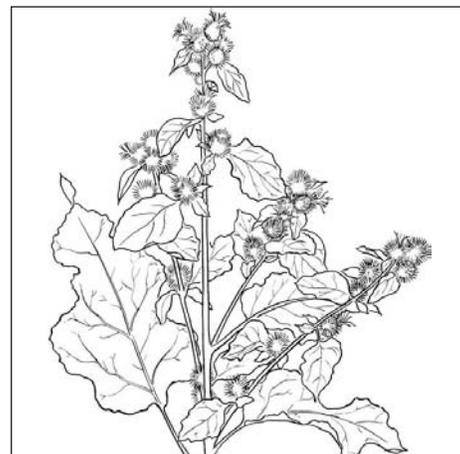
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# A Grower's Guide

# Burdock

*Arctium lappa*

The Latin name comes from the Greek “arktos,” or bear, suggesting rough-coated fruits, and “lappa,” which means to seize. Burdock, also known as gobo, is a main root vegetable in Asian cooking and a medicinal herb. Burdock is common along streams in the shade. It is also common in waste grounds with alkaline soil. The wild relative is *Arctium minus*.



**Family:** *Compositae/Asteraceae*

**Life cycle:** Herbaceous biennial (Zone 3)

**Native:** Eurasia. Introduced to North America and elsewhere.

**Height:** 2 to 9 feet

**Sun:** Full sun, partial shade, shade

**Soil:** Loamy soil and neutral to alkaline pH is preferred.

**Water:** Moderate water is preferred. Likes damp places.

**Flowers:** Late in the summer of the second year. Flowers are immature green burs with a pink center. As the seed matures, the burs turn tan or brown.

**Propagation:** Stratified seed will have an 80 to 90 percent germination rate; unstratified seed will be less. Germinates in one to two weeks. Seed can be sown directly in the field in the spring, or they can be started indoors planted 1/8-inch deep and transplanted out in the late spring. Seedlings grow very rapidly. Space

plants at least 18 inches apart and water moderately. Burdock will reseed itself readily so spreading will occur.

**Pests:** No significant insects or diseases. Some general leaf feeding occurred in our field plots.

**Harvesting:** Roots are harvested in the fall of the first year growth or in the spring of the second year. Burdock has a very deep, long taproot that requires a needle nose spade or a garden fork to dig. The seed pods should be harvested in the fall of the second year.

**Parts used:** Roots, leaves and seed, either fresh or dried.

**Used as:** Medicinal food, decoction, tincture, syrup, compress, poultice, elixir, ointment, salve, cream, balm, foot soak, bath herb, infused oil, tea (cancer treatment – seed).

**Medicinal benefits:** In vitro, burdock shows mild antimicrobial activity. Folk uses include ailments of the gastrointesti-

nal tract and for blood purifying. Externally used for many skin and scalp problems, sores and infections. In China, seeds are used for common colds and cough.

**Market potential:** Moderate to high for root and seed. Moderate to low for leaves. In addition to medicinal market, fresh root may be sold as a vegetable (check local market for prices). Prices found include leaf for \$10.05 per pound (lb) dry weight, root for \$3.60 to 33.60 lb dry weight, and seed for \$26.13 to 95.34 lb dry weight.

**Summary of field trial data:** This is a vigorous, hardy plant in Kansas. The only limitation may be harvesting technique and securing a market for the products. Plots were transplanted in our research trials, but the seed is large enough that direct seeding should be possible.

**K-State Field Trial Data 2000-2002 *Arctium lappa***

				<b>Average</b>	<b>Comments</b>
<b>Age of plants in years</b>	1	2	3		
<b>Number of test sites<sup>1</sup></b>	6	2	0		
<b>Survival rate (%)</b>	77.3	59.3	—	68.3	
<b>Vigor rating<sup>2</sup></b>	4.1	4.8	—	4.4	
<b>Height (cm)</b>	54.5	104.0	—	79.3	
<b>Dry weight herb (g/plant)</b>	123.8	175.7	—	—	Leaves lose condition in second year.
<b>Dry weight root (g/plant)</b>	60.8	102.0	—	—	Usually sold in fall of first year.
<b>Estimated seed yield (g/plant)</b>	—	8.8	—	—	Estimated as 5 percent of top biomass.
<b>Maturity rating<sup>3</sup></b>	1.0	5.4	—	—	This is a biennial crop.
<b>Insect damage rating<sup>4</sup></b>	1.7	0.5	—	1.1	
<b>Disease rating<sup>5</sup></b>	0.2	0.5	—	0.4	
<b>Estimated planting density (number of plants/A)</b>	19,360	19,360	—	—	1.5- by 1.5-foot plant spacing.
<b>Plant density<sup>6</sup></b>	14,965	11,480	—	—	
<b>kg/A dry weight (g/plant x plant number) – tops</b>	1,852	—	—	—	
<b>kg/A dry weight (g/plant x plant number) – roots</b>	910	—	—	—	
<b>kg/A dry weight (g/plant x plant number) – seeds</b>	—	101	—	—	
<b>Estimated marketable yield (dry weight lbs/A) – tops</b>	4,801	—	—	—	
<b>Estimated marketable yield (dry weight lbs/A) – roots</b>	2,004	—	—	—	
<b>Estimated marketable yield (dry weight lbs/A) – seeds</b>	—	223	—	—	
<b>Yield x ½ of price<sup>1</sup> – tops</b>	\$20,526	—	—	—	Only one price listed in sources checked.
<b>Yield x ½ of low price<sup>1</sup> – roots</b>	\$3,607	—	—	—	
<b>Yield x ½ of high price<sup>1</sup> – roots</b>	\$33,667	—	—	—	
<b>Yield x ½ of low price<sup>1</sup> – seeds</b>	—	\$2,913	—	—	
<b>Yield x ½ of high price<sup>1</sup> – seeds</b>	—	\$10,630	—	—	

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<sup>5</sup> Disease rating (scale of 0 to 5 with 0=no damage and 5=severe damage)

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Rhonda Janke, sustainable cropping systems specialist  
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## A Grower's Guide

# Butterfly Milkweed/Pleurisy Root

*Asclepias tuberosa*

This is a beautiful plant that stands out on the prairie. It has a bright orange flower and gorgeous fruit pods in the late summer. The common name, pleurisy root, comes from the use of this herb by Native Americans and pioneers to treat lung inflammations, or pleurisy. This milkweed does not have a white, milky sap that is common to other milkweeds.



**Family:** *Asclepiadaceae*

**Life cycle:** Herbaceous perennial  
(Zone 4)

**Native:** Great Plains; frequently seen in the Flint Hills of Kansas, though the plant is now on the United Plant Savers at-risk list. This plant should not be wild harvested.

**Height:** 24 inches

**Sun:** Full sun

**Soil:** Well-drained soil. Tolerates dry, sandy and rocky soil.

**Water:** Low to moderate

**Flowers:** Brightly colored orange flowers bloom in midsummer.

**Propagation:** Stratify seed for at least one month, then sow indoors. Seedlings appear in two to three weeks with 40 to 50 percent germination. Transplant in mid- to late spring. Sow directly in the field in late winter or early spring. Plant 12 inches apart. Grows in mounding clumps.

**Harvesting:** Harvest the root in the fall after the plant has gone to seed. Roots may be dug with a garden fork or needle-nose spade.

**Parts used:** Dried roots. Do not ingest any other part of this plant.

**Used as:** Tincture, elixir, syrup, some medicinal tea blends

**Medicinal benefits:** Recommended for respiratory conditions, coughs, as an analgesic and to ease breathing. Also used as a diaphoretic and expectorant.

**Market Potential:** Low to moderate. Price range \$8.50 to \$46.40 for retail, bulk dried (cut and sifted) herb.

**Summary of field trial data:** This plant germinates fairly well in the greenhouse after the seed is stratified. Young plants seem to lack vigor and are easily attacked by common greenhouse pests. Once in the field, the plants seem to need extra attention the first year because they are quite small. By the second year, plants are more

vigorous. Insect and disease pressures were not severe, but a large number of aphids weakened small, first-year plants.

This may be a good long-term crop for growers seeking diversification because the roots generally wouldn't be large enough to dig until the second or third year, or later. Prospects for sales are moderate, but the root is found in some commercial cold remedy teas. Ironically, as a native plant to central Kansas and the Great Plains, one would expect good vigor, but this plant rated only slightly above average with an overall average rating of 3.3.

**K-State Field Trial Data 2000-2002 *Asclepias tuberosa***

				Average	Comments
<b>Age of plants in years</b>	1	2	3		
<b>Number of test sites<sup>1</sup></b>	6	4	4		The six test sites evaluated in year 1 include testing two genotypes at two of our locations.
<b>Survival rate (%)</b>	66.9	47.3	52.0	55.4	We aren't sure how to explain the increase in percent survival from year 2 to year 3, except that some plants apparently re-grew from the roots after being harvested as data plants.
<b>Vigor rating<sup>2</sup></b>	3.1	3.4	3.5	3.3	
<b>Height (cm)</b>	28.4	49.5	60.5	46.1	
<b>Dry weight herb (g/plant)</b>	6.3	89.1	104.7	—	
<b>Dry weight root (g/plant)</b>	4.3	42.7	61.9	—	
<b>Maturity rating<sup>3</sup></b>	2.5	5.0	4.0	3.8	Plants were in full flower during harvest in years 2 and 3.
<b>Insect damage rating<sup>4</sup></b>	0.6	1.0	0.7	0.8	Aphids early, <i>Tetraopes sp.</i> or milkweed beetle on year 3 plants, and larvae damage to some roots.
<b>Disease rating<sup>5</sup></b>	0.2	1.7	1.0	1.0	
<b>Estimated planting density (number of plants/A)</b>	43,560	43,560	43,560	—	Assume 1- by-1 ft. spacing.
<b>Plant density<sup>6</sup></b>	29,142	20,604	22,651	—	
<b>kg/A dry weight (g/plant x plant number) – roots</b>	125	800	1,402	—	
<b>Estimated marketable yield (dry weight lbs/A) – roots</b>	276	1,938	3,088	—	
<b>Yield x ½ of low price<sup>1</sup></b>	\$1,173	\$8,237	\$13,125	—	
<b>Yield x ½ of high price<sup>1</sup></b>	\$6,403	\$44,962	\$71,642	—	

(Note: two biotypes were grown in the field - one adapted to silt or sand soils and one selected by the seed company for sites with more clay. Both types have been averaged in this table, but performed slightly differently at our different sites. For detailed site information, see Appendix C in K-State Research and Extension Publication S-144, *Farming a Few Acres of Herbs: An Herb Growers Handbook.*)

<sup>1</sup> See "How Data Were Collected," on page 3.

<sup>2</sup> Vigor rating (1=very poor, 3=slightly above average, 5=very good, well adapted)

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<sup>6</sup> Calculated as starting plant density x survival rate.

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All plants at each location were used to determine survival percentage, vigor rating, insect damage rating, and disease rating as described above. Three plants per plot were measured for height, and only one plant per plot was harvested to measure yield each year. Cultivating four plots allowed us to estimate yield from four plants at each location per year.

Plants were dried, and top and root weights recorded in grams. Grams per plant were converted to kilograms per acre (kg/A) and pounds per acre (lb/A) to estimate field-scale yield. The population density used to calculate field yields was the optimal population density (determined by the average size of the plants) times the actual percentage survival as measured in the field. There was generally some loss due to transplant shock and, for some species, significant winter loss as well.

Plant spacing recommendations on each fact sheet are for spacing within a row. Distance between rows will depend on the particular farming operation and equipment used. The minimum row spacing will be the same as the plant spacing recommendation. For example, if the recommendation is to set plants 12 inches apart, rows should be a minimum of 12 inches apart as well. However, if cultivator or root-harvesting equipment is on 5-foot centers, plant rows 5 feet apart to facilitate cultivating and harvesting. Adjust estimated plant density per acre on the worksheets to estimate gross yield and net income.

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# A Grower's Guide

# Calendula

*Calendula officinalis*

Calendula is also known as pot marigold, but is not related to the common garden marigold, *Tagetes spp.* Historically, calendula blossoms were used to color broth, rice and other foods as a substitute for saffron, but is now primarily used as skin cream, oil or lotion.



**Family:** *Asteraceae*

**Life cycle:** Herbaceous annual

**Native:** Europe to Africa

**Height:** 12 to 15 inches

**Sun:** Full sun. Tolerates hot conditions.

**Soil:** Well drained, not overly moist.  
Prefers loam.

**Water:** Moderate

**Flowers:** Flowers are bright yellow and orange, single or double, and bloom from early summer until a killing frost. Flowers close at night and reopen in the morning. Calendula will bloom from summer to early fall if deadheaded at the right time. Flowers attract beneficial insects. High resin varieties are available.

**Propagation:** Sow seed in the field. No treatment is needed. Seed can be started indoors and transplanted. Seed germinates in one to two weeks and will have about 80 percent germination. Use 10- to 12-inch spacing. Reseeds itself easily.

**Pests:** Calendula will attract whitefly, aphids and thrips. Cucumber beetles and blister beetles also may be a problem. Damping off can occur in the greenhouse.

**Harvesting:** Harvest flowers by hand when they are completely open. Avoid flowers that have gone to seed because medicinal properties are not as active. If plants are allowed to go to seed, they will quit growing. If harvesting only once for essential oil, harvest three weeks after flowers appear. One source reported that flowers need to be picked at least three times per week for optimal quality. It is estimated that 1 acre of calendula could keep a crew of three to four people busy every day for three or four months, with dry flower yields of 400 to 600 lbs/A. Flower petals dry quickly, but the rest of the head requires at least a week in the drying oven.

**Parts used:** Fresh or dried flowers

**Used as:** Medicinal food, food coloring, infusion, tincture, compress, poultice,

ointment, salve, cream, balm, foot soak, bath herb, infused oil, liniment, cosmetics, insect repellent. Petals have a nutty flavor.

**Medicinal benefits:** Several clinical studies show antimicrobial activity, antiviral activity and wound healing in skin tissue. Calendula was also shown to induce the formation of new blood vessels, which is important in wound healing. Approved in Europe for inflammation of the mouth and pharynx, and for wounds and burns. Typical forms are as a gel, ointment, tincture, tea, shampoo and hand cream.

**Market potential:** Moderate to high, preferred in dry form. Prices for flowers range from \$4.80 to \$39 per pound (lb) dry weight.

**Summary of field trial data:** To get complete yield data, weekly harvests are necessary, but that was beyond the capabilities of this project. The plants were in full flower most of the year, but only harvested in the fall. We estimated the yields

**K-State Field Trial Data 2000-2002 *Calendula officinalis***

				<b>Average</b>	<b>Comments</b>
<b>Age of plants in years</b>	1	2	3		
<b>Number of test sites<sup>1</sup></b>	7	0	0		Calendula is an annual crop.
<b>Survival rate (%)</b>	84.7	—	—	84.7	
<b>Vigor rating<sup>2</sup></b>	3.7	—	—	3.7	Did not do as well in non-irrigated sites.
<b>Height (cm)</b>	45.0	—	—	45.0	
<b>Dry weight herb (g/plant)</b>	73.0	—	—	73.0	
<b>Dry weight root (g/plant)</b>	7.5	—	—	7.5	
<b>Maturity rating<sup>3</sup></b>	4.6	—	—	4.6	
<b>Insect damage rating<sup>4</sup></b>	1.8	—	—	1.8	Damage from thrips and whiteflies noticed, especially with high-resin varieties.
<b>Disease rating<sup>5</sup></b>	1.1	—	—	1.1	Some leaf spotting, probably related to the thrips damage.
<b>Estimated planting density (number of plants/A)</b>	43,560	—	—	—	
<b>Plant density<sup>6</sup></b>	36,895	—	—	—	
<b>kg/A dry weight (g/plant x plant number) – flowers</b>	673	—	—	—	Rough assumption of 25 percent of top dry weight becomes flowers.
<b>Estimated marketable yield (dry weight lbs/A) – flowers</b>	1,483	—	—	—	
<b>Yield x ½ of low price<sup>1</sup></b>	\$3,559	—	—	—	
<b>Yield x ½ of high price<sup>1</sup></b>	\$28,919	—	—	—	

<sup>1</sup> See "How Data Were Collected," on page 3.

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<sup>3</sup> Maturity rating (1=vegetative, 2=early bud, 3=early flower, 4=full flower, 5=seed production, 6=senescence)

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<sup>6</sup> Calculated as starting plant density x survival rate.

we reported might be 25 percent of the top dry weight as flowers over the growing season. The crop must be harvested by hand for optimal quality in repeated harvests. Mechanization might be possible for a one-time harvest. This would imply some specialization in this crop, and/or other flowering crops, in order to pay for the infrastructure and equipment. A definite contract or market should be secured before taking on this debt. In our field plots, the calendula was robust even in hot, dry, windy summers. However, irrigation is needed for optimal yields. This also makes a nice plant for the flower garden.

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Plants were dried, and top and root weights recorded in grams. Grams per plant were converted to kilograms per acre (kg/A) and pounds per acre (lb/A) to estimate field-scale yield. The population density used to calculate field yields was the optimal population density (determined by the average size of the plants) times the actual percentage survival as measured in the field. There was generally some loss due to transplant shock and, for some species, significant winter loss as well.

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Prices were taken from Appendix B of K-State Research and Extension publication S-144 *Farming a Few Acres of Herbs: An Herb Growers Handbook*. To calculate a rough gross income potential for each herb, estimated yield was multiplied by the lowest and the highest retail price, divided by two. This is a rough estimate of wholesale price. Actual prices would be determined based on a contract obtained from a buyer.

Rhonda Janke, sustainable cropping systems specialist  
Jeanie DeArmond, extension assistant

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## A Grower's Guide

# Chinese Milkvetch

*Astragalus membranaceus*

This plant is widely and safely used in Chinese medicine but is related to many species from North America, including Missouri milkvetch (*A. missouriensis*) and woolly loco (*A. mollissimus*), which are poisonous to livestock.



**Family:** *Fabaceae*

**Life cycle:** Herbaceous perennial (Zone 5)

**Native:** Northeastern China

**Height:** 3 to 4 feet, sprawls as it matures

**Sun:** Partial shade to full sun

**Soil:** Well worked, sandy, dry soil

**Water:** Moderate, will not do well in poorly drained soil

**Flowers:** Pale yellow, blooms from mid-summer until frost

**Propagation:** Stratify seed for at least three weeks before sowing, then scarify and soak in warm water for several hours before planting seed. Germination rate will be about 50 percent. Sow directly in field or start indoors and transplant after last frost date. Susceptible to transplant shock. Plant 15 inches apart and water moderately.

**Harvesting:** The roots are harvested in the fall after at least two years growth,

generally between the third and fifth year depending on location and how fast the plants grow. Dig roots using a needle-nose spade or a garden fork to extract the entire root. Appears to be a taproot with branches. Harvest could be partially mechanized.

**Parts used:** Roots, fresh or dried.

**Used as:** Medicinal food, tonic, decoction, traditional tincture, syrup, elixir, lozenge, honey, powder

**Medicinal benefits:** Stimulates the immune system. Also an antioxidant with antiviral activity and cardiovascular effects.

**Market potential:** High, used in many Western and Chinese herbal formulations. Profits and volume up. Prices range from \$7.50 to \$56 per pound (lb) dry weight. Often sold as ground dried root or root slices.

**Summary of field trial data:** Chinese milkvetch is an attractive, sprawling legume that would fit well in the back of a

perennial flower bed or as a field crop. Though we had high hopes for this crop, the root yields in year three were not large. Potential demand is still high because this is a widely used herb with many properties. Digging and drying the root can be a lot of work, but mechanization may be possible. The plant does not have many insect or disease pests, but likes well-drained soil. It needs a bit of coddling for the first couple of months after transplanting because it grows slowly the first year. It may not work as a direct-seeded crop due to the stratification and scarification required for good seed germination. This is a fairly competitive crop once it gets established, but the percent survival in the second and third years was below 50 percent, so start with a high planting density. Some of the native *Astragalus* species in the Great Plains may have potential as medicinal plants, but medical research has not addressed this yet. Plants flowered and set seed prolifically under field conditions, so growers could plant their own seed after year two.

**K-State Field Trial Data 2000-2002 *Astragalus membranaceus***

				<b>Average</b>	<b>Comments</b>
<b>Age of plants in years</b>	1	2	3	—	
<b>Number of test sites<sup>1</sup></b>	4	3	2	—	
<b>Survival rate (%)</b>	64.3	41.7	42.5	49.5	
<b>Vigor rating<sup>2</sup></b>	2.9	4.3	4.5	3.9	
<b>Height (cm)</b>	34.0	73.0	115.0	74.2	
<b>Dry weight herb (g/plant)</b>	4.8	95.4	195.0	—	
<b>Dry weight root (g/plant)</b>	1.7	26.1	32.3	—	
<b>Maturity rating<sup>3</sup></b>	0.7	2.2	4.4	4.2	
<b>Insect damage rating<sup>4</sup></b>	0.5	0.5	1.2	0.7	
<b>Disease rating<sup>5</sup></b>	0.1	0.5	0.5	0.4	
<b>Estimated planting density (number of plants/A)</b>	27,878	27,878	27,878	—	
<b>Plant density<sup>6</sup></b>	17,926	11,625	11,848	—	
<b>kg/A dry weight (g/plant x plant number) – roots</b>	31	303	383	—	
<b>Estimated marketable yield (dry weight lbs/A) – roots</b>	67	668	843	—	
<b>Yield x ½ of low price<sup>1</sup> - roots</b>	\$251	\$2,505	\$3,161	—	
<b>Yield x ½ of high price<sup>1</sup> - roots</b>	\$1,876	\$18,704	\$23,604	—	

<sup>1</sup> See "How Data Were Collected," on page 3.

<sup>2</sup> Vigor rating (1=very poor, 3=slightly above average, 5=very good, well adapted)

<sup>3</sup> Maturity rating (1=vegetative, 2=early bud, 3=early flower, 4=full flower, 5=seed production, 6=senescence)

<sup>4</sup> Insect damage rating (scale of 0 to 5; 0=no damage and 5=severe damage)

<sup>5</sup> Disease rating (scale of 0 to 5 with 0=no damage and 5=severe damage)

<sup>6</sup> Calculated as starting plant density x survival rate.

### How Data Were Collected

The plants described in this fact sheet were grown in K-State test plots in Hays, Colby, Wichita, or Olathe, Kan. Generally, four replications of each species were included at a site. Not all species were screened at each site or each year. The number of locations is noted in the table. Depending on the location and year, either five or 10 plants per plot were established in each of the replications. Details can be found at [www.oznet.ksu.edu/ksherbs](http://www.oznet.ksu.edu/ksherbs). Plants were grown from seed in the greenhouse and transplanted in the field in May or June.

All plants at each location were used to determine survival percentage, vigor rating, insect damage rating, and disease rating as described above. Three plants per plot were measured for height, and only one plant per plot was harvested to measure yield each year. Because there were four plots, this allowed us to estimate yield from four plants at each location per year.

Plants were dried, and top and root weights recorded in grams. Grams per plant were converted to kilograms per acre (kg/A) and pounds per acre (lb/A) to estimate field-scale yield. The population density used to calculate field yields was the optimal population density (determined by the average size of the plants) times the actual percentage survival as measured in the field. There was generally some loss due to transplant shock and, for some species, significant winter loss as well.

Plant spacing recommendations on each fact sheet are for spacing within a row. Distance between rows will depend on the particular farming operation and equipment used. The minimum row spacing will be the same as the plant spacing recommendation. For example, if the recommendation is to set plants 12 inches apart, rows should be a minimum of 12 inches apart as well. However, if cultivator or root-harvesting equipment is on 5-foot centers, plant rows 5 feet apart to facilitate cultivating and harvesting. Adjust estimated plant density per acre on the worksheets to estimate gross yield and net income.

Prices were taken from Appendix B of K-State Research and Extension publication S-144 *Farming a Few Acres of Herbs: An Herb Growers Handbook*. To calculate a rough gross income potential for each herb, estimated yield was multiplied by the lowest and the highest retail price, divided by two. This is a rough estimate of wholesale price. Actual prices would be determined based on a contract obtained from a buyer.

Rhonda Janke, sustainable cropping systems specialist  
Jeanie DeArmond, extension assistant

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## A Grower's Guide

# Narrow-Leaved/Pale Purple Coneflower

*Echinacea angustifolia* and *Echinacea angustifolia* var. *pallida*

For years taxonomists have debated about whether these are two species or one. The morphology of the two species is quite different. The *E. angustifolia* is shorter with shorter flower petals. The plant is found in the drier regions of the Great Plains (western Kansas, Nebraska, Dakotas, etc.). *E. pallida* is much taller with a larger root, long drooping petals, and grows in the wet regions of the Great Plains, including eastern and southeastern Kansas. The chemical markers in the two species provide some distinguishing characteristics. The *E. angustifolia* has more isobutylamide, which is the tongue-numbing component that is often used to distinguish this root. However, other compounds in the plant appear to be responsible for the medicinal qualities, including polysaccharides. Currently, taxonomists have named *E. pallida* a sub-species of *E. angustifolia*, but these will be abbreviated in this fact sheet as if they were two species.



**Family:** Asteraceae

**Life cycle:** Herbaceous perennial  
(Zone 3)

**Native:** Great Plains, North America

**Height:** 2 feet for *E. angustifolia*,  
2 to 4 feet for *E. pallida*

**Sun:** Full sun

**Soil:** Any soil, can survive on poor soil.

**Water:** Low to moderate

**Flowering:** Pink/purple flowers bloom  
from mid- to late summer

**Propagation:** Seed must be stratified for one to three months to germinate, or sow outdoors in the fall or winter for natural stratification. Germination is erratic and can take several weeks. Germination rates will vary and are usually less than 50 percent.

*E. angustifolia* and *E. pallida* seed have a light requirement to germinate and should not be covered with soil.

**Harvesting:** Roots are harvested in the fall or spring of the second or third year. Both have taproots, and the top 6 to 12 inches are easy to harvest. It is difficult to get the entire root. In some cases, root remnants can resprout, so don't abandon the field immediately. Use a needle-nose spade to dig roots, or special digging tool that resembles a flattened crow-bar. A chisel plow or lister can also be used to loosen and expose roots, which are then picked up by hand and washed with a power sprayer or root washer. Occasionally the tops of these plants are marketed, but most of the market is for the roots or seed. If harvesting seed, keep other species of *Echinacea* at least ½ mile away, to avoid cross pollination.

In Kansas, these species are often harvested in the wild. In years of high prices, this leads to overharvesting. However, these species are also in danger of becoming rare from the use of broad-leaved herbicides and overgrazing. A sustainable harvest has been estimated as about 5 per-

cent of the adult plants, with the rest left to reseed. We recommend growing this crop as a cultivated species.

**Parts used:** Fresh or dried root

**Used as:** Infusion, decoction, tincture, syrup, compress, poultice, elixir, lozenge, ointment, salve, cream. Root can also be simply chewed, fresh or dry.

**Medicinal benefits:** *Echinacea pallida* has been approved by European physicians for use against fevers and colds. *E. angustifolia* is more in demand and has been more extensively used historically. Much of the research done on *Echinacea* in Europe before 1988 was done on *E. pallida*, which had been misidentified as *E. angustifolia*. All three species (*E. angustifolia*, *E. pallida*, and *E. purpurea*) stimulate the immune system and have wound-healing properties. Some of the more rare *Echinacea* species (*E. paradoxa*, *E. atrorubens*, or *E. tennesseensis*) may also share these traits, but have not been researched.

**Market potential:** Moderate to very high. Root price is \$20 to \$99.99 per pound (lb) dry weight for *E. angustifolia*, and \$14 to \$22.47/lb dry weight for *E. pallida*. *Echinacea* is one of the top-selling herbs in the United States, but the supply side of the market is becoming very competitive, with large players entering the market.

**Summary of field trial data:** The market sometimes pays a premium price for *E. angustifolia*, and there are fewer buyers and less name recognition for *E. pallida* (only two of the nine retailers in Appendix B listed it). However, based on our field data, we cannot recommend planting, or at least transplanting *E. angustifolia* at this time. Survival was poor, with 53 percent the first year (86 percent for *E. pallida*), and only 30 per-

cent survival by year three, compared to 54 percent for *E. pallida*. Yields were also low, with 23 g/root dry weight in year three for *E. angustifolia*, compared to 60 g/root dry weight for *E. pallida* and 59 g/root dry weight for *E. purpurea*.

*E. angustifolia* prefers high pH soils and well-drained, even stony sites. All of our sites had neutral to high pH, and all soils were well drained. Because it is taprooted, it may suffer from transplant shock and never fully recover. In discussions with colleagues from western Kansas and from North Dakota, one of the possible reasons those areas report larger plants than the ones from our plots is not just due to optimal pH and drainage, but also cooler night temperatures on the high plains.

In two observations not included in these data sets, strips of plots were broadcast seeded at Olathe and Wichita at the experiment fields in January of 2001. Preliminary data suggests that if seed germination is successful and weeds are moderately controlled, yields from direct seeding may equal or exceed yields from transplanted, weeded and coddled plots. Germination can be successful with direct seeding, but controlling weeds is difficult or impossible because this species does not compete well with weeds. Future research will address some of these questions, but for now, we recommend that growers only try *E. angustifolia* on a small scale. *E. pallida* and *E. purpurea* show some promise if the price can justify the harvest and labor costs.

**K-State Field Trial Data 2000-2002 *Echinacea angustifolia***

				Average	Comments
<b>Age of plants in years</b>	1	2	3		
<b>Number of test sites<sup>1</sup></b>	6	4	1		
<b>Survival rate (%)</b>	53.2	26.3	30.0	36.5	Apparently some root re-sprouting between years 2 and 3.
<b>Vigor rating<sup>2</sup></b>	2.0	2.2	1.8	2.0	A vigor rating below 3 is below average.
<b>Height (cm)</b>	11.5	28.0	47.0	28.8	
<b>Dry weight herb (g/plant)</b>	6.6	19.7	33.4	—	
<b>Dry weight root (g/plant)</b>	3.3	7.8	23.0	—	
<b>Maturity rating<sup>3</sup></b>	1.1	4.2	5.5	3.6	The plants appeared to flower earlier each year.
<b>Insect damage rating<sup>4</sup></b>	1.2	1.3	0.8	1.1	Observed some misc. leaf feeding, but no specific pests.
<b>Disease rating<sup>5</sup></b>	0.5	1.7	1.3	1.1	
<b>Estimated planting density (number of plants/A)</b>	—	21,780	21,780	—	1- by 2-ft. spacing.
<b>Plant density<sup>6</sup></b>	—	5,728	6,534	—	
<b>kg/A dry weight (g/plant x plant number) – roots</b>	—	45	150	—	
<b>Estimated marketable yield (dry weight lbs/A) – roots</b>	—	98	331	—	
<b>Yield x ½ of low price<sup>1</sup></b>	—	\$980	\$3,310	—	There is a huge price range out there for <i>E. angustifolia</i> roots, which makes budgeting difficult.
<b>Yield x ½ of high price<sup>1</sup></b>	—	\$4,900	\$16,550	—	

<sup>1</sup> See "How Data Were Collected," on page 3.

<sup>2</sup> Vigor rating (1=very poor, 3=slightly above average, 5=very good, well adapted)

<sup>3</sup> Maturity rating (1=vegetative, 2=early bud, 3=early flower, 4=full flower, 5=seed production, 6=senescence)

<sup>4</sup> Insect damage rating (scale of 0 to 5; 0=no damage and 5=severe damage)

<sup>5</sup> Disease rating (scale of 0 to 5 with 0=no damage and 5=severe damage)

<sup>6</sup> Calculated as starting plant density x survival rate.

**K-State Field Trial Data 2000-2002 *Echinacea angustifolia* var. *pallida***

				Average	Comments
Age of plants in years	1	2	3		
Number of test sites <sup>1</sup>	3	2	2		
Survival rate (%)	86.0	55.5	54.0	65.2	
Vigor rating <sup>2</sup>	3.0	3.3	3.9	3.4	
Height (cm)	25.0	81.0	91.5	65.8	
Dry weight herb (g/plant)	9.4	62.3	128.4	—	
Dry weight root (g/plant)	5.3	35.1	59.9	—	Root weights similar to <i>E. purpurea</i> in year 3, but easier to clean.
Maturity rating <sup>3</sup>	1.1	5.0	5.5	3.9	
Insect damage rating <sup>4</sup>	1.0	2.2	1.0	1.4	
Disease rating <sup>5</sup>	0.1	1.7	1.7	1.2	
Estimated planting density (number of plants/A)	—	21,780	21,780	—	1- by 2-ft. spacing.
Plant density <sup>6</sup>	—	12,088	11,761	—	
kg/A dry weight (g/plant x plant number) – roots	—	424	704	—	
Estimated marketable yield (dry weight lbs/A) – roots	—	935	1,552	—	
Yield x ½ of low price <sup>1</sup>	—	\$6,545	\$10,864	—	
Yield x ½ of high price <sup>1</sup>	—	\$10,509	\$17,444	—	

<sup>1</sup> See “How Data Were Collected,” on page 3.

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<sup>3</sup> Maturity rating (1=vegetative, 2=early bud, 3=early flower, 4=full flower, 5=seed production, 6=senescence)

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<sup>6</sup> Calculated as starting plant density x survival rate.

### How Data Were Collected

The plants described in this fact sheet were grown in K-State test plots in Hays, Colby, Wichita, or Olathe, Kan. Generally, four replications of each species were included at a site. Not all species were screened at each site or each year. The number of locations is noted in the table. Depending on the location and year, either five or 10 plants per plot were established in each of the replications. Details can be found at [www.oznet.ksu.edu/ksherbs](http://www.oznet.ksu.edu/ksherbs). Plants were grown from seed in the greenhouse and transplanted in the field in May or June.

All plants at each location were used to determine survival percentage, vigor rating, insect damage rating, and disease rating as described above. Three plants per plot were measured for height, and only one plant per plot was harvested to measure yield each year. Cultivating four plots allowed us to estimate yield from four plants per species at each location per year.

Plants were dried, and top and root weights recorded in grams. Grams per plant were converted to kilograms per acre (kg/A) and pounds per acre (lb/A) to estimate field-scale yield. The population density used to calculate field yields was the optimal population density (determined by the average size of the plants) times the actual percentage survival as measured in the field. There was generally some loss due to transplant shock and, for some species, significant winter loss as well.

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Prices were taken from Appendix B of K-State Research and Extension publication S-144 *Farming a Few Acres of Herbs: An Herb Growers Handbook*. To calculate a rough gross income potential for each herb, estimated yield was multiplied by the lowest and the highest retail price, divided by two. This is a rough estimate of wholesale price. Actual prices would be determined based on a contract obtained from a buyer.

Rhonda Janke, sustainable cropping systems specialist  
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## A Grower's Guide

# Purple Coneflower

*Echinacea purpurea*

Purple coneflower (*E. purpurea*) is the domesticated cousin of *E. angustifolia* and *E. pallida*. It is native to North America, but hails from the more humid regions of the southeast and Appalachia. Garden cultivars range from the intensely pink/purple “Blaze” to a pure white-flowered “White Swan.” This plant is rare in the wild, and should not be wildcrafted. Research shows that garden and wild varieties have medicinal properties, so this can be a dual purpose crop because the flowers are also in demand in the floral industry and local flower markets.



**Family:** *Asteraceae*

**Life cycle:** Herbaceous perennial (Zone 3)

**Native:** North America

**Height:** 3 to 4 feet

**Sun:** Full sun to partial shade

**Soil:** Fairly rich soil

**Water:** Moderate. Can tolerate some drought, but responds to irrigation.

**Flowering:** Pink/purple flowers bloom from mid- to late summer

**Propagation:** Sow seed directly in the field in spring, or sow seed indoors in very early spring and transplant to the field in late spring. No seed treatment is required for this *Echinacea*. In gardens, the plants reseed prolifically and daughter plants can be transplanted each year.

**Harvesting:** Roots are harvested in the fall or spring of the second or third year. Roots are fibrous and are fairly easy to harvest, but washing is more difficult than

with the taprooted species. Harvest the aerial parts, flowers and seed from the second season on while in full flower. Use needle nose spade to dig roots.

Mechanization is possible using a chisel plow, lister or modified potato digger to expose the root, then remove and clean roots by hand. Seed crops are possible, but echinaceas can hybridize for up to a mile, so grow only one species if you are saving seed to sell. Harvest seed once the heads are partially dry and thresh by hand or mechanically. If seed is difficult to get out, freeze and thaw several times to loosen the seed in the head.

**Parts used:** Tops, leaves, and roots, fresh or dried. The highest concentration of active ingredient is in the roots and flower buds.

**Used as:** Infusion (tea), tincture, juice and capsules. Found in many other products.

**Medicinal benefits:** Approved by physicians in Europe for common cold, cough, bronchitis, fevers, colds, urinary tract

infections, mouth and pharynx inflammation, infection and for wounds and burns. Several clinical trials have demonstrated the efficacy of *E. purpurea* in activating T-cells (immune system cells) and promoting wound healing. Historically used for everything from saddle sores to snakebite, and also to heal brown recluse spider bites.

**Market potential:** Moderate to very high. Prices for tops range from \$14 to \$54.40 per pound (lb) dry weight, and for roots \$12 to \$ 65.60 per lb dry weight *Echinacea* is the top-selling herb in the United States.

**Summary of field trial data:** Seeds were easy to germinate and seedlings for transplant were easy to grow in the greenhouse. Transplanting was fairly successful, and nearly 90 percent survived the first growing season. However, this plant appears to be highly susceptible to the disease aster yellows, which is a mycoplasma-like organism. The disease is spread by leafhoppers, and there are no

known organic controls for this pest. The disease doesn't always kill the plant, but symptoms include light-green leaves and stems, multiple seedheads, distorted or stunted growth, short internodes and stems and low vigor. Some symptoms were visible by the end of the first growing season and by the end of the second growing season 90 to 100 percent of plants appeared to be infected (data not shown). Survival was reduced to less than 50 percent and the vigor rating dropped from more than 3.0 in the first year, to less than 3.0 (below average) in years two and three. It might be possible to harvest some of the plant for the market – especially the root – but data on whether efficacy is

affected by the disease and whether it would be ethical to market roots known to have the disease is not yet available. The plant disease would not have an effect on humans per se, but might reduce the herb's effectiveness. Another possibility is to harvest the tops the first year for market, knowing that the entire stand will be affected by the second year.

Unfortunately, this disease was observed at all locations and reported by growers from several parts of the state, so this was not an isolated outbreak. Some parts of the country are not affected by aster yellows because leafhoppers are not prevalent, so those growers have an advantage over Great Plains growers.

This crop is not commercially viable on a large scale as an organic crop in Kansas because of disease control problems. There is some potential for small scale or local markets for this crop. Root weights per plant were as high with *E. purpurea* as with *E. pallida*, though *E. pallida* and *E. angustifolia* seem to be less susceptible to aster yellows (see *E. angustifolia* and *E. pallida* fact sheet MF-2620 for details).

**K-State Field Trial Data 2000-2002 *Echinacea purpurea***

				Average	Comments
<b>Age of plants in years</b>	1	2	3		
<b>Number of test sites<sup>1</sup></b>	5	2	2		
<b>Survival rate (%)</b>	89.8	48.0	44.5	60.8	
<b>Vigor rating<sup>2</sup></b>	3.2	2.7	2.9	2.9	
<b>Height (cm)</b>	39.8	56.0	58.5	51.4	
<b>Dry weight herb (g/plant)</b>	41.7	88.4	95.3	—	
<b>Dry weight root (g/plant)</b>	6.0	26.1	59.3	—	
<b>Maturity rating<sup>3</sup></b>	3.2	4.9	4.9	4.3	
<b>Insect damage rating<sup>4</sup></b>	1.0	2.1	1.8	1.6	
<b>Disease rating<sup>5</sup></b>	0.9	4.6	3.8	3.1	Aster yellows is a significant problem.
<b>Estimated planting density (number of plants/A)</b>	21,780	21,780	21,780	—	1- by 2-ft. row spacing.
<b>Plant density<sup>6</sup></b>	19,558	10,454	9,692	—	
<b>kg/A dry weight (g/plant x plant number) – tops</b>	816	924	924	—	
<b>kg/A dry weight (g/plant x plant number) – roots</b>	117	273	575	—	First-year roots too small to sell.
<b>Estimated marketable yield (dry weight lbs/A) – tops</b>	1,796	2,036	2,036	—	
<b>Estimated marketable yield (dry weight lbs/A) – roots</b>	257	601	1,266	—	
<b>Yield x ½ of low price<sup>1</sup> – tops</b>	\$12,572	\$14,252	\$14,252	—	
<b>Yield x ½ of high price<sup>1</sup> – tops</b>	\$48,851	\$55,379	\$55,379	—	
<b>Yield x ½ of low price<sup>1</sup> – roots</b>	\$1,544	\$3,606	\$7,596	—	
<b>Yield x ½ of high price<sup>1</sup> – roots</b>	\$8,430	\$19,713	\$41,525	—	

<sup>1</sup> See "How Data Were Collected," on page 3.

<sup>2</sup> Vigor rating (1=very poor, 3=slightly above average, 5=very good, well adapted)

<sup>3</sup> Maturity rating (1=vegetative, 2=early bud, 3=early flower, 4=full flower, 5=seed production, 6=senescence)

<sup>4</sup> Insect damage rating (scale of 0 to 5; 0=no damage and 5=severe damage)

<sup>5</sup> Disease rating (scale of 0 to 5 with 0=no damage and 5=severe damage)

<sup>6</sup> Calculated as starting plant density x survival rate.

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All plants at each location were used to determine survival percentage, vigor rating, insect damage rating, and disease rating as described above. Three plants per plot were measured for height, and only one plant per plot was harvested to measure yield each year. Cultivating four plots allowed us to estimate yield from four plants at each location per year.

Plants were dried, and top and root weights recorded in grams. Grams per plant were converted to kilograms per acre (kg/A) and pounds per acre (lb/A) to estimate field-scale yield. The population density used to calculate field yields was the optimal population density (determined by the average size of the plants) times the actual percentage survival as measured in the field. There was generally some loss due to transplant shock and, for some species, significant winter loss as well.

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Prices were taken from Appendix B of K-State Research and Extension publication S-144 *Farming a Few Acres of Herbs: An Herb Growers Handbook*. To calculate a rough gross income potential for each herb, estimated yield was multiplied by the lowest and the highest retail price, divided by two. This is a rough estimate of wholesale price. Actual prices would be determined based on a contract obtained from a buyer.

Rhonda Janke, sustainable cropping systems specialist  
Jeanie DeArmond, extension assistant

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## A Grower's Guide

# Dandelion

*Taraxacum officinale*

Dandelion is a relatively recent addition to the medicinal repertoire, and wasn't mentioned in Chinese herbals until the 7th century or in Europe until 1486. The name dandelion was apparently invented by a 15th-century surgeon, who compared the shape of the leaves to a lion's tooth, or *dens leonis*. Dandelion is considered weed in most yards and gardens, but they are nutritious, rich in minerals and vitamins, and have medicinal qualities. The Colorado cities of Aspen and Carbondale have declared it illegal to spray herbicides to eradicate dandelions. They suggest that people eat the plants instead.



**Family:** *Asteraceae*

**Life cycle:** Herbaceous perennial  
(Zone 3)

**Native:** Europe and Asia, but it is now one of the few plants that can truly claim pan-global dissemination.

**Height:** 8 to 24 inches

**Sun:** Full sun to partial shade

**Soil:** Any soil. Responds to fertility.

**Water:** Low to moderate. Will respond to increased water and lack of competition from other plants.

**Flowers:** Bright yellow flowers bloom continuously throughout the season, but primarily in the early spring and fall. Flowers attract bees. Likes cool temperatures.

**Propagation:** Easy to grow from seed. No treatment needed, but stratification of one week will raise the germination rate to 90 percent. Sow directly in the field or start seed indoors and then transplant in mid-

to late spring. Seed needs light to germinate. Do not cover. Space 10 to 12 inches apart. Reseeding will be vigorous. Seed maintains viability for one year or less.

**Pests:** No major insect or disease pests observed in the field, but human intervention is always a possibility. Numerous herbicides have been developed to take dandelions out of lawns, and even helpful neighbors may think you have a weed growing in your garden and kill it.

**Harvesting:** Harvest leaves any time and roots in the fall or early spring. One source recommends leaf harvest in the spring of the second year and roots in the fall of the second year. Dig with a needle nose spade or other mechanical digging device. In the home garden, harvest leaves by hand at any time for fresh salads or tea. Some people develop skin sensitivity to the white, milky sap. One of the folk uses of dandelion sap was as a treatment for warts.

**Parts used:** Whole plant fresh or dried. Leaves and roots also used separately. Dandelion wine is made from the fresh blossoms, with the green calyx removed. The medicinal herb market focus is on the leaf and root of the plant, and there does not appear to be any medical literature about the flowers or wine.

**Used as:** Infusion, decoction, elixir, extract, infused oil, honey, tincture, medicinal food

**Medicinal benefits:** Whole body tonic. Benefits the liver, urinary tract and skin. Approved for use in Europe for indigestion, urinary tract infections, liver and gallbladder complaints, and loss of appetite. Folk uses include for disturbance in bile flow, inflammatory conditions of the urinary tract, gout, rheumatic disorders, eczema and other skin disorders. The high potassium, vitamin A and vitamin C content of the leaves makes this a valuable food.

**Market potential:** High. Prices range from \$4.10 to \$21.60 for leaf, and \$4.10 to \$30.85 for root, per pound (lb) dry weight. However, local markets can also be tapped, and greens have sold for \$5/lb fresh weight in eastern Kansas, and the greens came from California.

**Summary of field trial data:** Though up to 3,000 lbs/A dry weight have been reported, our values were far below that, at 400 to 600 lbs/A of leaves, and around 700 lbs/A of roots. A yield of 3,000 lbs/A should be possible because at a planting density of 29,000 plants/A, plants would only need to weigh 47 g. This species was

tested at five sites for one year, and is in its second year of testing at two sites. There was a lot of site-to-site variability in the plant, mainly due to access to moisture; for example drip-irrigated plants at Colby yielded 35 g per plant in year one as compared to 5 g per plant at Olathe, a dryland site. We also observed rabbit feeding at some locations, and were not able to quantify losses due to rabbits. Our fairly low survival rate is probably not accurate, as many times our enthusiastic volunteer help did not realize that the dandelion was a crop in this experiment, and not a weed.

It may seem odd to purposely plant dandelions when they are in the lawn already. Dandelions that are properly spaced, weeded, watered and fertilized can get as big as a dinner plate. This cuts down on harvesting costs, which are a big input in the medicinal herb business. It would take about 100 or more dandelions from a typical lawn to weigh as much as one of the dandelions from our best field plots. These plants will produce seed, but it is only viable for one year. Harvest the blossoms before seeding and make dandelion wine. Share with the neighbors to ease concerns about a dandelion crop in the neighborhood.

**K-State Field Trial Data 2000-2002 *Taraxacum officinale***

				Average	Comments
<b>Age of plants in years</b>	1	2	3		
<b>Number of test sites<sup>1</sup></b>	5	2	0		
<b>Survival rate (%)</b>	65.0	38.5	—	51.8	
<b>Vigor rating<sup>2</sup></b>	3.7	3.6	—	3.7	
<b>Height (cm)</b>	22.2	20.5	—	21.4	
<b>Dry weight herb (g/plant)</b>	15.1	18.7	—	—	Range of 5 to 35 g/plant in year 1, and 9 to 28 g/plant in year 2.
<b>Dry weight root (g/plant)</b>	17.9	31.5	—	—	Range of 11 to 23g/plant in year 1, and 16 to 46 g/plant in year 2.
<b>Maturity rating<sup>3</sup></b>	1.8	1.0	—	1.4	
<b>Insect damage rating<sup>4</sup></b>	0.3	1.5	—	0.9	
<b>Disease rating<sup>5</sup></b>	0.6	0.3	—	0.4	
<b>Estimated planting density (number of plants/A)</b>	29,040	29,040	—	—	Assume 1- by 1.5-ft. spacing.
<b>Plant density<sup>6</sup></b>	18,876	11,180	—	—	
<b>kg/acre dry weight (g/plant x plant number) – tops</b>	285	209	—	—	
<b>Estimated marketable yield (dry weight lbs/A) – tops</b>	628	461	—	—	
<b>Yield x ½ of low price<sup>1</sup> - tops</b>	\$1,287	\$945	—	—	
<b>Yield x ½ of high price<sup>1</sup> - tops</b>	\$6,782	\$4,979	—	—	
<b>kg/acre dry weight (g/plant x plant number) – roots</b>	338	352	—	—	
<b>Estimated marketable yield (dry weight lbs/A) – roots</b>	744	776	—	—	
<b>Yield x ½ of low price<sup>1</sup> - roots</b>	\$1,525	\$1,591	—	—	
<b>Yield x ½ of high price<sup>1</sup> - roots</b>	\$11,480	\$11,974	—	—	

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Rhonda Janke, sustainable cropping systems specialist  
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# A Grower's Guide

# Feverfew

*Tanacetum parthenium*

With a name like feverfew, you would expect this herb to have something to do with colds, the flu or some other contagious ailment. Instead, the name is a corruption of the words “feather few,” which refer to the plant’s fine petals. Historically, this plant was used for various uterine disorders or applied externally to ease headaches. It has been only recently that laboratory research and clinical trials have shown the usefulness of this plant as a prophylactic, or preventative treatment, for migraine headaches.



**Family:** *Compositae*

**Life cycle:** Tender herbaceous perennial (Zone 4)

**Native:** Europe, Balkan Peninsula, escaped from cultivation in North and South America. Widely grown as a garden ornamental and in herb gardens. Highly varied in looks and chemistry.

**Height:** 1 to 3 feet

**Sun:** Full sun to partial shade

**Soil:** Any soil, but prefers a rich, loamy, dry location. Adaptable to a wide variety of soil, grows in wild meadows, roadsides, mountains and rocky soils.

**Water:** Moderate

**Flowers:** Daisy-like white flowers with a yellow center. Blooms in midsummer and continues until fall.

**Propagation:** Stratify seed at least one week before sowing. Plant indoors and transplant later, or plant in the field in mid-spring. Seed needs light to germinate.

Germination will occur within two weeks, and about 70 percent germination rate. Also can propagate through cuttings and root divisions. Space 12 inches apart in the row. Feverfew reseeds readily.

**Pests:** Trials in Iowa identified several pests, including aphids, aster yellow disease, fusarium crown rot, root rot, and septoria leaf spot. Kansas researchers observed few insect or disease problems, but a few plants were infected with aster yellows and had poor overwintering ability.

**Harvesting:** Harvest aerial parts or flowers only, usually the top 6 to 8 inches of the plant. Some prefer to use the leaf because more research has been done on leaf tissues.

**Parts used:** Leaves and flowering aerial parts, fresh or dried

**Used as:** Tincture, infusion (tea), powder in capsules, syrup, medicinal food (fresh leaf)

**Medicinal benefits:** Feverfew has a long history and good reputation as a medicinal herb, and recent research has validated its usefulness to treat migraine headaches, at least for some individuals. Several double-blind, placebo-controlled studies determined that dried feverfew capsules were effective in preventing migraine headaches and/or lessening their severity if taken prophylactically (before the headache). Key active compounds have been identified in the plant, and feverfew extracts have been shown to inhibit human blood aggregation and serotonin secretion. Another type of feverfew extract had antispasmodic effects by affecting potassium channels in cell membranes. Feverfew was not effective at treating rheumatoid arthritis, though it has been used in folk medicine for this ailment. Other folk uses of the leaves and flowering heads include as an anti-inflammatory, antispasmodic, emmenagogue, vasodilator and vermifuge. Use the fresh leaves with caution because they can

cause dermatitis and mouth ulcers, especially with frequent exposure.

**Market potential:** Moderate to high. Prices range from \$6.75 to \$40 per pound (lb) dry weight for herb with flowers. Other growers are getting into this market, and the University of North Carolina is doing research on this herb as a cash/transition crop for former tobacco growers in their state.

**Summary of field trial data:** Feverfew appears to be well adapted to Kansas conditions during its first year of growth, with

a survival rate of 90 percent for transplants, a vigor rating of 3.7 and gross yield of tops of more than 3,000 lbs/A dry weight. However, winter survival was extremely poor, averaging about 1 percent. The plant easily self seeds, and in some cases we measured the volunteer plants in the second and even third year (data not shown). These plants were smaller than the parent plants and scattered, which would make it difficult to mechanically weed. Though acceptable and desirable in a home garden, these volunteers would not make a cash crop

for a grower. We aren't sure why this plant does not overwinter well, but we got this result at several locations over several years. Kansas sometimes has warm spells in January and February that can trick plants into breaking dormancy and cause suffering from frost and/or wind desiccation damage later. This could be the cause of the problem. This plant may be a viable cash crop if a niche market can be obtained, and if it is treated like an annual crop rather than a perennial. In the home garden, this is a beautiful, tangy, aromatic addition to a flower bed or herb garden.

K-State Field Trial Data 2000-2002 <i>Tanacetum parthenium</i>					
				Average	Comments
Age of plants in years	1	2	3		
Number of test sites <sup>1</sup>	8	4	0		
Survival rate (%)	90.0	1.0	—	—	
Vigor rating <sup>2</sup>	3.7	3.6	—	3.7	
Height (cm)	41.0	50.3	—	45.7	
Dry weight herb (g/plant)	55.7	49.3	—	—	
Dry weight root (g/plant)	16.0	13.7	—	—	
Maturity rating <sup>3</sup>	4.6	4.6	—	4.6	
Insect damage rating <sup>4</sup>	0.4	0.3	—	0.4	
Disease rating <sup>5</sup>	0.6	0.3	—	0.5	
Estimated planting density (number of plants/A)	29,040	29,040	—	—	Assume 1- by 1.5-ft. spacing.
Plant density <sup>6</sup>	26,136	290	—	—	
kg/acre dry weight (g/plant x plant number) – tops	1,456	14	—	—	
Estimated marketable yield (dry weight lbs/A) – tops	3,207	32	—	—	
Yield x ½ of low price <sup>1</sup>	\$10,840	\$108	—	—	
Yield x ½ of high price <sup>1</sup>	\$64,140	\$640	—	—	

<sup>1</sup> See "How Data Were Collected," on page 3.

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## A Grower's Guide

# Evening Primrose

*Oenothera biennis*

The name evening primrose refers to the habit of the plant to open its flowers only in the evening. The light yellow color of the flowers is similar to, but should not be confused with the European primrose, *Primula spp.* The Lakota called the plant “rattle weed,” and the Potawatomi name was “yellow top.” The plant forms a rosette and tall, flowering stalk and should not be confused with other plants with the common name primrose. The oil from the seed is the most common medicinal product, which is a good source of gamma-linolenic acid, but the leaves and roots were also used by Native Americans.



**Family:** *Oenagracea*

**Life cycle:** Herbaceous biennial (Zone 3)

**Native:** Great Plains and eastern North America. Naturalized throughout most of Europe and parts of Asia.

**Height:** 2 to 6 feet

**Sun:** Full sun optimal, will tolerate partial shade.

**Soil:** Does best on well-drained soil, but will tolerate some wet soils. Can be grown with low fertility, but will do better with some compost and/or mulch.

**Water:** Low to moderate

**Flowers:** Bright yellow flowers with four petals that bloom at dusk each day and fade by mid-morning the following day. Begins blooming mid-summer of the second year of growth, but a few will bloom in late summer of the first year.

**Propagation:** Seeds should be stratified for three to four weeks to improve germination, then sow directly outdoors or in seedling flats for transplants. Seed is extremely small, so controlling the seeding rate would be difficult outdoors. Seed also can be saved from your own plants, and this plant will reseed if seed is not harvested. Space plants at least 12 inches in the row, with 2 to 3 feet between rows.

**Pests:** No major insect or disease pests were observed in our field trials, though the plants appeared to lack winter hardiness and/or succumb to root diseases between the first and second year.

**Harvesting:** The flowering tops are clipped in the early flowering stage. Seed is harvested at full maturity.

**Parts used:** Seed and/or aboveground herb.

**Used as:** Oil extracted from seed, herb used as infusion (tea), tincture, syrup.

**Medicinal benefits:** The gamma-linolenic acid in the oil has anti-inflammatory and cell membrane stabilizing activity.

The oil may be beneficial to neural development in breastfed infants. Capsules of evening primrose oil have been approved in Germany for atopic eczema. Approved in Britain for treatment of atopic eczema, premenstrual syndrome and prostatitis. One precaution listed in the *Physicians Desk Reference for Herbal Medications* is that the oil has the potential to reduce the seizure threshold in patients with seizure disorders or those being treated with drugs that reduce the seizure threshold. Native Americans used root tea for obesity, bowel pains. Poulitced root was used for piles and bruises and rubbed on muscles to give athletes strength.

**Market potential:** Unknown. The seed is extracted for oil, but we don't know if there is a market for U.S.-grown seed. Seed products, but not raw seed, were found in herb catalog sources. There appears to be a small market for the aboveground portion of primrose, with prices ranging from \$7.50 to \$34.96 per pound (lb) dry weight.

**Summary of field trial data:** This plant had few insect or disease pests in its first year of growth and scored 4.2 vigor rating on a 5-point scale. A few plants bloomed the first year, which would have produced a seed crop. However, no plants survived at our three sites the second year, and a few plants in a demonstration garden survived, but suffered from a root disease. We don't know if our seed source lacked winter hardiness or if root disease will be

problematic for Kansas growers in general. We did not harvest the crop for seed the first year, so we can't recommend it as a crop for Kansas. In future trials, we should see if enough seed is produced in the first year to make this a commercial crop. There appears to be a small market for the aboveground portion of primrose, though there is little information in the research literature on medicinal use of this part of the plant.

**K-State Field Trial Data 2000-2002 *Oenothera biennis***

				Average	Comments
<b>Age of plants in years</b>	1	2	3		
<b>Number of test sites<sup>1</sup></b>	3	3	0		
<b>Survival rate (%)</b>	74.7	0.0		—	
<b>Vigor rating<sup>2</sup></b>	4.2	—	—	4.2	
<b>Height (cm)</b>	47.3	—	—	47.3	
<b>Dry weight herb (g/plant)</b>	147.5	—	—	—	
<b>Dry weight root (g/plant)</b>	11.5	—	—	—	
<b>Maturity rating<sup>3</sup></b>	2.6	—	—	2.6	
<b>Insect damage rating<sup>4</sup></b>	0.7	—	—	0.7	
<b>Disease rating<sup>5</sup></b>	0.7	—	—	0.7	
<b>Estimated planting density (number of plants/A)</b>	14,520	—	—	—	Assumed 1- by 1-ft. spacing.
<b>Plant density<sup>6</sup></b>	10,846	—	—	—	
<b>kg/A dry weight (g/plant x plant number) – tops</b>	1,560	—	—	—	
<b>Estimated marketable yield (dry weight lbs/A) – tops</b>	3,524	—	—	—	
<b>Yield x ½ of low price<sup>1</sup></b>	\$13,215	—	—	—	
<b>Yield x ½ of high price<sup>1</sup></b>	\$61,600	—	—	—	

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Prices were taken from Appendix B of K-State Research and Extension publication S-144 *Farming a Few Acres of Herbs: An Herb Growers Handbook*. To calculate a rough gross income potential for each herb, estimated yield was multiplied by the lowest and the highest retail price, divided by two. This is a rough estimate of wholesale price. Actual prices would be determined based on a contract obtained from a buyer.

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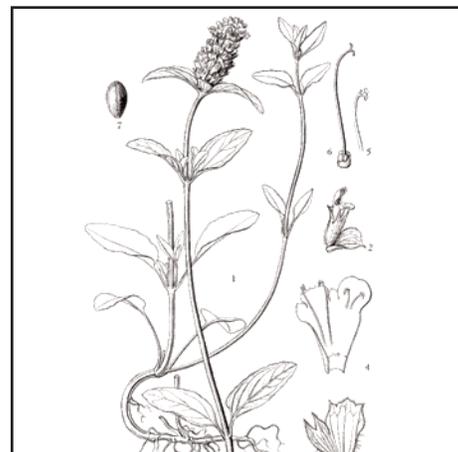
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## A Grower's Guide

# All Heal/Self Heal

*Prunella vulgaris*

This European herb is often used to stop bleeding. Because the flower spikes resemble the throat, the herb was also used to treat inflammations of the mouth and throat. In Chinese medicine, the flower spikes are thought to be useful for the liver and gallbladder, especially cooling an over-heated liver, called “gan hao” or “liver fire,” from which the phrase “gung-ho” is thought to have derived. In western herbalism, leaves and young shoots are applied to fresh wounds to stop bleeding and clean cuts. Other common names include woundwort, heal all and carpenter’s herb.



**Family:** *Lamiaceae*

**Life cycle:** Herbaceous perennial  
(Zone 4)

**Native:** Europe, Asia, and most temperate regions of the world. Naturalized in parts of North America from Eurasia.

**Height:** 6 to 18 inches

**Sun:** Common in woodlands and forests. Also found in mountain meadows. Does well in partial shade. Tolerates full sun.

**Soil:** Prefers a humus soil.

**Water:** Moderate. Will survive under dry-land conditions in Kansas.

**Flowers:** Attractive and vary in color from pink to purple to white. Bloom in early and midsummer for nearly two months. A well-behaved ground cover in the garden.

**Propagation:** Stratify seed for at least one month before sowing. Start indoors and watch for germination within three weeks. Transplant outdoors in mid- to late

spring. Plant 10 to 12 feet apart in rows or beds.

**Pests:** Few observed or reported.

**Harvesting:** Harvest the aerial parts while it is in flower. This may have to be hand harvested with snips or scissors because the plant is low growing. May also have to rinse dust from leaves after harvest because the plants get dirty from rain splash.

**Parts used:** Entire aboveground flowering plant

**Used as:** Can be made into tincture, syrup, compress, tea, poultice, elixir, ointment, slave, balm, etc.

**Medicinal benefits:** Unproven uses include for inflammatory diseases, ulcers in the mouth and throat and gastrointestinal catarrh. A remedy for diarrhea, hemorrhage and gynecological disorders. Recent research suggests the plant possesses antibiotic, hypotensive and anti-mutagenic qualities. Contains the anti-

tumor and diuretic compound ursolic acid. Rich in natural antioxidant compounds and contains more rosmarinic acid than rosemary.

**Market potential:** Moderate. Seek companies that make topical preparations and flower essences. Herb prices range from \$20.35 to \$56.80 per pound (lb) dry weight.

**Summary of field trial data:** This plant had good survival from transplants in replicated plots in Olathe, Wichita and Hays. First-year yield of the aboveground portion was not bad (close to 1 ton) considering the hot, dry conditions of 2002. The 2003 data is still being evaluated, but it looks as though the plant had moderate survival as a perennial. It had a vigor rating of 3.6, which is above average. This is surprising because it was grown under field conditions with full sun while it is traditionally a woodland herb. When harvested in its prime, this plant appears to have few insect or disease pests, but dur-

ing fall harvest, which is past the prime blooming time, the plants' leaves are prone to attack by various pests. The potential for this crop in Kansas will depend on whether there is a market that justifies hand harvesting and washing.

K-State Field Trial Data 2000-2002 <i>Prunella vulgaris</i>					
				Average	Comments
<b>Age of plants in years</b>	1	2	3		
<b>Number of test sites<sup>1</sup></b>	3	0	0		
<b>Survival rate (%)</b>	85.0	—	—	85.0	
<b>Vigor rating<sup>2</sup></b>	3.6	—	—	3.6	
<b>Height (cm)</b>	18.3	—	—	18.3	
<b>Dry weight herb (g/plant)</b>	36.4	—	—	—	
<b>Dry weight root (g/plant)</b>	12.2	—	—	—	
<b>Maturity rating<sup>3</sup></b>	4.7	—	—	4.7	
<b>Insect damage rating<sup>4</sup></b>	0.6	—	—	0.6	
<b>Disease rating<sup>5</sup></b>	1.2	—	—	1.2	
<b>Estimated planting density (number of plants/A)</b>	29,040	—	—	—	Assume 1- by 1.5-ft. plant spacing.
<b>Plant density<sup>6</sup></b>	24,684	—	—	—	
<b>kg/A dry weight (g/plant x plant number) – tops</b>	898	—	—	—	
<b>Estimated marketable yield (dry weight lbs/A) – tops</b>	1,979	—	—	—	
<b>Yield x ½ of low price<sup>1</sup></b>	\$20,136	—	—	—	
<b>Yield x ½ of high price<sup>1</sup></b>	\$56,204	—	—	—	
<sup>1</sup> See "How Data Were Collected," on page 3. <sup>2</sup> Vigor rating (1=very poor, 3=slightly above average, 5=very good, well adapted) <sup>3</sup> Maturity rating (1=vegetative, 2=early bud, 3=early flower, 4=full flower, 5=seed production, 6=senescence) <sup>4</sup> Insect damage rating (scale of 0 to 5; 0=no damage and 5=severe damage) <sup>5</sup> Disease rating (scale of 0 to 5 with 0=no damage and 5=severe damage) <sup>6</sup> Calculated as starting plant density x survival rate.					

### How Data Were Collected

The plants described in this fact sheet were grown in K-State test plots in Hays, Colby, Wichita, or Olathe, Kan. Generally, four replications of each species were included at a site. Not all species were screened at each site or each year. The number of locations is noted in the table. Depending on the location and year, either five or 10 plants per plot were established in each of the replications. Details can be found at [www.oznet.ksu.edu/ksherbs](http://www.oznet.ksu.edu/ksherbs). Plants were grown from seed in the greenhouse and transplanted in the field in May or June.

All plants at each location were used to determine survival percentage, vigor rating, insect damage rating, and disease rating as described above. Three plants per plot were measured for height, and only one plant per plot was harvested to measure yield each year. Cultivating four plots allowed us to estimate yield from four plants at each location per year.

Plants were dried, and top and root weights recorded in grams. Grams per plant were converted to kilograms per acre (kg/A) and pounds per acre (lb/A) to estimate field-scale yield. The population density used to calculate field yields was the optimal population density (determined by the average size of the plants) times the actual percentage survival as measured in the field. There was generally some loss due to transplant shock and, for some species, significant winter loss as well.

Plant spacing recommendations on each fact sheet are for spacing within a row. Distance between rows will depend on the particular farming operation and equipment used. The minimum row spacing will be the same as the plant spacing recommendation. For example, if the recommendation is to set plants 12 inches apart, rows should be a minimum of 12 inches apart as well. However, if cultivator or root-harvesting equipment is on 5-foot centers, plant rows 5 feet apart to facilitate cultivating and harvesting. Adjust estimated plant density per acre on the worksheets to estimate gross yield and net income.

Prices were taken from Appendix B of K-State Research and Extension publication S-144 *Farming a Few Acres of Herbs: An Herb Growers Handbook*. To calculate a rough gross income potential for each herb, estimated yield was multiplied by the lowest and the highest retail price, divided by two. This is a rough estimate of wholesale price. Actual prices would be determined based on a contract obtained from a buyer.

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## A Grower's Guide

# Joe Pye Weed

*Eupatorium purpureum*

This herb is named after a New England medicine man who used it to induce sweating in people with typhus fever. Another common name is “Gravelroot” because it is often used in folk medicine as a diuretic and to clear urinary stones. The flowers and seeds yield a pink or red textile dye. The fragrant flowers have a light vanilla scent that becomes more intense when crushed.



**Family:** *Composite/Asteraceae*

**Life cycle:** Herbaceous perennial (Zone 3)

**Native:** Found in thickets throughout the eastern half of North America.

**Height:** 3 to 12 feet

**Sun:** Full sun to partial shade

**Soil:** Prefers moist soil, but does well with moderate water.

**Water:** Natural habitat is wet sites, and it prefers regular, deep watering. Joe Pye also appears to withstand Kansas heat and drought fairly well.

**Flowers:** Pale pink-purple flowers in a rounded cluster July through September

**Propagation:** To propagate from seed, stratify for 10 days at 40°F. Do not cover. Seeds need light for germination.

Germination time is typically two to three weeks with up to 80 to 90 percent germination. Older plants can be divided and replanted in the fall or spring. Root cut-

tings can be taken in the spring. Plant on at least 24-inch centers, because the plant will form large clumps.

**Pests:** No major pests mentioned in the literature or observed in the field.

**Harvesting:** The root is the primary part of the plant sold today, though historically the whole plant was used. Harvest the root in the fall with a spade or mechanically. The somewhat fibrous root system is most dense right under the plant, so it is not too hard to get most of it with one shovel. Harvest aboveground portion when flowers are starting in early to midsummer. Dry tops quickly because they may start to decompose.

**Parts used:** Primarily roots.

**Used as:** Tea, tincture, decoction

**Medicinal benefits:** Not currently listed in the *Physicians Desk Reference for Herbal Medications*, but folk uses include treatment for urinary tract and kidney stones, prostate problems, menstrual pain. It is also used to ease childbirth and as a diuretic.

**Market potential:** Low to medium. Probably most of the herb on the market is wildcrafted. This crop appears to have potential for large-scale production, so it wouldn't take much to saturate the market unless the market grows significantly. Retail prices range from \$9.50 to \$28 per pound (lb) dry weight for the root.

**Summary of field trial data:** Though Joe Pye Weed was only tested at Wichita as a second- and third-year crop, it shows promise as a crop for Kansas. We have data from two sites as a first-year crop, and it seems to do well on sandy and silt loam soils. It appears to do best when water is plentiful from rain or irrigation, but can withstand some drought. The plant can get very tall and form large clumps, so don't plant adjacent to smaller plants or crops that would be crowded out. The flowers are very nice and it would do well as a background plant or against a fence in a flower garden.

**K-State Field Trial Data 2000-2002 *Eupatorium purpureum***

				<b>Average</b>	<b>Comments</b>
<b>Age of plants in years</b>	1	2	3		
<b>Number of test sites<sup>1</sup></b>	2	1	1		
<b>Survival rate (%)</b>	89.0	75.0	91.0	85.0	The higher percent survival in year 3 as compared to year 2 probably represents clumps that are multiplying and getting double-counted.
<b>Vigor rating<sup>2</sup></b>	3.8	5.0	5.0	4.6	This was one of the highest vigor ratings of the herbs tested.
<b>Height (cm)</b>	45.0	133.0	147.0	108.3	This plant can get quite tall, even under only semi-irrigated conditions.
<b>Dry weight herb (g/plant)</b>	41.0	347.4	216.0	—	Lower aboveground dry weight in year 3 is probably due to a combination of the plant being more mature and the hot, dry weather in 2002.
<b>Dry weight root (g/plant)</b>	14.9	252.9	264.5		Root biomass only increased slightly from year 2 to year 3.
<b>Maturity rating<sup>3</sup></b>	3.5	5.0	5.4	4.6	
<b>Insect damage rating<sup>4</sup></b>	0.7	1.5	1.4	1.2	Only moderate insect feeding was noted.
<b>Disease rating<sup>5</sup></b>	1.5	1.8	0.0	1.1	
<b>Estimated planting density (number of plants/A)</b>	10,890	10,890	10,890	—	Assume 2- by 2-ft. spacing.
<b>Plant density<sup>6</sup></b>	9,692	8,168	9,910	—	
<b>kg/acre dry weight (g/plant x plant number) – roots</b>	144	2,066	2,621	—	
<b>Estimated marketable yield (dry weight lbs/A) – roots</b>	318	4,550	5,773	—	
<b>Yield x ½ of low price<sup>1</sup></b>	\$1,511	\$21,613	\$27,422	—	
<b>Yield x ½ of high price<sup>1</sup></b>	\$4,452	\$63,700	\$80,822	—	

<sup>1</sup> See "How Data Were Collected," on page 3.

<sup>2</sup> Vigor rating (1=very poor, 3=slightly above average, 5=very good, well adapted)

<sup>3</sup> Maturity rating (1=vegetative, 2=early bud, 3=early flower, 4=full flower, 5=seed production, 6=senescence)

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<sup>5</sup> Disease rating (scale of 0 to 5 with 0=no damage and 5=severe damage)

<sup>6</sup> Calculated as starting plant density x survival rate.

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# A Grower's Guide

# Licorice

*Glycyrrhiza glabra* and *Glycyrrhiza uralensis*

The earliest use of licorice was recorded in 2100 B.C. *Glycyrrhiza* is a Greek word meaning “sweet root.” In traditional Chinese medicine, licorice is the most used herb after ginseng. The compound glycyrrhizin is responsible for the sweet flavor of licorice roots. The herb has many uses, including as a cough suppressant and an anti-inflammatory for ulcers. It stimulates the adrenal glands and is often used in Chinese medicine to balance other herbs in a prescription. People at risk for high blood pressure should not use licorice. Most licorice candy is now flavored with anise, not *G. glabra*, though the herb is still used to flavor tobacco products.



**Family:** Fabaceae

**Life cycle:** Perennial (Zones 6-11 for *G. glabra*, Zones 4-11 for *G. uralensis*)

**Native:** *G. glabra* is native to southwest Asia and the Mediterranean region and was cultivated in Europe since at least the 16th century. *G. uralensis* is native to central Asia, China and Japan. A third species, *G. lepidota*, is native to North America and found in the Great Plains and west.

**Height:** 2 to 5 feet

**Sun:** Full sun to partial shade

**Soil:** Well-drained soil, seems to prefer a pH of 6.5 to 8.

**Water:** Moderate

**Flowers:** Lavender and white flowers bloom in mid- to late summer. *G. glabra* or *G. uralensis* rarely bloomed in our fields in Kansas.

**Propagation:** Seed must be stratified for several weeks and scarified and soaked

for two hours in warm water before sowing. Treated seed has an 80 percent germination rate compared to a 20 percent germination rate for untreated seed. Germination takes about two weeks. Can be planted directly into the field, but the germination rate is about 20 percent. Space 2 feet apart because the plant will spread. Also possible to plant from rhizome cuttings. This plant will re-sprout from harvested roots and rhizomes, so don't plant it in a spot unless you are prepared to have it there forever.

**Harvesting:** Harvest roots in the second or third year using a needle nose spade or other digging tool. Harvest in the spring or fall. The plant will form a sturdy taproot, several branch roots, and also send out runners up to 8 meters (26 feet) long.

**Parts used:** Rhizome and root, fresh or dried

**Used as:** Decoction, tincture, syrup elixir, lozenge, medicinal food, fluid extract, tonic wine

**Medicinal benefits:** In Europe, *G. glabra* is approved for use by physicians for coughing, bronchitis and gastritis. In laboratory studies, licorice has demonstrated anti-inflammatory effects and is protective against gastric ulcers. It also has antiviral and antifungal properties, but can increase water retention and cause high blood pressure. Common folk uses include winter tonic for immunity, digestive tract, respiratory tract and adrenal gland support. Native Americans used *G. lepidota* root tea to reduce fevers in children and a poultice of the leaves to treat earaches. Some chewed the root to keep the mouth moist and strengthen the throat for singing.

**Market potential:** High. Buyers need good organic sources for this herb. Much of the *G. glabra* is imported from Europe and *G. uralensis* is imported from Asia. Domestic, organic sources should be popular. *G. glabra* root sells for \$3.35 to \$25.60 per pound (lb) dry weight, and *G. uralensis* sells for \$18.20 to \$46.40/lb dry weight.

**Summary of field trial data:** Neither species seemed to be affected by insect or disease pressure, and at harvest in early fall, both were primarily in the vegetative stage (see maturity rating of 1.0 to 1.1, or vegetative). If the plants had flowered at all, there didn't appear to be any seed set or flowers by late August or early September. Both plants spread prolifically. *G. glabra* had a survival rating of 171 percent by the second year, and by the third year the survival rating of *G. uralensis* was 158 percent. Many licorice plants of both species were observed in neighboring rows that weren't just a few inches or a foot away, but 3 to 6 or more feet from the original planting. Both species appear to be winter hardy in Kansas, though one reference claimed that *G. glabra* was only

hardy to zone 9. Most of Kansas is in zones 5 and 6.

The main difficulty in growing and harvesting licorice might be in successfully and easily digging and washing roots and rhizomes. Both can be dug and sold, though the tap root can be pretty firmly rooted and difficult to get out of the ground. Some of the rhizomes are easy to pull up by hand because they run for several feet just a few inches above the ground. This makes harvest largely a hand-labor task, and it's not clear whether the economics justify the hand harvesting.

So far, the *G. glabra* we have grown does not have a particularly sweet root, especially compared to *G. uralensis*, and is a

little bitter tasting. It might be a good idea to check the biotype or find a superior biotype before planting a whole field to this crop. Also, once you plant, it will probably be there forever. This advice applies to flower gardens, too. However, it isn't like mint, which takes over absolutely everything. It will spread out its airy-looking fronds throughout the bed every 1 to 3 feet and be a lovely though unpredictable addition to the flower garden.

Field trials with *G. lepidota* are underway, but we don't have multiple years of data yet to report. So far, it appears to be doing well, but we haven't found any retail prices for this herb, so specialized contracts may be required to sell it.

**K-State Field Trial Data 2000-2002 *Glycyrrhiza glabra***

				Average	Comments
<b>Age of plants in years</b>	1	2	3		
<b>Number of test sites<sup>1</sup></b>	5	3	2		
<b>Survival rate (%)</b>	85.2	171.7	126.0	127.6	Survival numbers higher than 100% indicate that the plant was spreading via rhizomes.
<b>Vigor rating<sup>2</sup></b>	3.6	3.9	3.7	3.7	
<b>Height (cm)</b>	38.4	54.7	75.5	56.2	
<b>Dry weight herb (g/plant)</b>	12.1	46.0	49.9	—	
<b>Dry weight root (g/plant)</b>	8.7	53.2	50.8	—	These roots appear to be less affected by the drought in 2002 than the <i>G. uralensis</i> (see next table)
<b>Maturity rating<sup>3</sup></b>	1.0	1.3	1.0	1.1	Observed blooms in late summer of 2001 only.
<b>Insect damage rating<sup>4</sup></b>	0.5	0.5	0.5	0.5	
<b>Disease rating<sup>5</sup></b>	0.1	1.5	0.6	0.7	
<b>Estimated planting density (number of plants/A)</b>	21,780	21,780	21,780	—	Assume 1- by 2-ft. spacing
<b>Plant density<sup>6</sup></b>	—	21,780	27,443	—	Assumed 100% survival in second year, then 126% in second year.
<b>kg/A dry weight (g/plant x plant number) – roots</b>	—	1,159	1,394	—	
<b>Estimated marketable yield (dry weight lbs/A) – roots</b>	—	2,552	3,071	—	Root biomass of 5000 lb/a has been estimated by Tim Blakely. This might be possible if a larger area was harvested. For data purposes, we only harvested the root and rhizome attached to one plant, without extracting all the rhizomes that had spread.
<b>Yield x ½ of low price<sup>1</sup></b>	—	\$4,287	\$5,159	—	
<b>Yield x ½ of high price<sup>1</sup></b>	—	\$32,666	\$39,309	—	

<sup>1</sup> See "How Data Were Collected," on page 4.

<sup>2</sup> Vigor rating (1=very poor, 3=slightly above average, 5=very good, well adapted)

<sup>3</sup> Maturity rating (1=vegetative, 2=early bud, 3=early flower, 4=full flower, 5=seed production, 6=senescence)

<sup>4</sup> Insect damage rating (scale of 0 to 5; 0=no damage and 5=severe damage)

<sup>5</sup> Disease rating (scale of 0 to 5 with 0=no damage and 5=severe damage)

<sup>6</sup> Calculated as starting plant density x survival rate.

**K-State Field Trial Data 2000-2002 *Glycyrrhiza uralensis***

				Average	Comments
<b>Age of plants in years</b>	1	2	3		
<b>Number of test sites<sup>1</sup></b>	2	2	2		
<b>Survival rate (%)</b>	72.5	69.0	158.0	98.8	
<b>Vigor rating<sup>2</sup></b>	3.5	4.0	3.8	3.8	
<b>Height (cm)</b>	30.5	53.0	60.0	47.8	
<b>Dry weight herb (grams/plant)</b>	6.8	64.0	28.2	—	
<b>Dry weight root (grams/plant)</b>	4.6	41.8	20.5	—	Yields probably lower in third year due to drought effect on crop and difficulty in digging the root from a very dry soil.
<b>Maturity rating<sup>3</sup></b>	1.0	1.0	1.0	1.0	
<b>Insect damage rating<sup>4</sup></b>	0.6	0.8	0.7	0.7	
<b>Disease rating<sup>5</sup></b>	0.2	1.3	0.5	0.7	
<b>Estimated planting density (number of plants/acre)</b>	21,780	21,780	21,780	—	Assume 1- by 2-ft. spacing
<b>Plant density<sup>6</sup></b>	—	15,028	34,412	—	
<b>kg/acre dry weight (grams/plant x plant number) – roots</b>	—	628	705	—	
<b>Estimated marketable yield (dw lbs/acre) – roots</b>	—	1,384	1,554	—	The dry weight harvest of this species appears to be lower than that of <i>G. glabra</i> , even when taking the higher plant density in year 3 into account. Higher high-end prices could make up for the lower yields, if they are obtained in the market.
<b>Yield x ½ of low price<sup>1</sup></b>	—	\$12,594	\$14,140	—	
<b>Yield x ½ of high price<sup>1</sup></b>	—	\$32,109	\$36,053	—	

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<sup>6</sup> Calculated as starting plant density x survival rate.

## How Data Were Collected

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Plants were dried, and top and root weights recorded in grams. Grams per plant were converted to kilograms per acre (kg/A) and pounds per acre (lb/A) to estimate field-scale yield. The population density used to calculate field yields was the optimal population density (determined by the average size of the plants) times the actual percentage survival as measured in the field. There was generally some loss due to transplant shock and, for some species, significant winter loss as well.

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Prices were taken from Appendix B of K-State Research and Extension publication S-144 *Farming a Few Acres of Herbs: An Herb Growers Handbook*. To calculate a rough gross income potential for each herb, estimated yield was multiplied by the lowest and the highest retail price, divided by two. This is a rough estimate of wholesale price. Actual prices would be determined based on a contract obtained from a buyer.

Rhonda Janke, sustainable cropping systems specialist  
Jeanie DeArmond, extension assistant

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## A Grower's Guide

# Marsh Mallow

*Althea officinalis*

Its botanical name is from the Greek word *althe* meaning “to heal.” Marsh mallow has been used since ancient Egyptian times. Many members of the mallow family, including domesticated garden hollyhocks and common mallows, have similar properties. Some believe marshmallows were originally made from the root of this plant, cooked with sugar and whipped until they were fluffy. Marsh mallow is a beautiful plant in the landscape. Its large mass will fill an empty area in gardens and provide a plant with soft texture and a long blooming period.



**Family:** *Malvaceae*

**Life cycle:** Herbaceous perennial  
(Zone 4)

**Native:** Originally indigenous to Asia, then spread to southeast Europe and China.

**Height:** 2 to 5 feet

**Sun:** Sun, partial sun, shade

**Soil:** Prefers a moist, loamy soil.  
Naturalized in salt marshes along Mid-Atlantic States.

**Water:** Moderate to high

**Flowers:** Pale pink flowers bloom from the bottom of the stalk in mid- to late summer.

**Seed:** Stratify seed for several weeks. Plant directly outside as soon as the soil is workable. Or sow inside then transplant outside in mid- to late spring. Germination rate is 70 to 80 percent. Takes two to three weeks to germinate. Grows in clumps. Space 12 to 24 inches apart.

**Pests:** No significant pests.

**Harvesting:** The roots should be harvested in spring or fall. Roots are large and deep, so use a garden fork or needle-nose spade. Flowers and leaves can be hand picked at any time.

**Parts used:** Leaves, roots, and fresh or dried flowers

**Used as:** Decoction, infusion, tincture, syrup, elixir, lozenge, compress, poultice, medicinal food, ointment, salve, cream, balm, infused oil, powder

**Medicinal benefits:** Root (up to 30 percent) and leaves (up to 16 percent) high in mucilage, which is responsible for soothing irritated mucous membranes and skin. Marsh mallow is a soothing herb for the gastrointestinal tract, urinary tract and throat. Often used for winter illnesses and to alleviate skin conditions. Approved in Europe for coughing and bronchitis.

**Market potential:** Moderate. Prices range from \$5 to \$28 per pound (lb) dry

weight for root, and \$3.90 to \$36 for tops as retail bulk dried herb.

**Summary of field trial data:** This plant appears to be well adapted to Kansas. It survived on both wet and dry sites and in wet and dry years, but did best under well-watered conditions. Top and root biomass was heavy in the second year. Obviously, if the plant is harvested for the root market, tops could not be harvested the following year. Drying this much plant material could be a problem for large-scale growers, and the demand for this crop is not high. Some insect feeding on leaves was noted, but there was not a significant yield loss to insects or disease.

**K-State Field Trial Data 2000-2002 *Althea officinalis***

				<b>Average</b>	<b>Comments</b>
<b>Age of plants in years</b>	1	2	3		
<b>Number of test sites<sup>1</sup></b>	5	3	0		No third-year plants available yet.
<b>Survival rate (%)</b>	94.8	94.7	—	94.8	
<b>Vigor rating<sup>2</sup></b>	4.3	4.9	—	4.6	
<b>Height (cm)</b>	80.6	121.3	—	101.0	
<b>Dry weight herb (g/plant)</b>	193.8	470.9	—	—	Plants much larger in year 2.
<b>Dry weight root (g/plant)</b>	99.9	497.5	—	—	
<b>Maturity rating<sup>3</sup></b>	3.9	4.8	—	4.3	Flowering occurred earlier in second year.
<b>Insect damage rating<sup>4</sup></b>	0.8	1.4	—	1.1	Some leaf feeding noted in late season.
<b>Disease rating<sup>5</sup></b>	0.6	0.4	—	0.5	
<b>Estimated planting density (number of plants/A)</b>	19,360	19,360	—	—	Plants per acre at 1.5- by 1.5-ft. spacing.
<b>Plant density<sup>6</sup></b>	18,353	18,334	—	—	
<b>kg/A dry weight (g/plant x plant number) – tops</b>	3,557	8,633	—	—	
<b>kg/A dry weight (g/plant x plant number) – roots</b>	1,833	9,121	—	—	
<b>Estimated marketable yield (dry weight lbs/A) – tops</b>	7,835	19,016	—	—	
<b>Estimated marketable yield (dry weight lbs/A) –roots</b>	4,038	20,091	—	—	
<b>Yield x ½ of low price<sup>1</sup> - tops</b>	\$19,585	\$47,540	—	—	
<b>Yield x ½ of high price<sup>1</sup> - tops</b>	\$109,690	\$266,224	—	—	
<b>Yield x ½ of low price<sup>1</sup> - roots</b>	\$10,095	\$50,228	—	—	
<b>Yield x ½ of high price<sup>1</sup> - roots</b>	\$56,535	\$281,274	—	—	

<sup>1</sup> See "How Data Were Collected," on page 3.

<sup>2</sup> Vigor rating (1=very poor, 3=slightly above average, 5=very good, well adapted)

<sup>3</sup> Maturity rating (1=vegetative, 2=early bud, 3=early flower, 4=full flower, 5=seed production, 6=senescence)

<sup>4</sup> Insect damage rating (scale of 0 to 5; 0=no damage and 5=severe damage)

<sup>5</sup> Disease rating (scale of 0 to 5 with 0=no damage and 5=severe damage)

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## A Grower's Guide

# Milk Thistle

*Silybum marianum*

Milk thistle is a spiny, white-veined plant with sharp, spiny flowers and a purple center. This thistle looks different from the common thistles that are considered weeds in Kansas. It is quite attractive in the flower garden and the blooms attract butterflies. It is not found in the wild in Kansas. The most feared thistle in Kansas, the musk thistle (*Carduus nutans*) and another common thistle, the bull thistle (*Cirsium vulgare*), are not closely related to the milk thistle. Milk thistle is one of the top-selling herbs worldwide. Used clinically in Europe for many years, it has only recently become popular in the United States. The seed is used as supportive treatment in Germany for many forms of chronic inflammatory liver disorders that vary from hepatitis to severe Amanita mushroom poisoning.



**Family:** *Asteraceae/Composite*

**Life cycle:** Annual or biennial

**Native:** Mediterranean/Europe

**Height:** 2 to 6 feet

**Sun:** Full sun

**Soil:** Any soil, does well in rocky and dry soil.

**Water:** Low water requirement

**Flowering:** Flowers are spiny with purple center. Blooms in mid-summer if planted the fall before, and late summer if spring planted. (June-September)

**Seed:** No treatment is needed, and germination rates are very good. Seed can be planted directly into the field in fall or very early spring, or started inside and transplanted in late spring. Transplants are difficult to handle because of the spines. Transplants are probably not worth the trouble as a cash crop, but would work for a garden. Reseeds itself easily, but hasn't become weedy in our

plots, even after several generations of volunteer plants.

**Spacing:** Plant 12 to 15 inches apart.

**Harvesting:** Seed should be harvested when it is brown for maximum medicinal quality. Using scissors, cut off seed head and place into a basket, then remove seed from pods and hairs. Screen out debris. Can also be mechanically harvested with a wheat combine, but one would want to clean out the combine very well or have a designated machine for milk thistle harvest.

**Parts used:** Fresh or dried seeds

**Used as:** Tincture, medicinal food, powder, infusion (tea) and capsules.

**Food uses:** Stalks can be boiled as a vegetable, young leaves used in salads and the root is edible. Roasted seed can be used as a coffee substitute.

**Medicinal benefits:** Although there are some interesting flavonoids and steroids in the leaves of the plant, the main active

ingredient in this plant, silymarin, is found only in the seed case. Silymarin blocks toxins from entering liver cell membranes, to detoxify liver cells, and even to promote regeneration of liver cells through increased ribosomal protein synthesis. Clinical studies have not always shown improvement in patients with severe liver damage, but a study of patients with subacute liver disease showed positive results. Approved in Europe for treatment of upset stomach and liver and gallbladder ailments. Used for toxic liver damage, adjunctive treatment in chronic inflammatory liver disease and hepatic cirrhosis. Unproven uses include as an antidote to death-cap mushroom poisoning.

**Market potential:** Very high. This is becoming a very popular herb in the treatment of hepatitis and other liver ailments and is one of the top selling herbs in the world. However, prices for the seed may not justify growing the crop and cleaning the seed, with a price range of \$3.20 to

\$26.50 per pound (lb). Most milk thistle seed is imported from Europe and South America.

**Summary of field trial data:** The milk thistle appeared to be healthy in our field trials, but we didn't grow it under optimal conditions for high yield. The ideal timing is to direct seed it in the fall or very early spring (February or March in Kansas) so it will flower in June and set seed in July. As a winter annual/biennial, the timing is similar to wheat, but it doesn't have a temperature requirement to bloom as wheat does. Our plants were greenhouse grown and transplanted in May, so they only had a month or two in the field before flowering and seed set. Our data at this point consists of top and root dry weight, and we are working on getting an estimate of

seed weight as a ratio of the total top dry weight. For now, we don't have accurate yield data for the seed for this plant under Kansas conditions.

Estimates from the literature range from ¼ pound of seed per plant, when hand harvested, which would result in about 4,000 pounds of seed from a crop density of 21,780 and a survival rate of 75 percent. Another literature estimate was closer to 2,000 lbs/A of dry weight seed for machine harvesting. The seed heads don't mature at all the same time, so hand-harvested yields will be higher than machine-harvested, which would be harvested all at once. With a yield of 2,000 lbs/A (similar to 33-bushel wheat), a grower would probably not make money at the low-end price of \$1.60/lb (half of lowest price in

Appendix B), but could possibly make money if the price were closer to \$13.25 (half of the high-end price). Other questions would have to be answered, such as whether February or March is the right planting window for growers to get the seed in the ground and the proper equipment to harvest the seed. From our observations, this plant self-seeds, but doesn't seem to become weedy or spread from the immediate vicinity of seed drop. However, in some places this plant has become weedy, be careful where it is seeded and clean harvesting equipment thoroughly before moving to other crops.

**K-State Field Trial Data 2000-2002 *Silybum marianum***

				Average	Comments
<b>Age of plants in years</b>	1	2	3		
<b>Number of test sites<sup>1</sup></b>	4	0	0		Annual crop.
<b>Survival rate (%)</b>	75.6	—	—	—	
<b>Vigor rating<sup>2</sup></b>	3.6	—	—	—	
<b>Height (cm)</b>	57.5	—	—	—	
<b>Dry weight herb (g/plant)</b>	144.7	—	—	—	
<b>Dry weight root (g/plant)</b>	32.0	—	—	—	
<b>Maturity rating<sup>3</sup></b>	4.7	—	—	—	
<b>Insect damage rating<sup>4</sup></b>	0.9	—	—	—	
<b>Disease rating<sup>5</sup></b>	0.7	—	—	—	
<b>Estimated planting density (number of plants/A)</b>	21,780	—	—	—	Assume 1- by 2-ft. spacing.
<b>Plant density<sup>6</sup></b>	16,466	—	—	—	
<b>kg/A dry weight (g/plant x plant number) – seeds</b>		—	—	—	
<b>Estimated marketable yield (dry weight lbs/A) – seeds</b>	2,000	—	—	—	
<b>Yield x ½ of low price<sup>1</sup></b>	\$3,200	—	—	—	
<b>Yield x ½ of high price<sup>1</sup></b>	\$26,500	—	—	—	

<sup>1</sup> See "How Data Were Collected," on page 3.

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# A Grower's Guide

# Mullein

*Verbascum thapsus*

Medieval Europeans dipped this plant in suet and used it as a torch. The leaves make a mild tea that soothes the throat during the cold season. Science has confirmed mild expectorant and antiviral activity in mullein. The plant also contains verbascoside, which has antiseptic, antitumor, antibacterial and immunosuppressant properties. Boy Scouts and other avid campers sometimes call mullein the “toilet paper plant” because of its large, soft, furry leaves. Pioneers also used the leaves for soft cushions for their shoes.



**Family:** *Scrophulariaceae/Figwort*

**Life cycle:** Biennial (Zone 3)

**Native:** Europe, naturalized in North America

**Height:** 1 to 8 feet

**Sun:** Full sun

**Soil:** Well-drained soil, but does better with moderate water. pH 6.5 to 7. Doesn't require much fertility.

**Water:** Low to moderate

**Flowers:** Flowering does not occur until the second year. The flowers are a spike or spikelike panicle with small, yellow flowers along the upper portion of the stalk. Blooms in mid- to late summer.

**Propagation:** Sow seed directly in the field or start indoors for better germination. Seed is very small, so do not cover with soil. Germination occurs in about two weeks at a rate of 80 percent. Space 24 inches apart in the row. Mullein takes up a lot of space because of the size of the lower leaves.

**Harvest:** Leaves can be harvested by hand at any time, preferably in the late spring or early summer when in bloom. For the largest crop, harvest leaves in the fall of the first year or the spring of the second year, because quality deteriorates after that. The lower leaves may need to be discarded because they may be covered with dust and have more insect and wind damage than middle and upper leaves. The roots are harvested with a needle-nose spade in the fall of the first year or in the spring of the second year. Flowers can be harvested individually or by cutting a stalk in heavy flower/bud stage. Lay on screens to dry in a shady location or in forced air oven. Make sure to dry leaves well, to prevent mold.

**Parts used:** Flowers, leaves and root, fresh or dried. Most of the market seems to be for leaves. One source recommends growing *V. olympicum* for flower harvest because they are easier to pick.

**Used as:** Tincture, infusion, syrup, ointment, salve, cream, balm, infused oil

**Medicinal benefits:** Flowers and leaves are used for skin, ears and respiratory tract. The roots are used for the urinary tract. Approved for use in Europe for cough and bronchitis. The plant contains up to 3 percent mucilage, in addition to saponins, flavonoids and other biologically active compounds. The mullein alleviates irritation and acts as an expectorant due to its mucin and saponin. The flowers are infused in olive oil over a period of weeks, which is used traditionally for earache, eczema of the auditory canal, middle ear infection and inflammatory skin diseases.

**Market potential:** Moderate for leaves to high for flowers. Prices range from \$3.50 to \$20.43 for leaves. No prices found for flowers or roots. Flowers are often sold fresh, not dried.

**Summary of field trial data:** Mullein does very well under Kansas conditions. There are often healthy stands near roadsides, ditches, riverbanks and other non-mowed areas. Mullein does not appear to

like too much mulch, especially if the mulch is applied over the top of the plant or gets into the inner whorl, which we saw where we applied wood chip mulch for weed control. Many of the whorls began to rot from the center, and the plants did not do well if too much water was retained close to the base of the plant. The optimal time to harvest leaves seems to be in the fall of the first year. In

the second year, the plant begins to put its energy into the flower stalk, and the leaves were smaller. This would be a good crop to grow in Kansas, as long as there is enough of a market for the leaves. The flowers would be very labor intensive to harvest, and might be good for a market to local herbalists or for home use. This is a lovely plant for the home garden, and some seed sources seemed to grow

exceptionally large plants, with multiple flower stems, which would be very impressive in the backyard garden. We don't recommend harvesting this plant from wild stands along roadsides because they may be contaminated with dust, car fumes and other pollutants.

K-State Field Trial Data 2000-2002 <i>Verbascum thapsus</i>					
				Average	Comments
<b>Age of plants in years</b>	1	2	3		
<b>Number of test sites<sup>1</sup></b>	6	1			Biennial crop.
<b>Survival rate (%)</b>	81.7	8.3			Poor survival due to mulch.
<b>Vigor rating<sup>2</sup></b>	4.2	5.0			
<b>Height (cm)</b>	47.0	90.0			
<b>Dry weight herb (g/plant)</b>	237.4				
<b>Dry weight root (g/plant)</b>	75.7				
<b>Maturity rating<sup>3</sup></b>	1.0	4.8			
<b>Insect damage rating<sup>4</sup></b>	1.1	0.5		0.5	
<b>Disease rating<sup>5</sup></b>	0.5	0.5		0.5	
<b>Estimated planting density (number of plants/A)</b>	7,260				Assume 2- by 3-ft. spacing.
<b>Plant density<sup>6</sup></b>	5,931				
<b>kg/A dry weight (g/plant x plant number) – tops</b>	1,408				
<b>Estimated marketable yield (dry weight lbs/A) – tops</b>	3,105				
<b>Yield x ½ of low price<sup>1</sup></b>	\$5,433				
<b>Yield x ½ of high price<sup>1</sup></b>	\$31,718				
<sup>1</sup> See "How Data Were Collected," on page 3. <sup>2</sup> Vigor rating (1=very poor, 3=slightly above average, 5=very good, well adapted) <sup>3</sup> Maturity rating (1=vegetative, 2=early bud, 3=early flower, 4=full flower, 5=seed production, 6=senescence) <sup>4</sup> Insect damage rating (scale of 0 to 5; 0=no damage and 5=severe damage) <sup>5</sup> Disease rating (scale of 0 to 5 with 0=no damage and 5=severe damage) <sup>6</sup> Calculated as starting plant density x survival rate.					

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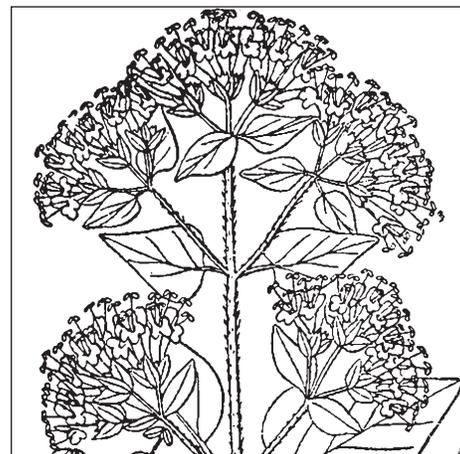
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# A Grower's Guide

# Oregano

*Origanum vulgare*

Oregano is used as both a culinary and medicinal herb. *O. vulgare* is known as oregano, while its cousin *O. majorana* is usually called sweet marjoram. The two are similar in scent. Greek oregano, popular in many dishes, is a subspecies of common oregano, *O. vulgare hirtum*. The dried leaves of oregano are used in many folk remedies, which have not been tested for efficacy. However, the essential oil is a powerful antimicrobial and has been tested and used at K-State to sterilize plant cell cultures in tissue culture experiments. In these trials, oregano oil was as strong as chlorine bleach.



**Family:** *Lamiaceae/Labiatae*

**Life cycle:** Herbaceous/slightly woody perennial (Zones 4-9)

**Native:** Mediterranean region. Enjoys a hot, but not too wet, climate. Common throughout Asia, Europe and northern Africa, and cultivated in gardens in North America.

**Height:** 6 to 24 inches

**Sun:** Full sun preferred, tolerates partial shade.

**Soil:** Well drained is ideal, does not require fertile soil. Responds well to compost or mulch.

**Water:** Low to moderate

**Flowers:** Small white or lavender flowers bloom throughout the summer. Plant tends to have more leaves before and after flowering.

**Propagation:** Stratify seeds for one week and then sow indoors for germination near 70 percent. Seeds take one to two

weeks to sprout. Transplant outside after spring weather has settled. Can also propagate through stem/tip cuttings. Space 12 inches in the row. Plant will bush up, and spread slightly, but it is not a rampant spreader like mints.

**Pests:** No major pests noted in the field plots or in the literature.

**Harvesting:** Clip aboveground portion before full flower. Could be mechanized.

**Parts used:** Aboveground portion, leaves, before or during flowering, and the oil obtained through steam distillation of aboveground parts.

**Used as:** Leaves for infusions (teas), gargles and bath additives. Essential oil for external use only.

**Medicinal benefits:** Oregano is a strong medicinal food that is recommended during winter illnesses and to support healthy digestive system function. Unproven folk medicine uses include treatment for respiratory disorders, coughs, inflammation of

the bronchial mucous membranes and as an expectorant. In China, it is used for colds, fever, vomiting, dysentery, jaundice and malnutrition in children. Oil is strongly antiseptic for the skin.

**Market potential:** Medium, competitive. Prices range from \$3.83 to \$25.42 per pound (lb) dry weight for tops/herb.

**Summary of field trial data:** This plant was grown at Wichita only, and the plot was not replicated, so the data are based on observations of five plants from this plot. However, we felt that it was worth including here because the results were positive (more than 3 tons/A dry weight estimated in the second year of growth), and there is potential for market growth. Traditionally, tea tree (*Melaleuca alternifolia*) essential oil was the main antiseptic for skin disorders, but recent research, including research at K-State, shows that oregano oil is just as effective. For this market to be available to Kansas growers, access to a steam distillation plant would

be needed within a half day's drive of the oregano fields. There are small distillation units available for test batches, but no commercial units at this time.

A positive aspect of growing oregano is that it is also a culinary herb, so a grower may be able to sell to a local or regional market. However, the quantities may be limited and competition from international markets may undercut the price.

Because the aboveground portion of oregano is marketed, mechanization may be possible.

Field observations suggest that this is a vigorous plant with few pests or diseases under Kansas' hot, windy conditions. There was no mortality of the five plants under observation, and the plants continued to spread into the second and third year of growth. Replicated plots in 2004 seem to confirm these early observational results.

**K-State Field Trial Data 2000-2002 *Origanum vulgare***

				Average	Comments
<b>Age of plants in years</b>	1	2	3		
<b>Number of test sites<sup>1</sup></b>	1	1	0		
<b>Survival rate (%)</b>	100.0	100.0	—	100.0	
<b>Vigor rating<sup>2</sup></b>	4.1	5.0	—	4.6	
<b>Height (cm)</b>	44.0	61.0	—	52.5	
<b>Dry weight herb (g/plant)</b>	47.8	134.0	—	—	
<b>Dry weight root (g/plant)</b>	29.9	46.0	—	—	
<b>Maturity rating<sup>3</sup></b>	1.8	5.0	—	3.4	
<b>Insect damage rating<sup>4</sup></b>	0.0	0.0	—	0.0	
<b>Disease rating<sup>5</sup></b>	0.0	0.0	—	0.0	
<b>Estimated planting density (number of plants/A)</b>	21,780	21,780	—	—	
<b>Plant density<sup>6</sup></b>	21,780	21,780	—	—	
<b>kg/A dry weight (g/plant x plant number) – tops</b>	1,041	2,919	—	—	
<b>Estimated marketable yield (dry weight lbs/A) – tops</b>	2,293	6,428	—	—	
<b>Yield x ½ of low price<sup>1</sup></b>	\$4,403	\$12,342	—	—	
<b>Yield x ½ of high price<sup>1</sup></b>	\$29,144	\$81,700	—	—	

<sup>1</sup> See "How Data Were Collected," on page 3.

<sup>2</sup> Vigor rating (1=very poor, 3=slightly above average, 5=very good, well adapted)

<sup>3</sup> Maturity rating (1=vegetative, 2=early bud, 3=early flower, 4=full flower, 5=seed production, 6=senescence)

<sup>4</sup> Insect damage rating (scale of 0 to 5; 0=no damage and 5=severe damage)

<sup>5</sup> Disease rating (scale of 0 to 5 with 0=no damage and 5=severe damage)

<sup>6</sup> Calculated as starting plant density x survival rate.

## How Data Were Collected

The plants described in this fact sheet were grown in K-State test plots in Hays, Colby, Wichita, or Olathe, Kan. Generally, four replications of each species were included at a site. Not all species were screened at each site or each year. The number of locations is noted in the table. Depending on the location and year, either five or 10 plants per plot were established in each of the replications. Details can be found at [www.oznet.ksu.edu/ksherbs](http://www.oznet.ksu.edu/ksherbs). Plants were grown from seed in the greenhouse and transplanted in the field in May or June.

All plants at each location were used to determine survival percentage, vigor rating, insect damage rating, and disease rating as described above. Three plants per plot were measured for height, and only one plant per plot was harvested to measure yield each year. Cultivating four plots allowed us to estimate yield from four plants at each location per year.

Plants were dried, and top and root weights recorded in grams. Grams per plant were converted to kilograms per acre (kg/A) and pounds per acre (lb/A) to estimate field-scale yield. The population density used to calculate field yields was the optimal population density (determined by the average size of the plants) times the actual percentage survival as measured in the field. There was generally some loss due to transplant shock and, for some species, significant winter loss as well.

Plant spacing recommendations on each fact sheet are for spacing within a row. Distance between rows will depend on the particular farming operation and equipment used. The minimum row spacing will be the same as the plant spacing recommendation. For example, if the recommendation is to set plants 12 inches apart, rows should be a minimum of 12 inches apart as well. However, if cultivator or root-harvesting equipment is on 5-foot centers, plant rows 5 feet apart to facilitate cultivating and harvesting. Adjust estimated plant density per acre on the worksheets to estimate gross yield and net income.

Prices were taken from Appendix B of K-State Research and Extension publication S-144 *Farming a Few Acres of Herbs: An Herb Growers Handbook*. To calculate a rough gross income potential for each herb, estimated yield was multiplied by the lowest and the highest retail price, divided by two. This is a rough estimate of wholesale price. Actual prices would be determined based on a contract obtained from a buyer.

Rhonda Janke, sustainable cropping systems specialist  
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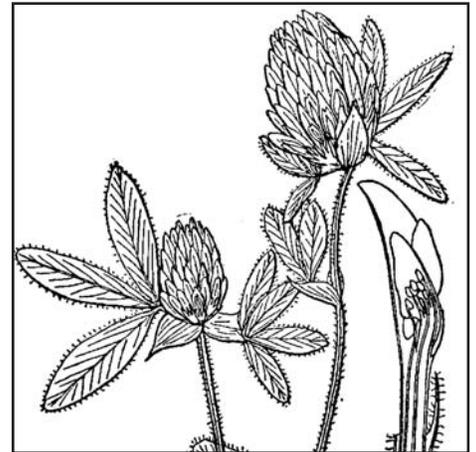
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# A Grower's Guide

# Red Clover

*Trifolium pratense*

The word “trifolium” refers to the three leaves of clovers. Demand is high for quality red clover blossoms, but the price will need to be high to pay for the labor-intensive harvest of this crop. Historically valued for its use in controlling coughs, bronchitis and skin problems, red clover contains phytoestrogens, which have several important properties.



**Family:** *Fabaceae*

**Life Cycle:** Herbaceous, short-lived perennial (Zone 3)

**Native:** Indigenous to Europe, central Asia, northern Africa and naturalized in many other parts of the world.

**Height:** 12 to 24 inches

**Sun:** Full sun to partial shade

**Soil:** Any soil. Will fix its own nitrogen, but requires some fertility (phosphorus and potassium) for high yields.

**Water:** Moderate

**Flowering:** Flowers are large, pink blossoms that appear throughout the summer, with a particularly large flush in mid-spring and early summer.

**Propagation:** Some say seed germinates easily in the field (is probably scarified first), while others suggest that seed must be stratified for several weeks before sowing. Germination takes seven to 10 days with a germination rate of about 75 per-

cent. Space 12 inches apart in row. When grown as a forage crop, direct seed in early spring or fall, or broadcast seed into standing oats or wheat in early to mid-March for a clover crop after the grain is harvested. Since red clover is a common forage crop, the seed won't be expensive compared to other herbs.

**Pests:** Pests were not a problem in our field plots, except for rabbit and deer feeding. With only a few red clover plants scattered in each plot among other plants that are less palatable, the animals fed heavily on the red clover. In a larger, solid-seeded field of red clover, this would probably not be a problem. One reference reported some powdery mildew on the leaves and flowers in late summer and early fall. There is also a root weevil that is common in many parts of the country that limits red clover's productive life to about two to three years. Plan to rotate this crop.

**Harvesting:** Harvest the flowers carefully by hand in the early morning while dew is still on the plant. Clover will bruise easily, so handle with care. Place the flowers on a screen in one layer and allow them to dry naturally. When fully dried they have a deep purplish-red color. Store them in a glass jar or paper bags away from direct heat and light until use.

**Parts used:** Flowers, fresh or dried. Some use the dried herb or leaves.

**Used as:** Infusion, tincture, syrup, elixir, lozenge, medicinal food, ointment, salve, cream, balm, honey

**Medicinal benefits:** Red clover is reported to have antispasmodic and expectorant effects, and promotes the skin's healing process in treatments for athlete's foot, sores, burns and ulcers. Traditional uses also include for coughs, bronchitis and whooping cough. It is also used as an anticancer remedy. Science has not confirmed red clover's traditional uses, but has identified many biologically

active compounds, including phytoestrogenic isoflavones, which activate estrogen receptors in mammals. Some standardized extracts of red clover are sold with eight times the amount of phytoestrogens consumed in the typical diet. Phytoestrogens can cause physical problems in cattle that are fed late cut hay, and reduced fertility and conception rates in sheep that graze on red clover pasture. Red clover contains volatile oils and cyanogenic glycosides. Though red clover leaves are sold by several herb companies, there is not much written about the medicinal value of the

leaves, as compared to the flowers, which have been used and studied more.

**Market potential:** High for quality flowers. Flowers sell for between \$5.70 and \$47.03 per pound (lb) dry weight, and the leaves for \$8 to \$52.80 lb dry weight. Because harvest is so labor intensive, growers might want to secure a market, probably local, to obtain a return for the time investment.

**Summary of field trial data:** Red clover was grown under less than optimum conditions, and we didn't have the

people or time to harvest individual red clover blossoms for yield estimates. We grew all of the herbs in the greenhouse in the spring and transplanted them to the field so various species could be compared. Most growers direct seed red clover. In our trial, survival ranged from 20 to 85 percent for first year transplants, and biomass differed by location, ranging from 4 to 150 g/plant dry weight in the first year. The differences can be partially explained by irrigation, but rabbit and deer feeding were also a factor. Solid-seeded, large stands of clover probably

**K-State Field Trial Data 2000-2002 *Trifolium pratense***

				Average	Comments
<b>Age of plants in years</b>	1	2	3		
<b>Number of test sites<sup>1</sup></b>	4	2	0		
<b>Survival rate (%)</b>	57.3	48.3	—	52.8	
<b>Vigor rating<sup>2</sup></b>	3.5	3.5	—	3.5	
<b>Height (cm)</b>	37.0	38.0	—	37.5	
<b>Dry weight herb (g/plant)</b>	67.5	140.8	—	—	Year 2 – Flower yield estimate: 25 percent of dry weight is flowers, or 35.2 g/plant. See price calculations below.
<b>Dry weight root (g/plant)</b>	9.9	38.6	—	—	
<b>Maturity rating<sup>3</sup></b>	3.8	5.2	—	4.5	
<b>Insect damage rating<sup>4</sup></b>	0.6	0.4	—	0.5	
<b>Disease rating<sup>5</sup></b>	0.5	0.2	—	0.3	
<b>Estimated planting density (number of plants/A)</b>	43,560	43,560	—	—	Assume a solid seeded stand, with at least 1- by 1-ft. spacing.
<b>Plant density<sup>6</sup></b>	24,960	21,039	—	—	
<b>kg/A dry weight (g/plant x plant number) – tops</b>	1,685	2,962	—	—	
<b>Estimated marketable yield (dry weight lbs/A) – tops</b>	3,711	6,525	—	—	
<b>Yield x ½ of low price<sup>1</sup></b>	\$14,844	\$26,100	—	—	
<b>Yield x ½ of high price<sup>1</sup></b>	\$97,970	\$172,260	—	—	
<b>kg/A dry weight (g/plant x plant number) – flowers</b>		741			
<b>Estimated marketable yield (dry weight lbs/A) – flowers</b>		1,631			
<b>Yield x ½ of low price<sup>1</sup> - flowers</b>		\$4,648			
<b>Yield x ½ of high price<sup>1</sup> - flowers</b>		\$38,361			

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<sup>2</sup> Vigor rating (1=very poor, 3=slightly above average, 5=very good, well adapted)

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<sup>5</sup> Disease rating (scale of 0 to 5 with 0=no damage and 5=severe damage)

<sup>6</sup> Calculated as starting plant density x survival rate.

wouldn't suffer unless a large herd of deer fed on it during the winter.

If we assume that about 25 percent of the dry weight of the aboveground plant in the second year could be flower blossoms (especially if harvested over several weeks of repeated picking), then a yield of about 1,600 lbs/A dry weight of flowers should be possible. However, labor is more likely than land to be the limiting factor for this crop. One reference estimated that an

experienced harvester can pick 1 lb dry weight flowers per hour, while an average value is  $\frac{1}{2}$  to  $\frac{3}{4}$  lb per hour. A grower would certainly need a price closer to \$25 to \$30 per lb to make it worthwhile to grow and harvest.

Though prices were found for the leaves, their medicinal value is unclear. Another option for a diversified farm is to harvest the field for livestock hay once or twice per year.

### How Data Were Collected

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All plants at each location were used to determine survival percentage, vigor rating, insect damage rating, and disease rating as described above. Three plants per plot were measured for height, and only one plant per plot was harvested to measure yield each year. Cultivating four plots allowed us to estimate yield from four plants at each location per year.

Plants were dried, and top and root weights recorded in grams. Grams per plant were converted to kilograms per acre (kg/A) and pounds per acre (lb/A) to estimate field-scale yield. The population density used to calculate field yields was the optimal population density (determined by the average size of the plants) times the actual percentage survival as measured in the field. There was generally some loss due to transplant shock and, for some species, significant winter loss as well.

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Prices were taken from Appendix B of K-State Research and Extension publication S-144 *Farming a Few Acres of Herbs: An Herb Growers Handbook*. To calculate a rough gross income potential for each herb, estimated yield was multiplied by the lowest and the highest retail price, divided by two. This is a rough estimate of wholesale price. Actual prices would be determined based on a contract obtained from a buyer.

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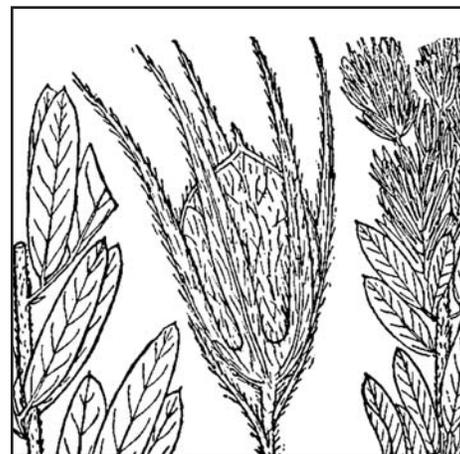
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## A Grower's Guide

# Round-headed Lespedeza

*Lespedeza capitata*

The Pawnee name for this plant is “rabbit foot,” while the Omaha and Ponca call it “male buffalo bellow plant” because it blooms on hillsides during the bison rutting season. Use by Native Americans has been documented, but the herb is not widely used today. *L. capitata* is related to, but not the same as its aggressive and invasive cousin, Seresia lespedeza (*L. cuneata*). Another cousin of this plant, Korean lespedeza (*L. stipulacea*), is a low-growing, drought-hardy annual that is grown as a forage crop in Kansas.



**Common name:** Bush clover

**Family:** *Fabaceae*

**Life cycle:** Herbaceous perennial  
(Zone 3)

**Native:** Great Plains and eastern North America

**Height:** 2 to 3 feet

**Sun:** Full sun optimal

**Soil:** Appears to prefer well-drained, hillside soils of the Great Plains. Did well in neutral pH, silt-loam soil at Olathe.

**Water:** Plants did well without irrigation at the Olathe site, but would benefit from some water.

**Flowers:** Creamy white flowers in crowded, bristly heads, July through September

**Propagation:** Can start from seeds.

**Pests:** Appears to be resistant to most insect pests, though wet conditions might

have caused mildew on the leaves one year.

**Harvesting:** Harvest aboveground portions of the plant with clippers or mower.

**Parts used:** Aboveground stems and leaves

**Used as:** Infusion (tea) or moxa

**Medicinal benefits:** Round-head lespedeza was generally not used in Anglo medicine and is not listed in the Herbal PDR. It was listed in 1901 in the “Preliminary List of Medicinal and Economic Kansas Plants” as a diuretic and emetic. This plant was used by Native Americans as a poison antidote and a tea was made from the leaves that was thought to be beneficial to sick people. The Omahas and Poncas used lespedeza as a moxa for neuralgia or rheumatism. To make a moxa, they moistened one end of a short piece of stem so it would stick to the skin, then lit the other end and allowed it to burn down to the skin. Similar treatments are often used with

other plants in traditional Chinese medicine. Experiments with lespedeza have found that extracts have an antitumor activity against Walker-256 carcinosarcoma, and it reportedly lowers blood cholesterol levels. The plant contains several biologically active compounds and is worthy of more research. Pharmaceutical preparations are manufactured in Europe from this plant.

**Market potential:** Unclear. Only one company surveyed listed a price or product, so it is not widely recognized or used commercially. The price for lespedeza tops was \$19.52 per pound (lb) dry weight (Richters).

**Summary of field trial data:** Lespedeza is not a common herb in the commercial market, but it was included in our field trials because it is native to the Great Plains. We tried this plant at Olathe only, so it should be tested at other sites if there is a market for this plant. At Olathe, the plant appeared healthy (average vigor

**K-State Field Trial Data 2000-2002 *Lespedeza capitata***

				Average	Comments
<b>Age of plants in years</b>	1	2	3		
<b>Number of test sites<sup>1</sup></b>	1	1	1		Only evaluated at Olathe, same plot, all three years.
<b>Survival rate (%)</b>	73.0	82.0	111.0	—	Plants apparently spread, either by seed or rhizomes each year.
<b>Vigor rating<sup>2</sup></b>	3.5	4.5	3.5	3.8	Above average vigor rating, especially in year 2, in spite of disease symptoms.
<b>Height (cm)</b>	32.0	59.0	97.0	62.7	
<b>Dry weight herb (g/plant)</b>	6.0	61.2	58.1	—	Yields did not decline in year 3 as much with this plant as with some others that suffered from the drought in 2002 at Olathe, which had no irrigation.
<b>Dry weight root (g/plant)</b>	6.7	26.7	29.2	—	
<b>Maturity rating<sup>3</sup></b>	3.6	5.0	5.0	4.5	Plants were in full flower/seed set at the time of harvest.
<b>Insect damage rating<sup>4</sup></b>	0.8	1.0	0.5	0.8	
<b>Disease rating<sup>5</sup></b>	0.0	3.0	0.5	1.2	Higher disease rating in year 2 than other years. May have been mildew or other leaf-spotting disease. Third-year plants did not show disease symptoms, and it was a much drier year.
<b>Estimated planting density (number of plants/A)</b>	21,780	21,780	21,780	—	Assume 1- by 2-ft. spacing.
<b>Plant density<sup>6</sup></b>	15,899	17,860	24,176	—	
<b>kg/A dry weight (g/plant x plant number) – tops</b>	95	1,093	1,405	—	
<b>Estimated marketable yield (dry weight lbs/A) – tops</b>	210	2,408	3,094	—	
<b>Yield x ½ of low price<sup>1</sup></b>	—	—	—	—	
<b>Yield x ½ of high price<sup>1</sup></b>	\$2050	\$23,497	\$30,196	—	

<sup>1</sup> See "How Data Were Collected," on page 3.

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<sup>5</sup> Disease rating (scale of 0 to 5 with 0=no damage and 5=severe damage)

<sup>6</sup> Calculated as starting plant density x survival rate.

rating of 3.8), though leaves were spotted with a mildew-like symptoms in year two. Dry weight yields per plant appeared to level off in year two, but the plants continued to propagate and more stems were counted each year. Transplant survival was 73 percent for first-year plants. Yields were 1 ton in year two and 1.5 tons in year three, so this could almost be considered a forage crop. In the flower garden, *Lespedeza capitata* is a graceful plant on a long stem, with greenish-grey foliage and white flowers inside a light-brown, ball-like cluster.

## How Data Were Collected

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# A Grower's Guide

# Sheep Sorrel

*Rumex acetosella*

Sheep sorrel leaves have a tangy, lemon flavor and are sometimes used in salad, though high tannin and oxalic acid content limit its use in large quantities. This is a cousin to yellow dock, *R. crispus*, another naturalized European plant in North America. Sheep sorrel is best known as an ingredient in Essiac, an herbal formula often used as a therapy for cancer patients. Related culinary species include French sorrel, *R. scutatus*, and garden sorrel, *R. acetosa*, which are known for their use in soup.



**Family:** *Polygonaceae*

**Life cycle:** Herbaceous perennial  
(Zone 3)

**Native:** Europe. Now found throughout North America, especially in acidic soils.

**Height:** 4 to 12 inches

**Sun:** Full sun

**Soil:** Any soil. Does well in wetter, acidic soils.

**Water:** Light to moderate

**Flowers:** Flowers are reddish-purple and bloom from mid- to late summer.

**Propagation:** Sow seeds indoors and transplant outside in mid- to late spring or sow directly outdoors. No treatment required. Germination in seven to 10 days at a rate of 70 percent. Plant 12 inches apart to allow for spreading.

**Pests:** No major pests.

**Harvesting:** Harvest aerial parts with scissors in the early summer.

**Parts used:** Aerial parts, fresh or dried, and roots

**Used as:** Infusion (tea), tincture

**Medicinal benefits:** Benefits the immune and lymphatic systems. Caution: may cause poisoning in large doses due to high levels of oxalic acid and tannin. Leaf tea used for fevers, inflammations and scurvy. Fresh leaves are considered a cooling diuretic. Root tea used for diarrhea and excessive menstrual bleeding. Sheep sorrel is rich in cancer-preventative vitamins and includes four antimutagenic and antioxidant compounds.

**Market potential:** Moderate. Prices for herb range from \$6.30 to \$33 per pound (lb) dry weight. Is a main ingredient in the well-known Essiac cancer-treatment formula.

**Summary of field trial data:** This plant had very good survival from transplants in replicated plots in Olathe, Wichita, Colby and Hays. First year yield of the above-

ground portion was small, but individual plants had spread by the second year and aboveground biomass was estimated at more than 2 tons per acre. This may be an underestimate because approximately 1 square foot was harvested to estimate the in-row per plant yield, while most plants had spread to 2 to 3 square feet. Harvesting this crop will be difficult because the plant is low growing and hand harvesting with scissors or mechanically harvesting and then washing the entire plant may be necessary.

The survival rate goes up instead of down the second year because the plants are spreading and filling in gaps. This is not a good companion crop because it can become weedy. We don't know yet if tillage will kill this plant. By the third year, the plants had grown well out of their original rows, and had invaded neighboring plots.

**K-State Field Trial Data 2000-2002 *Rumex acetosella***

				<b>Average</b>	<b>Comments</b>
<b>Age of plants in years</b>	1	2	3		
<b>Number of test sites<sup>1</sup></b>	4	3	0		
<b>Survival rate (%)</b>	85.8	99.0	—	92.4	
<b>Vigor rating<sup>2</sup></b>	3.5	4.3	—	3.9	
<b>Height (cm)</b>	14.5	22.7	—	18.6	
<b>Dry weight herb (g/plant)</b>	11.8	66.1	—	—	
<b>Dry weight root (g/plant)</b>	6.9	38.5	—	—	
<b>Maturity rating<sup>3</sup></b>	1.0	2.0	—	1.5	
<b>Insect damage rating<sup>4</sup></b>	0.4	0.0	—	0.2	
<b>Disease rating<sup>5</sup></b>	0.4	0.2	—	0.3	
<b>Estimated planting density (number of plants/A)</b>	29,040	29,040	—	—	1- by 1.5-ft. plant spacing assumed.
<b>Plant density<sup>6</sup></b>	24,916	28,750	—	—	
<b>kg/A dry weight (g/plant x plant number) – tops</b>	294	1,900	—	—	
<b>Estimated marketable yield (dry weight lbs/A) – tops</b>	648	4,186	—	—	
<b>Yield x ½ of low price<sup>1</sup></b>	\$2,041	\$13,129	—	—	
<b>Yield x ½ of high price<sup>1</sup></b>	\$10,692	\$69,069	—	—	

<sup>1</sup> See "How Data Were Collected," on page 3.

<sup>2</sup> Vigor rating (1=very poor, 3=slightly above average, 5=very good, well adapted)

<sup>3</sup> Maturity rating (1=vegetative, 2=early bud, 3=early flower, 4=full flower, 5=seed production, 6=senescence)

<sup>4</sup> Insect damage rating (scale of 0 to 5; 0=no damage and 5=severe damage)

<sup>5</sup> Disease rating (scale of 0 to 5 with 0=no damage and 5=severe damage)

<sup>6</sup> Calculated as starting plant density x survival rate.

## How Data Were Collected

The plants described in this fact sheet were grown in K-State test plots in Hays, Colby, Wichita, or Olathe, Kan. Generally, four replications of each species were included at a site. Not all species were screened at each site or each year. The number of locations is noted in the table. Depending on the location and year, either five or 10 plants per plot were established in each of the replications. Details can be found at [www.oznet.ksu.edu/ksherbs](http://www.oznet.ksu.edu/ksherbs). Plants were grown from seed in the greenhouse and transplanted in the field in May or June.

All plants at each location were used to determine survival percentage, vigor rating, insect damage rating, and disease rating as described above. Three plants per plot were measured for height, and only one plant per plot was harvested to measure yield each year. Cultivating four plots allowed us to estimate yield from four plants at each location per year.

Plants were dried, and top and root weights recorded in grams. Grams per plant were converted to kilograms per acre (kg/A) and pounds per acre (lb/A) to estimate field-scale yield. The population density used to calculate field yields was the optimal population density (determined by the average size of the plants) times the actual percentage survival as measured in the field. There was generally some loss due to transplant shock and, for some species, significant winter loss as well.

Plant spacing recommendations on each fact sheet are for spacing within a row. Distance between rows will depend on the particular farming operation and equipment used. The minimum row spacing will be the same as the plant spacing recommendation. For example, if the recommendation is to set plants 12 inches apart, rows should be a minimum of 12 inches apart as well. However, if cultivator or root-harvesting equipment is on 5-foot centers, plant rows 5 feet apart to facilitate cultivating and harvesting. Adjust estimated plant density per acre on the worksheets to estimate gross yield and net income.

Prices were taken from Appendix B of K-State Research and Extension publication S-144 *Farming a Few Acres of Herbs: An Herb Growers Handbook*. To calculate a rough gross income potential for each herb, estimated yield was multiplied by the lowest and the highest retail price, divided by two. This is a rough estimate of wholesale price. Actual prices would be determined based on a contract obtained from a buyer.

Rhonda Janke, sustainable cropping systems specialist  
Jeanie DeArmond, extension assistant

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# A Grower's Guide

# Skullcap

*Scutellaria lateriflora*

This herb is also known as mad-dog skullcap because the tea was once used as a remedy for rabies. The debate over the effectiveness of this plant has a long history. It was listed in the U.S. Pharmacopoeia from 1863 to 1916 and in the national formulary from 1916 to 1947, but the U.S. Dispensatory states that skullcap has no medicinal properties. There are eight species of skullcap found throughout the prairie states. The Mesquakies used the small skullcap *S. parvula* to treat diarrhea. This plant is enjoying renewed interest from herbalists as a tincture to treat nervous disorders, and contains scutellarin – a flavonoid compound with confirmed sedative and antispasmodic qualities.



**Family:** *Lamiaceae*

**Life cycle:** Herbaceous perennial (Zone 4)

**Native:** Native to North America, found in rich woods, moist thickets and along stream banks.

**Height:** 1 to 3 feet

**Sun:** Full sun or partial shade

**Soil:** Prefers moist, well-drained. Will respond to fertility.

**Water:** Moderate. Prefers moist sites in the wild, but survived in dryland non-irrigated field sites. Irrigation increases growth.

**Flowers:** Violet, blue, hooded, lipped flowers bloom from May through September. Before planting in a flower garden, remember that this plant spreads.

**Propagation:** Stratify seeds for at least one week before sowing. Sow indoors and look for germination in about two weeks.

Transplant outside after danger of frost. This herb grows in clumps. Space 12 inches apart in the row. Propagate with cuttings or root divisions. Plants spread once established in the field. Difficult to weed mechanically due to plant clumps.

**Pests:** No major pests

**Harvesting:** Harvest aerial parts when the herb is in full flower. Harvest 3 inches above the ground.

**Parts used:** Aerial parts

**Used as:** Tincture, tea, liniment

**Medicinal benefits:** Strong tea traditionally used as a sedative, nerve tonic and antispasmodic for nervous conditions including epilepsy, insomnia, anxiety and neuralgia.

**Market potential:** High. Prices range from \$16 to \$64 per pound (lb) dry weight. This herb has a high low-end price, because it isn't competing with imports from Asia or eastern Europe yet.

**Summary of field trial data:** Skullcap did well under field conditions and was tested in replicated plots in Wichita, Hays, Olathe and Colby. The average survival the first year was 88.5 percent, and the average vigor rating was 3.8. The lowest vigor rating was at Hays with a 3.0, which represented the harshest field conditions with dry weather, wind and no irrigation. The lowest biomass harvest was also from Hays. For a woodland, water-loving plant, this was an amazingly hardy field herb. Given the current high value in the market and ease of harvest (this is an above-ground herb), we recommend trying this as a field crop. Preliminary observations in year two indicate that winter survival was good and yields will be higher in year two than in year one. Only first-year data is presented here because this plant was not included in screening trials until 2002, and data from 2003 is being summarized.

**K-State Field Trial Data 2002 *Scutellaria lateriflora***

				Average	Comments
<b>Age of plants in years</b>	1	2	3		
<b>Number of test sites<sup>1</sup></b>	4	0	0		
<b>Survival rate (%)</b>	88.5	—	—	88.5	
<b>Vigor rating<sup>2</sup></b>	3.8	—	—	3.7	
<b>Height (cm)</b>	40.8	—	—	40.8	
<b>Dry weight herb (g/plant)</b>	52.5	—	—	—	
<b>Dry weight root (g/plant)</b>	11.1	—	—	—	
<b>Maturity rating<sup>3</sup></b>	4.6	—	—	4.6	
<b>Insect damage rating<sup>4</sup></b>	0.2	—	—	0.2	
<b>Disease rating<sup>5</sup></b>	0.4	—	—	0.4	
<b>Estimated planting density (number of plants/A)</b>	21,780	—	—	—	1- by 2-ft. plant spacing assumed.
<b>Plant density<sup>6</sup></b>	19,275	—	—	—	
<b>kg/A dry weight (g/plant x plant number) – tops</b>	1,012	—	—	—	
<b>Estimated marketable yield (dry weight lbs/A) – tops</b>	2,229	—	—	—	
<b>Yield x ½ of low price<sup>1</sup></b>	\$17,832	—	—	—	
<b>Yield x ½ of high price<sup>1</sup></b>	\$71,328	—	—	—	

<sup>1</sup> See "How Data Were Collected," on page 3.

<sup>2</sup> Vigor rating (1=very poor, 3=slightly above average, 5=very good, well adapted)

<sup>3</sup> Maturity rating (1=vegetative, 2=early bud, 3=early flower, 4=full flower, 5=seed production, 6=senescence)

<sup>4</sup> Insect damage rating (scale of 0 to 5; 0=no damage and 5=severe damage)

<sup>5</sup> Disease rating (scale of 0 to 5 with 0=no damage and 5=severe damage)

<sup>6</sup> Calculated as starting plant density x survival rate.

## How Data Were Collected

The plants described in this fact sheet were grown in K-State test plots in Hays, Colby, Wichita, or Olathe, Kan. Generally, four replications of each species were included at a site. Not all species were screened at each site or each year. The number of locations is noted in the table. Depending on the location and year, either five or 10 plants per plot were established in each of the replications. Details can be found at [www.oznet.ksu.edu/ksherbs](http://www.oznet.ksu.edu/ksherbs). Plants were grown from seed in the greenhouse and transplanted in the field in May or June.

All plants at each location were used to determine survival percentage, vigor rating, insect damage rating, and disease rating as described above. Three plants per plot were measured for height, and only one plant per plot was harvested to measure yield each year. Cultivating four plots allowed us to estimate yield from four plants at each location per year.

Plants were dried, and top and root weights recorded in grams. Grams per plant were converted to kilograms per acre (kg/A) and pounds per acre (lb/A) to estimate field-scale yield. The population density used to calculate field yields was the optimal population density (determined by the average size of the plants) times the actual percentage survival as measured in the field. There was generally some loss due to transplant shock and, for some species, significant winter loss as well.

Plant spacing recommendations on each fact sheet are for spacing within a row. Distance between rows will depend on the particular farming operation and equipment used. The minimum row spacing will be the same as the plant spacing recommendation. For example, if the recommendation is to set plants 12 inches apart, rows should be a minimum of 12 inches apart as well. However, if cultivator or root-harvesting equipment is on 5-foot centers, plant rows 5 feet apart to facilitate cultivating and harvesting. Adjust estimated plant density per acre on the worksheets to estimate gross yield and net income.

Prices were taken from Appendix B of K-State Research and Extension publication S-144 *Farming a Few Acres of Herbs: An Herb Growers Handbook*. To calculate a rough gross income potential for each herb, estimated yield was multiplied by the lowest and the highest retail price, divided by two. This is a rough estimate of wholesale price. Actual prices would be determined based on a contract obtained from a buyer.

Rhonda Janke, sustainable cropping systems specialist  
Jeanie DeArmond, extension assistant

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## A Grower's Guide

# St. John's Wort

*Hypericum perforatum*

The species name “perforatum” comes from the translucent dots on the leaves that look like holes when they are held up to the light. There are about 370 species of *Hypericum*, but *H. perforatum* is easy to identify. Native to Europe and Asia, it has naturalized in North America and is considered a weed in western rangeland. For many years the USDA imported insects to biologically control this plant. The common name of the plant originates from the Knights of St. John of Jerusalem, who used it to treat wounds on Crusade battlefields.



**Family:** *Hypericaceae*

**Life cycle:** Herbaceous perennial  
(Zone 3)

**Native:** Europe, western Asia, and northern Africa, naturalized in North America, especially western states.

**Height:** 2 to 4 feet

**Sun:** Full sun optimal, tolerates partial shade

**Soil:** Does best on well-drained soil, but tolerates some wet soils. Can be grown with low fertility, but does better with compost and/or mulch.

**Water:** Low to moderate

**Flowers:** Bright-yellow flowers, five-petaled, about  $\frac{3}{4}$  inch across that bloom in mid- to late summer. Flower petals have small black dots on margins.

**Propagation:** Seeds should be stratified for three to four weeks to improve germination. Germination occurs in about two weeks, and is approximately 70 percent.

Sow directly outdoors or in seedling flats for transplants. Seed is extremely small, so controlling the seeding rate would be difficult outdoors. Seed germination is light dependent, so cover the seed very lightly. Transplants are tough to kill. Plant spreads via short rhizomes, so larger plants can be propagated with root divisions in the spring or fall of the second or third year. Seed can be saved from your own plants if some flowers are left to seed. Space plants about 12 inches in the row, with 2 to 3 feet between rows.

**Pests:** No major pests observed in our field trials. The Klamath Beetle (*Chrysolina* spp.), introduced into California by the USDA in 1944, continues to be a problem for growers west of the Rockies.

**Harvesting:** The flowering tops are clipped when in full flower. For the best quality, individual blossoms are picked the day they open, but this option would only be used if you are making oil or tincture for yourself. Sold fresh or dried.

**Parts used:** Flowering tops in peak flower. Check with buyer about how much plant material may be included with flowering tops.

**Used as:** Infusion, tincture, herb powder, liquid, wash, cream, infused oil

**Medicinal benefits:** Clinical studies have shown St. John's wort is an effective anti-depressant, sedative and anti-anxiety treatment. Oil-based *Hypericum* preparations have an anti-inflammatory effect, though no antiviral properties of the herb have been proven. It does have antibacterial effects, including against penicillin-resistant Staph. In Europe, St. John's wort has been approved for use by physicians in treating anxiety, depression, inflammation of the skin, blunt injuries, wounds and burns.

The herb can cause increased skin sensitivity to the sun when taken internally. For many years, manufactured products from St. John's wort were standardized to the hypericin content of the herb. However, it

was later found that the efficacy of this herb is due to synergy of several compounds, so now hypericin is simply considered an “indicator” compound that may or may not actually be linked to how effective the product might be.

**Market potential:** High. However, most St. John’s wort currently is wild crafted in California and other western states. Can be hand harvested, but some mechanization is possible. This herb has received a lot of publicity as an alternative treatment for mild depression. It also has value for skin healing and other medicinal uses, so future demand for this herb should be

good. In Europe, St. John’s wort is prescribed 20 times more often for depression than Prozac®. Prices for tops with flowers range from \$4.50 to \$25.75 per pound (lb) dry weight.

**Summary of field trial data:** Overall, St. John’s wort seems to be one of the better adapted plants evaluated in test plots. Transplants held up well under stress and mature plants had few insect or disease pests. Our results agree with the recommendations of Sturdivant and Blakley (1999), who suggest that second-year plants yield more than third-year plants.

Our stands also declined in year three, but this was partly due to a drought in 2002, and fall harvest, which was not the best time for maximum biomass. The best time to harvest would have been June or July.

If a good price can be obtained for fresh or dried material, this may be a crop to try in Kansas. Because buyers are willing to accept some green matter in with the flowers (8 to 12 inches) this crop could be partially mechanized with a hedge trimmer or a tractor-mounted tool. The tops still need to be dried carefully or shipped immediately as a fresh product.

**K-State Field Trial Data 2000-2002 *Hypericum perforatum***

				Average	Comments
<b>Age of plants in years</b>	1	2	3		
<b>Number of test sites<sup>1</sup></b>	4	2	2		
<b>Survival rate (%)</b>	86.3	72.5	96.0	84.9	The higher survival in year 3 as compared to year 2 is due to clumps spreading, and being overcounted in year 3.
<b>Vigor rating<sup>2</sup></b>	4.0	4.5	4.7	4.4	High vigor ratings overall.
<b>Height (cm)</b>	30.8	69.5	83.0	61.1	
<b>Dry weight herb (grams/plant)</b>	41.0	428.5	60.5	—	Lower biomass yields in year 3 due to decline of stand, drought in 2002, and late harvest relative to bloom time. The same sets of plots were evaluated in years 2 and 3.
<b>Dry weight root (g/plant)</b>	13.8	299.2	32.3	—	
<b>Maturity rating<sup>3</sup></b>	2.8	5.0	5.3	4.4	Plants flowered prior to fall harvest in years 2 and 3. Harvest for maximum floral bloom would occur in June or July.
<b>Insect damage rating<sup>4</sup></b>	0.0	0.5	0.3	0.3	Little or no insect or disease damage observed.
<b>Disease rating<sup>5</sup></b>	0.1	0.7	0.3	0.3	
<b>Estimated planting density (number of plants/A)</b>	21,780	21,780	21,780	—	1- by 2-ft. plant spacing assumed.
<b>Plant density<sup>6</sup></b>	18,796	15,791	20,909	—	
<b>kg/A dry weight (g/plant x plant number) – tops</b>	77	677	126	—	Assume that 10 percent of the top dry weight will be harvested with flowers.
<b>Estimated marketable yield (dry weight lbs/A) – tops</b>	170	1,490	279	—	The second year dw estimate is not too far off Blakely’s estimate of 1,250 lbs/A dry weight.
<b>Yield x ½ of low price<sup>1</sup></b>	\$383	\$3,353	\$627	—	
<b>Yield x ½ of high price<sup>1</sup></b>	\$2,190	\$19,191	\$3,594	—	

<sup>1</sup> See “How Data Were Collected,” on page 3.

<sup>2</sup> Vigor rating (1=very poor, 3=slightly above average, 5=very good, well adapted)

<sup>3</sup> Maturity rating (1=vegetative, 2=early bud, 3=early flower, 4=full flower, 5=seed production, 6=senescence)

<sup>4</sup> Insect damage rating (scale of 0 to 5; 0=no damage and 5=severe damage)

<sup>5</sup> Disease rating (scale of 0 to 5 with 0=no damage and 5=severe damage)

<sup>6</sup> Calculated as starting plant density x survival rate.

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All plants at each location were used to determine survival percentage, vigor rating, insect damage rating, and disease rating as described above. Three plants per plot were measured for height, and only one plant per plot was harvested to measure yield each year. Cultivating four plots allowed us to estimate yield from four plants at each location per year.

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# A Grower's Guide

# Stevia

*Stevia rebaudiana*

Stevia has recently gained attention and become available in health food stores in the United States as a natural non-sugar sweetener. It is a tropical plant that is native to Paraguay and Brazil, but does well in Kansas and probably in other Great Plains states. An herb company in Missouri has recently obtained seed from a breeding selection program in Canada to improve Stevia and select for sweeter plants. Stevia was originally used in eastern Paraguay to sweeten the local tea, Yerba Mate, but the plant was also used medicinally.



**Family:** *Asteraceae*

**Life cycle:** Herbaceous tender perennial. Not winter hardy in Kansas.

**Native:** Paraguay and Brazil

**Height:** 12 to 15 inches

**Sun:** Full sun or partial shade

**Soil:** Responds well to rich soil with high organic matter.

**Water:** Prefers a hot and humid environment, but did well in Kansas field trials with heat and wind. Tolerates drought, but supply moderate to high irrigation if possible.

**Flowers:** Delicate, white flowers bloom on and off throughout growing season. Flowers are more abundant in the fall.

**Propagation:** Easily propagated from cuttings, especially before the plant blooms. Seed propagation is also possible. Keep seeds moist and warm, and expect about 30 percent germination over a two- to three-week period. This plant can be

grown outdoors year-round in tropical regions, and could be brought inside as a houseplant for the winter in Kansas. Not winter hardy outside in Kansas. Collect cuttings in the fall for rooting and spring replanting. As a field crop, treat as an annual.

**Pests:** No significant disease or insect pests noted in our plots. Rabbit and deer feeding does not appear to be a problem, but in one set of test plots, four of five plants mysteriously disappeared between field day and harvest.

**Harvesting:** Clip leaves or aboveground portion any time during the growing season. One source recommends fall harvest for the sweetest plants. A supplier in Missouri recommended the opposite – an early season harvest.

**Parts used:** Leaves, before flowering.

**Used as:** The leaves of the plant are powdered and used as a non-sugar based sweetener. In some cases, an extract of Stevia is sold as a concentrated white

powder to sprinkle on food.

**Medicinal benefits:** This plant has been used in folk medicine to treat hypertension, diabetes and as a contraceptive. However, it is popular as a sugar substitute, and the glycosidal diterpens in the leaves are 30 times sweeter than sugar. The concentrated extract is 300 times sweeter. One recipe conversion chart suggests that  $\frac{1}{8}$  teaspoon of Stevia is equivalent to 1 tablespoon of sugar, and 2 tablespoons of Stevia could substitute for 1 cup of sugar.

**Market potential:** Moderate to high. Prices for the herb range from \$6.50 to \$36.77 per pound (lb) dry weight.

**Summary of field trial data:** This species did well under Kansas conditions, especially considering its tropical origins. It appeared healthy and vigorous even in the hot wind. In 2001, the Hays site (non-irrigated, central/western Kansas) yielded about half the dry weight (32 g/plant) as the Wichita site, which was irrigated (72

g/plant). The 2003 trial seems to be similar: larger plants in Wichita with irrigation, compared to Olathe, which was not irrigated. The vigor rating is 4.2 on a 5-point scale, and no significant insect or disease pests were noted. Because this is an aboveground herb, harvesting could be mechanized as long as quality is maintained. The price spread is a bit disconcerting with the high-end price more than five times the low-end price.

**K-State Field Trial Data 2000-2002 *Stevia rebaudiana***

				Average	Comments
<b>Age of plants in years</b>	1	2	3		
<b>Number of test sites<sup>1</sup></b>	2	0	0		This is an annual crop.
<b>Survival rate (%)</b>	95.0	—	—	—	
<b>Vigor rating<sup>2</sup></b>	4.2	—	—	—	
<b>Height (cm)</b>	60.5	—	—	—	
<b>Dry weight herb (g/plant)</b>	51.9	—	—	—	
<b>Dry weight root (g/plant)</b>	8.7	—	—	—	
<b>Maturity rating<sup>3</sup></b>	2.0	—	—	—	
<b>Insect damage rating<sup>4</sup></b>	0.6	—	—	—	
<b>Disease rating<sup>5</sup></b>	0.4	—	—	—	
<b>Estimated planting density (number of plants/A)</b>	21,780	—	—	—	1- by 2-ft. plant spacing assumed.
<b>Plant density<sup>6</sup></b>	20,691	—	—	—	
<b>kg/acre dry weight (g/plant x plant number) – tops</b>	1,074	—	—	—	
<b>Estimated marketable yield (dry weight lbs/A) – tops</b>	2,365	—	—	—	
<b>Yield x ½ of low price<sup>1</sup></b>	\$7,686	—	—	—	
<b>Yield x ½ of high price<sup>1</sup></b>	\$43,492	—	—	—	

<sup>1</sup> See "How Data Were Collected," on page 3.

<sup>2</sup> Vigor rating (1=very poor, 3=slightly above average, 5=very good, well adapted)

<sup>3</sup> Maturity rating (1=vegetative, 2=early bud, 3=early flower, 4=full flower, 5=seed production, 6=senescence)

<sup>4</sup> Insect damage rating (scale of 0 to 5; 0=no damage and 5=severe damage)

<sup>5</sup> Disease rating (scale of 0 to 5 with 0=no damage and 5=severe damage)

<sup>6</sup> Calculated as starting plant density x survival rate.

### How Data Were Collected

The plants described in this fact sheet were grown in K-State test plots in Hays, Colby, Wichita, or Olathe, Kan. Generally, four replications of each species were included at a site. Not all species were screened at each site or each year. The number of locations is noted in the table. Depending on the location and year, either five or 10 plants per plot were established in each of the replications. Details can be found at [www.oznet.ksu.edu/ksherbs](http://www.oznet.ksu.edu/ksherbs). Plants were grown from seed in the greenhouse and transplanted in the field in May or June.

All plants at each location were used to determine survival percentage, vigor rating, insect damage rating, and disease rating as described above. Three plants per plot were measured for height, and only one plant per plot was harvested to measure yield each year. Cultivating four plots allowed us to estimate yield from four plants at each location per year.

Plants were dried, and top and root weights recorded in grams. Grams per plant were converted to kilograms per acre (kg/A) and pounds per acre (lb/A) to estimate field-scale yield. The population density used to calculate field yields was the optimal population density (determined by the average size of the plants) times the actual percentage survival as measured in the field. There was generally some loss due to transplant shock and, for some species, significant winter loss as well.

Plant spacing recommendations on each fact sheet are for spacing within a row. Distance between rows will depend on the particular farming operation and equipment used. The minimum row spacing will be the same as the plant spacing recommendation. For example, if the recommendation is to set plants 12 inches apart, rows should be a minimum of 12 inches apart as well. However, if cultivator or root-harvesting equipment is on 5-foot centers, plant rows 5 feet apart to facilitate cultivating and harvesting. Adjust estimated plant density per acre on the worksheets to estimate gross yield and net income.

Prices were taken from Appendix B of K-State Research and Extension publication S-144 *Farming a Few Acres of Herbs: An Herb Growers Handbook*. To calculate a rough gross income potential for each herb, estimated yield was multiplied by the lowest and the highest retail price, divided by two. This is a rough estimate of wholesale price. Actual prices would be determined based on a contract obtained from a buyer.

Rhonda Janke, sustainable cropping systems specialist  
Jeanie DeArmond, extension assistant

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## A Grower's Guide

# Stinging Nettle

*Urtica dioica*

There are more than 50 species of nettle worldwide, and many are harvested for food or medicine. This medicinal plant is often overlooked and mistaken for a weed. Young shoots are a great source of vitamins and minerals. Use blanched in salads, in tea and boiled as a vegetable. Good source of iron. Nettle leaves and stems are covered with sharp spines that sting when touched. Wear gloves when handling this herb fresh. The sting is caused by histamine, small amounts of formic acid and other compounds. These are deactivated when the plant is dried or cooked.



**Family:** *Urticaceae*

**Life cycle:** Herbaceous perennial (Zone 2)

**Native:** The North American species (*U. dioica* spp. *gracilis*), has male and female flowers on separate branches or plants, and the species from Eurasia (*U. dioica* spp. *dioica*) has male and female flowers on separate plants. In the wild, this plant grows near streams, ponds, rivers and lakes in a disturbed area. The stems of nettle are square.

**Habit:** Grows 2 to 4 feet and will spread, so plant at least 12 inches apart.

**Sun:** Full sun, partial shade or full shade.

**Soil:** Plant in soil with high organic content (4 to 5 percent). Responds to increased fertility.

**Water:** Moderate to heavy. Will survive under dryland conditions.

**Flowering:** Cream-colored, pearl-like, tiny, flowers bloom from early summer to late fall.

**Propagation:** Stratify seed and sow directly in the garden or plant indoors and transplant to the garden in late spring. Expect a 50-percent germination rate.

Propagate by root division in early spring. The individual plants will spread into large clumps in years two and three.

**Harvesting:** Harvest aerial parts any time during the growing season. Best when harvested before flowering. Can harvest several times a year after the plant is established. Wear gloves and cut with scissors or clippers. Harvest root in the fall.

**Pests:** Caterpillars like to feed on nettles, but the plant usually outgrows the damage.

**Parts used:** Aerial parts fresh or dried. Roots are proven effective for prostate inflammation.

**Used as:** Infusion, tincture, elixir, food, ointment, cream, salve, balm, foot soak, bath herb, infused oil, honey, liniment, dye

**Medical benefits:** Whole body tonic. Nettles are great for the reproductive health of males and females. Benefits the immune system, urinary tract and respiratory system. Good for skin, hair and provides allergy relief. Nettles are an astringent and good for facial steams. Approved in Europe for infections of the urinary tract, kidney and bladder stones and rheumatism. The root has been approved in Europe for prostate ailments and irritable bladder. Research with animals has shown anesthetic, analgesic, antirheumatic and antiarthritic properties.

**Market potential:** Moderate. Prices for tops range from \$3.25 to \$19.52 per pound (lb) dry weight, roots \$4.50 to \$18.50 lb dry weight.

**Summary of field trial data:** Under our field conditions, the plants were subjected to full sun and limited water at three sites. Yields were better with irrigation, but it survived when water stressed. It can be wild harvested, but it might be a good crop to grow if you don't have access to a

wild stand. The time to harvest should be taken into account when planting this crop. One local grower harvested about 1 pound of root and 1 lb of tops in an hour. The plant will have more leaves if harvested before flowering. It is stemmy after that, but a second flush of leaves will come out during a wet fall. Repeated harvests may keep the plant from getting stemmy and allow for more harvests. Our data are based on one harvest in late summer or early fall, so the aboveground biomass estimates are probably low compared to the full potential of this plant.

<b>K-State Field Trial Data 2000-2002 <i>Urtica dioica</i></b>					
				<b>Average</b>	<b>Comments</b>
<b>Age of plants in years</b>	1	2	3		
<b>Number of test sites<sup>1</sup></b>	5	3	0		
<b>Survival rate (%)</b>	75.0	66.0	—	70.5	
<b>Vigor rating<sup>2</sup></b>	3.8	4.2	—	4.0	
<b>Height (cm)</b>	52.0	61.0	—	56.5	
<b>Dry weight herb (g/plant)</b>	243.7	424.3	—	—	
<b>Dry weight root (g/plant)</b>	26.6	185.8	—	—	
<b>Maturity rating<sup>3</sup></b>	3.4	4.7	—	4.1	
<b>Insect damage rating<sup>4</sup></b>	0.8	0.5	—	0.6	
<b>Disease rating<sup>5</sup></b>	0.4	0.2	—	0.3	
<b>Estimated planting density (number of plants/A)</b>	14,520	14,520	—	—	1- by 3-ft. plant spacing assumed.
<b>Plant density<sup>6</sup></b>	10,890	9,583	—	—	
<b>kg/A dry weight (g/plant x plant number) – tops</b>	2,654	4,066	—	—	
<b>Estimated marketable yield (dry weight lbs/A) – tops</b>	5,846	8,956	—	—	
<b>Yield x ½ of low price<sup>1</sup> - tops</b>	\$9,529	\$14,598	—	—	
<b>Yield x ½ of high price<sup>1</sup> - tops</b>	\$57,057	\$87,411	—	—	
<b>kg/A dry weight (g/plant x plant number) – roots</b>	290	1,781	—	—	
<b>Estimated marketable yield (dry weight lbs/A) – roots</b>	638	3,922	—	—	
<b>Yield x ½ of low price<sup>1</sup> - roots</b>	\$1,436	\$8,824	—	—	
<b>Yield x ½ of high price<sup>1</sup> - roots</b>	\$5,902	\$36,279	—	—	

<sup>1</sup> See "How Data Were Collected," on page 3.

<sup>2</sup> Vigor rating (1=very poor, 3=slightly above average, 5=very good, well adapted)

<sup>3</sup> Maturity rating (1=vegetative, 2=early bud, 3=early flower, 4=full flower, 5=seed production, 6=senescence)

<sup>4</sup> Insect damage rating (scale of 0 to 5; 0=no damage and 5=severe damage)

<sup>5</sup> Disease rating (scale of 0 to 5 with 0=no damage and 5=severe damage)

<sup>6</sup> Calculated as starting plant density x survival rate.

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# A Grower's Guide

# Valerian

*Valeriana officinalis*

Most commercial valerian is from a plant that is native to Europe, but a related species, *V. sitchensis*, is native to the western United States, and has higher levels of valepotriates and stronger medicinal activity. However, this plant should be cultivated, not wild harvested, and is entering the market now in small quantities. Valerian tincture was used in WWI and WWII to treat shell shock, nervousness and stress. Valerian root has a very strong odor that attracts cats similar to catnip. According to folklore, in 18th century apothecaries, the quality of valerian root was determined by the way in which cats reacted to it.



**Family:** *Valerianaceae*

**Life cycle:** Herbaceous perennial (Zone 3)

**Native:** Europe, Western Asia. Naturalized in northeastern North America where it is found in ditches, damp meadows, marshy thickets and near stream banks.

**Height:** 4 to 5 feet (in bloom)

**Sun:** Prefers partial shade. Tolerates full sun and shade.

**Soil:** Prefers a nutrient-rich, high humus soil with pH 6 to 7. High phosphorus requirement.

**Water:** Moderate to heavy. Grows along ditches, rivers and damp woods. Can grow in soil too wet for other species.

**Flowers:** Fragrant white or slightly pink flowers in a dense head of several stalked clusters. Blooms in late spring and early summer.

**Propagation:** No treatment needed for seed germination. Seed directly in the

field in early spring or start indoors to transplant in late spring. Press into soil, do not cover. Needs light to germinate. Optimum germination temperature is 68°F. Germination occurs in seven to 14 days with a rate of 60 to 70 percent. Space 12 to 24 inches apart. Seed will lose viability after the first year, so do not save old seed. Fresh seed reported by Frontier only 30 percent viable. Another option is to take root divisions in fall or spring. Recommended seeding rate is 2 lb/A.

**Pests:** Trials in Iowa reported some foliage diseases: powdery mildew (*Erysiphe polygani*) and peronospora (*Peronospora valerianae*). Other diseases encountered included adema, root rot and white mold. In our field trials, first year plants appeared quite healthy, but during the second year, the foliage appeared stunted, purple and yellow, and a root rot – possibly sclerotinia – was identified on some plants.

**Harvesting:** Harvest the root in the fall of the first or second year. Two references suggested harvesting in the second year, but another reference reported that the roots will deteriorate in quality by the fall of the second year so harvest accordingly. Use a needle-nose spade and dig when the soil is moist but not wet. Good weed control is recommended for optimizing crop yield. Cut tops before harvest for easier digging. Carefully dry root with circulating air at temperatures lower than 40°C (110°F). These are somewhat fibrous roots and difficult to wash.

**Parts used:** Root, fresh or dried.

**Used as:** Infusion (tea), decoction, expressed juice from fresh plants, tincture. Oil is used in flavoring, pharmaceutical and fragrance industry.

**Medicinal benefits:** Valerian is used as a strong sedative and pain reliever. It is approved for use in Europe to treat nervousness and insomnia, and many research studies support its effectiveness. Also used

to treat hypochondria, nervous headaches, irritability, mild spasmodic affections, depression, despondency, as well as insomnia. Warning: Do not use in large doses over a long time period. Side effects include headache and palpitations. It is not recommended that valerian be combined with other central nervous system depressants or with alcohol.

**Market potential:** High. This is one of the top-selling sedatives in Europe, and is still growing in popularity in the United States. There are growers producing this herb on a large scale. Prices range from \$2.95 to \$31.65.

**Summary of field trial data:** Though literature values suggest potentially high yields with this crop, ranging from 1,500 to 2,500 lbs/A dry weight to 5 tons/A, and few pests, our experience in the field was quite different. First-year plant survival

and vigor was relatively good, but observations in the spring and fall of the second year found plants that barely emerged from winter dormancy, showed severe discoloration, deformed leaves and failed to produce much the second year. In the field, this affected nearly all the plants, but in a garden setting, with wind breaks and more regular watering, fewer plants were affected. Field sites for year one plants included Wichita, Hays, Olathe and Colby, with the first three trials taking place in 2001, and the Colby trial in 2002. Yields varied a lot, ranging from root dry weight yield of only 3.4 and 2.0 g/plant at Wichita and Hays, and 31.5 and 37.5 g/plant at Olathe and Colby, respectively. Though Olathe was not irrigated and Colby was, the Olathe site apparently did better than Wichita and Hays because of the heavier soils and receiving enough rain in 2001. A second column of data is

presented in the comments section of the first table, to calculate yields and net return from the average of the better performing sites. Even using only the best sites, per acre yield was only about 1,200 lbs dry weight. Better yields could perhaps have been obtained the second year, if more plants had survived.

Two valerian varieties were compared: the "standard" or common variety sold by Richters, and a named, improved variety, 'Artener auchtung.' Unfortunately, the named variety was only tested at one site, Hays, and this was one of the harsher sites for valerian, so yields were disappointing. The vigor rating and survival was better for the named variety however, so future research on this and other herbs should include as many cultivars as possible.

Future research on valerian in Kansas should also include wetter, higher fertility

**K-State Field Trial Data 2000-2002 *Valeriana officinalis***

				Average	Comments
<b>Age of plants in years</b>	1	2	3		
<b>Number of test sites<sup>1</sup></b>	4	2	0		
<b>Survival rate (%)</b>	78.0	3.7	—	—	
<b>Vigor rating<sup>2</sup></b>	2.9	2.3	—	—	
<b>Height (cm)</b>	35.8	—	—	—	
<b>Dry weight herb (g/plant)</b>	41.0	36.0	—	—	
<b>Dry weight root (g/plant)</b>	18.6	33.0	—	—	Average yield of two best sites in the field trial. Year 1 data = 34.5 (Olathe and Colby)*
<b>Maturity rating<sup>3</sup></b>	1.0	1.0	—	—	
<b>Insect damage rating<sup>4</sup></b>	0.8	0.5	—	—	
<b>Disease rating<sup>5</sup></b>	1.2	0.3	—	—	
<b>Estimated planting density (number of plants/A)</b>	21,780	21,780	—	—	21,780
<b>Plant density<sup>6</sup></b>	16,988	806	—	—	16,988
<b>kg/A dry weight (g/plant x plant number) – roots</b>	316	27	—	—	586
<b>Estimated marketable yield (dry weight lbs/A) – roots</b>	969	59	—	—	1,291
<b>Yield x ½ of low price<sup>1</sup></b>	\$1,434	\$87	—	—	\$1,911
<b>Yield x ½ of high price<sup>1</sup></b>	\$15,339	\$927	—	—	\$20,436

<sup>1</sup> See "How Data Were Collected," on page 3.

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<sup>5</sup> Disease rating (scale of 0 to 5 with 0=no damage and 5=severe damage)

<sup>6</sup> Calculated as starting plant density x survival rate.

\*Average yield over two years does not make sense with only 4% survival rate. The average of our two best locations in the fall of year 1 is presented under the comments above.

sites. Under our field conditions, each transplant receives compost. Wichita has occasional irrigation from an overhead sprinkler system, and Colby has drip irrigation. All are exposed to full sun and wind. Symptoms in second-year plants could have been due to many things or a combination of factors. We suspected winter stress (including wind desiccation of young leaves), phosphorus deficiency (leaves were quite purple), herbicide drift

damage, or disease. The only stress factor we've confirmed so far is the presence of a root disease, possibly sclerotinia, from one of the plants that died in our demonstration garden, that had been growing under fairly ideal conditions.

Until we get better survival in the field, we do not recommend this as a crop in Kansas at this time, though it does make an attractive and fragrant addition to the home flower or herb garden.

**K-State Field Trial Data 2000-2002 *Valerian officinalis* var. *Artener* auchtung**

				Average	Comments
<b>Age of plants in years</b>	1	2	3		
<b>Number of test sites<sup>1</sup></b>	1	1	—		
<b>Survival rate (%)</b>	100.0	13.0	—		
<b>Vigor rating<sup>2</sup></b>	3.4	0.1	—		
<b>Height (cm)</b>	31.0	—	—		
<b>Dry weight herb (g/plant)</b>	21.8	—	—		Plants were too small to dig in the second year.
<b>Dry weight root (g/plant)</b>	4.4	—	—		
<b>Maturity rating<sup>3</sup></b>	1.0	1.0	—		
<b>Insect damage rating<sup>4</sup></b>	0.0	0.0	—		
<b>Disease rating<sup>5</sup></b>	0.0	0.0	—		
<b>Estimated planting density (number of plants/A)</b>	21,780	—	—		
<b>Plant density<sup>6</sup></b>	21,780	—	—		
<b>kg/A dry weight (g/plant x plant number) – roots</b>	96	—	—		
<b>Estimated marketable yield (dw lbs/A) – roots</b>	211	—	—		
<b>Yield x ½ of low price<sup>1</sup></b>	\$312	—	—		
<b>Yield x ½ of high price<sup>1</sup></b>	\$3340	—	—		

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# A Grower's Guide

# White Sage

*Salvia apiana*

White sage has been overharvested for ceremonial products and is now on the United Plant Savers at-risk list. Growers are needed to ensure the survival of this herb. This sage is different than the common garden sage *Salvia officinalis*, which is known for its culinary and medicinal uses. White sage is often used in ceremonies, but rarely used internally. Bundles of sage are sometimes used with cedar to smudge or purify through exposure to smoke. Another plant with the common name white sage, *Artemisia ludoviciana*, was also used medicinally and ceremonially by Native Americans. This plant is more closely related to mugwort, or *Artemisia vulgaris*, than to garden sage.



**Family:** *Lamiaceae*

**Life cycle:** Tender herbaceous perennial (Zone 8)

**Native:** Southern California and northern Baja region

**Height:** 12 to 24 inches

**Sun:** Full sun

**Soil:** Well drained soil. Good tolerance for hot, dry weather.

**Water:** Low to moderate

**Flowers:** Pale blue/purple flowers bloom in late summer.

**Seeds:** Stratify seed for at least one week and then sow indoors. Nighttime temperature of 70°F and hot daytime temperatures between 80 and 90°F are necessary. Germination around 40 percent and will take two to three weeks to germinate. Keep moist until seedlings are up and then cut back watering. Do not overwater at this stage. Transplant in late spring. Space 12 inches apart.

**Pests:** No major pests

**Harvesting:** Harvest aerial parts in late summer.

**Parts used:** Aerial parts, fresh or dried

**Used as:** Tincture, insect repellent, smudge stick, incense

**Medicinal benefits:** Women's health, digestive tract conditions, respiratory illness, skin and throat conditions. Not listed in the *Physician's Desk Reference for Herbal Medicines* or many other herb books, so exercise caution before using medicinally.

**Market potential:** High. Prices range from \$7.85 to \$32 per pound (lb) dry weight.

**Summary of field trial data:** This plant did well the first year it was transplanted, with an 87-percent survival rating and vigor rating of 4.1 on a 5-point scale. Aboveground biomass was also high and yielded about 2 tons/A, though there was not much flowering in the test plots. Of

the three sites tested, the least successful was the drip-irrigated field in Colby, which suggests that this plant prefers dryland sites over the irrigated. Though white sage is a perennial, none of the plants overwintered in Kansas (hardiness zone 8 and up), so it would need to be treated as an annual crop here.

**K-State Field Trial Data 2000-2002 *Salvia apiana***

				Average	Comments
Age of plants in years	1	2	3		
Number of test sites <sup>1</sup>	3	3	0	—	
Survival rate (%)	86.7	0.0		—	
Vigor rating <sup>2</sup>	4.1	—	—	4.1	
Height (cm)	56.3	—	—	56.3	
Dry weight herb (g/plant)	99.5	—	—	—	
Dry weight root (g/plant)	21.4	—	—	—	
Maturity rating <sup>3</sup>	1.0	—	—	1.0	
Insect damage rating <sup>4</sup>	0.5	—	—	0.5	
Disease rating <sup>5</sup>	0.6	—	—	0.6	
Estimated planting density (number of plants/A)	21,780	—	—	—	Assume 1- by 2-ft. plant spacing.
Plant density <sup>6</sup>	18,883	—	—	—	
kg/A dry weight (g/plant x plant number) – tops	1,879	—	—	—	
Estimated marketable yield (dry weight lbs/A) – tops	4,139	—	—	—	
Yield x ½ of low price <sup>1</sup>	\$16,266	—	—	—	
Yield x ½ of high price <sup>1</sup>	\$66,224	—	—	—	

<sup>1</sup> See “How Data Were Collected,” below.

<sup>2</sup> Vigor rating (1=very poor, 3=slightly above average, 5=very good, well adapted)

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<sup>6</sup> Calculated as starting plant density x survival rate.

**How Data Were Collected**

The plants described in this fact sheet were grown in K-State test plots in Hays, Colby, Wichita, or Olathe, Kan. Generally, four replications of each species were included at a site. Not all species were screened at each site or each year. The number of locations is noted in the table. Depending on the location and year, either five or 10 plants per plot were established in each of the replications. Details can be found at [www.oznet.ksu.edu/ks herbs](http://www.oznet.ksu.edu/ks herbs). Plants were grown from seed in the greenhouse and transplanted in the field in May or June.

All plants at each location were used to determine survival percentage, vigor rating, insect damage rating, and disease rating as described above. Three plants per plot were measured for height, and only one plant per plot was harvested to measure yield each year. Cultivating four plots allowed us to estimate yield from four plants at each location per year.

Plants were dried, and top and root weights recorded in grams. Grams per plant were converted to kilograms per acre (kg/A) and pounds per acre (lb/A) to estimate field-scale yield. The population density used to calculate field yields was the optimal population density (determined by the average size of the plants) times the actual percentage survival as measured in the field. There was generally some loss due to transplant shock and, for some species, significant winter loss as well.

Plant spacing recommendations on each fact sheet are for spacing within a row. Distance between rows will depend on the particular farming operation and equipment used. The minimum row spacing will be the same as the plant spacing recommendation. For example, if the recommendation is to set plants 12 inches apart, rows should be a minimum of 12 inches apart as well. However, if cultivator or root-harvesting equipment is on 5-foot centers, plant rows 5 feet apart to facilitate cultivating and harvesting. Adjust estimated plant density per acre on the worksheets to estimate gross yield and net income.

Prices were taken from Appendix B of K-State Research and Extension publication S-144 *Farming a Few Acres of Herbs: An Herb Growers Handbook*. To calculate a rough gross income potential for each herb, estimated yield was multiplied by the lowest and the highest retail price, divided by two. This is a rough estimate of wholesale price. Actual prices would be determined based on a contract obtained from a buyer.



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# A Grower's Guide

# Yarrow

*Achillea millefolium*

The name *Achillea* comes from the tale of Achilles using this plant to heal his warriors because it staunched blood flow. It was also used in the U.S. Civil War and was known as soldier's woundwort. It has a history of use by Native American and European healers. Few species are native to both sides of the Atlantic. The plant described in this fact sheet is the native or "wild" white flowering yarrow. Domestic varieties of yarrow are often yellow, orange, and red. These are suitable for home use, though they are not found in the medicinal herb market.



**Family:** *Asteraceae*

**Life cycle:** Herbaceous perennial (Zone 3)

**Native:** North America and Europe. Common in overgrazed pastures.

**Height:** 2 to 3 feet

**Sun:** Best in full sun. Tolerates partial shade.

**Soil:** Well-drained soil

**Water:** Low to moderate

**Flowers:** White flowers begin to appear in mid- to late summer.

**Propagation:** Stratify seeds for a month before sowing them. Sow indoors and then transplant outside in mid- to late spring, or sow directly outdoors in early spring. Germination is about 70 percent and occurs in about one to two weeks. An easy way to propagate yarrow is root divisions in spring or fall. Space 12 inches apart, because yarrow spreads as clumps enlarge.

**Pests:** Susceptible to disease if grown in wet soil. Looses condition in later summer after flowering.

**Harvesting:** Harvest aerial parts in mid- to late summer while plant is in early or full flower.

**Parts used:** Flowering aerial parts, fresh or dried

**Used as:** Infusion (tea), tincture, syrup, compress, poultice, elixir, lozenge, ointment, salve, cream, balm, foot soak, bath herb, infused oil, honey, liniment

**Medicinal benefits:** Approved for use in Europe for loss of appetite, upset stomach, and liver and gallbladder complaints. Folk uses include healing wounds, hemorrhoids, menstrual complaints and varicose veins.

**Market potential:** Moderate. Retail price range for bulk dried herb is \$3.40 to \$24.65 per pound (lb) dry weight.

**Summary of field trial data:** Yarrow grew well at all locations and seems to be

well adapted to Kansas heat, wind and drought. Disease and insect pressures were low until well after flowering. The vigor ratings were high at all locations, indicating that this is an easy plant to grow and is well adapted to Kansas. The yield per acre is fairly large and harvest has the potential to be partially or fully mechanized. Drying this much material and maintaining quality would be challenges for large-scale production. Yarrow is a useful herb, but is not used nationally in large quantities.

**K-State Field Trial Data 2000-2002 *Achillea millefolium***

				Average	Comments
<b>Age of plants in years</b>	1	2	3		
<b>Number of test sites<sup>1</sup></b>	3	2	0		No third-year plants available yet.
<b>Survival rate (%)</b>	85.3	78.0	—	81.7	
<b>Vigor rating<sup>2</sup></b>	4.4	4.8	—	4.6	
<b>Height (cm)</b>	56.7	77.5	—	67.1	Second year plants were noticeably larger (taller, and bigger clumps).
<b>Dry weight herb (g/plant)</b>	83.5	130.2	—	—	
<b>Dry weight root (g/plant)</b>	27.4	74.3	—	—	
<b>Maturity rating<sup>3</sup></b>	4.5	5.7	—	5.1	Flowering was earlier in second-year plants.
<b>Insect damage rating<sup>4</sup></b>	0.6	0.3	—	0.4	
<b>Disease rating<sup>5</sup></b>	0.5	0.3	—	0.4	
<b>Estimated planting density (number of plants/A)</b>	43,560	43,560	—	—	
<b>Plant density<sup>6</sup></b>	37,157	33,977	—	—	
<b>kg/A dry weight (g/plant x plant number) – tops</b>	3,103	4,424	—	—	
<b>Estimated marketable yield (dry weight lbs/A) – tops</b>	6,834	9,744	—	—	
<b>Yield x ½ of low price<sup>1</sup></b>	\$11,618	\$16,565	—	—	
<b>Yield x ½ of high price<sup>1</sup></b>	\$84,229	\$120,095	—	—	

<sup>1</sup> See "How Data Were Collected," below.

<sup>2</sup> Vigor rating (1=very poor, 3=slightly above average, 5=very good, well adapted)

<sup>3</sup> Maturity rating (1=vegetative, 2=early bud, 3=early flower, 4=full flower, 5=seed production, 6=senescence)

<sup>4</sup> Insect damage rating (scale of 0 to 5; 0=no damage and 5=severe damage)

<sup>5</sup> Disease rating (scale of 0 to 5 with 0=no damage and 5=severe damage)

<sup>6</sup> Calculated as starting plant density x survival rate.

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