

Herb Crops for the Great Plains

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Introduction

Medicinal herbs have been used to promote health for centuries and have increased in popularity and sales in the last ten to twenty years. Current estimates are \$337 million dollars in retail sales in U.S. mass-market retail outlets and an additional \$134 million in sales through natural food supermarkets for the year 2001 (Herbalgram 55 pg. 60). Though prices have leveled off and even declined over the past three years, there is continued interest among established, part-time, and new farmers in growing medicinal herbs as part of their overall farm enterprise mix.

This experiment began in the summer of 2000, with this objective: To screen medicinal herbs as possible crops for Kansas and Great Plains region farmers in the United States. The list of hundreds of possible herbs was narrowed down using the following criteria: 1) those likely to grow under our climatic conditions, 2) those currently popular in the mass market, or 3) those recommended by local herbalists.

Materials and Methods

Two sites were originally chosen for the screening trials. The first was the Horticultural Research Farms at Olathe in northeast Kansas, featuring silt loam soils high in organic matter and having more than thirty-five inches of annual rainfall. The second was Wichita, located in south-central Kansas on a sandier soil with less average rainfall. In 2001, a third site was added, Hays, located in west-central Kansas, and in 2002 a fourth site, Colby, in the northwestern part of the state, was added. Both of

these sites have lower average rainfall and potentially more wind. Irrigation is used only at the Colby and Wichita sites, though the other sites received hand-watering at the time of transplanting.

Fifteen herb species and/or biotypes were screened in 2000, an additional fifteen added in 2001, and a second year of data collected on the first set of plots. Another five species were added in 2002. A total of thirty-eight accessions, including thirty-six species and two sets of variety/biotype comparisons have been made at one or more sites over the three-year period. Data collected includes survival rate, biomass in the fall (tops and roots), plant vigor rating (1-5), insect pressure rating (1-5), and disease rating (1-5). The percent dry weight at the time of harvest and growth stage (vegetative, flowering, seed) is also recorded. With few exceptions, all plots are replicated four times, and either five or ten plants per plot were transplanted from greenhouse-grown seedlings. Planting density changes from site to site, depending on site conditions and whether irrigation is available, and ranges from a spacing of 1 to 10 ft² per plant. An attempt was made to achieve a plant spacing that would not limit yield.

Fertility has been supplemented at three of the four sites, with compost added at the time of planting and/or side-dressed after planting. Weed control is through mechanical means, hay and fabric mulch, and hand-weeding. Because many prospective herb growers are organic farmers and future trends predict more demand for organic production, all plots have been managed using practices that could be certified as organic by a

About Dr. Rhonda Janke

Rhonda Janke received B.S. in Agronomy from Kansas State University and M.S. and Ph.D. from Cornell. She grew up on a diversified crop-dairy farm in Central Kansas. Her experience includes work in the areas of cropping systems, crop rotations, soil quality, cover crops, and crop-weed competition. In Kansas, she has worked in the area of whole-farm planning, diversification, and medicinal herbs as alternative crops, and she helped start the Great Plains Medicinal Herb Association, a grower-member group for education, marketing, and networking.

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Herb%20June%202002.PDF](http://www.oznet.ksu.edu/rc_hefw/Herb%20June%202002.PDF)

commercial grower, though no attempt has been made to certify the research fields.

Results and Discussion

Survival— Of the thirty-four accessions compared in the first two years of this trial, three had unacceptable stands (less than 50 percent survival) at the end of the first growing season: borage (at two of the three sites), *Monarda didyma* ("Panorama Red Shades"), and evening primrose, which seemed to winter-kill at all three sites. Since primrose is a biennial, and the marketed portion is usually the seed, this presents a problem. Three other species that are perennials also winter-killed but could be harvested in the first year if necessary: white sage, feverfew, and mullein. Another three perennials had acceptable stands in year one but fell below the 50 percent survival point during year two, which would limit yield. These were butterfly milkweed, Chinese milk vetch, and *Echinacea angustifolia*. Since these are often of higher market value, they might still be worth a grower's time to establish and harvest, though as multiyear crops, continued stand lost would be a problem.

Vigor ratings were scored in both the spring and the fall and indicate how "adapted" a particular plant was to its site and climate. Of the thirty-four accessions, only six rated below a 2.5 on a 5-point scale in the fall ratings at one or more sites, and ten rated below 2.5 in the spring (three of those had winter-killed). Thus, most of the plants chosen for this trial were at least somewhat adapted to Kansas growing conditions.

Insect damage ratings were scored in the fall, and eleven accessions scored 2.0 or higher, indicating significant damage and/or feeding by insects on a 1-5 scale (with 5 being the most damage). Disease ratings also showed eleven accessions with a 2.0 or higher. Of these, eight were affected by aster yellows, a common disease in the floriculture industry. The three *Echinacea* species were most affected, with the infection rate as measured by plants with visual symptoms at the end of the second year at one of the sites as 25 percent for *E. angustifolia*, 26 percent for *E. pallida*, and 99 percent for *E. purpurea*. Interestingly, the infection rate for the *E. purpurea* was also high in the first year, and yet the plants were still alive in year two, so mortality from the disease wasn't as high as expected.

Yields of the tops and the roots were collected in the fall of each year, washed, weighed fresh, and then subsamples were weighed fresh and dry to obtain dry weight. Of the thirty-four accessions, sixteen are marketed as root crops, nineteen are marketed for the tops (stems and leaves), and in four only the floral portion is used. Data is presented for the tops and roots of the appropriate

species, and floral plants have been left out of the data set for now. Floral medicinal plants are also probably not feasible in Kansas, especially for a mass market, due to the high cost of labor for harvesting.

Data are presented as grams per plant, but useful conversions to field scale can be made using the following assumptions. The average density used in the field trials was 5 ft² per plant, or 8,712 plants per acre. For herbs, yield goals might be in the range of 500, 1000, or 2000 pounds per acre, which translates to 26, 52, and 104 grams/plant. This would also be equivalent to 560, 1,120, and 2,240 kg/ha (kilograms per half acres). This rule of thumb makes a useful comparison or yardstick for the yield data, and one can assess if this is a low, medium, or high-yielding herb. If potential growers also know the current going price in the marketplace, they can use these yield figures to estimate gross profit, then deduct anticipated growing costs to come up with a reasonable budget with which to plan.

Conclusions

Potential herb growers need data on which to base decisions on potential yield, production cost, and potential price. This experiment is intended to generate data to help growers know which herbs are adapted to their region of Kansas and which species might be susceptible to insects or diseases, and to provide realistic yield figures with which to develop budgets. In some cases, specific varieties or biotypes of herbs are compared. Future work needs to continue comparing available varieties of adapted herbs, harvesting established herbs over several years, and continuing to screen new herbs that have promise as crops for this region. Larger field-scale trials with direct seeding and mechanized harvest are also planned for the future in collaboration with farmer-growers.

For more information:

American Botanical Council, nonprofit educational organization, publishes the quarterly trade magazine *Herbalgram*; see website at www.herbalgram.org or contact at their headquarters, P.O. Box 144345, Austin, TX, 78714-4345. Phone: (512) 926-4900. Fax: (512) 926-2345.

ATTRA, Appropriate Technology Transfer for Rural Areas. P.O. Box 3657, Fayetteville, AR 72702. (800) 346-9140. www.attra.org/attra-pub/herblist.html. Many fact sheets on herbs in general and on specific popular herbs. Many other fact sheets of interest to farmers looking for alternative crops.

Kansas State University, see website at www.oznet.ksu.edu, especially publication MF 2532, "Economic Issues with *Echinacea*." Also, www.oznet.ksu.edu/

Percent survival for one year, spring of second season (* until the end of the first growing season for the annuals).

Species	Common Name	2000/2001 TRIAL				2001/2002 TRIAL		
		Wichita		Olathe		Wichita	Olathe	Hays
		Yr 1	Yr2	Yr1	Yr 2	Yr 1	Yr 1	Yr 1
<i>Achillea millefolium</i>	Yarrow 'Proa'	-	-	-	-	59	97	-
<i>Althea officinalis</i>	Marshmallow	-	-	-	-	84	97	100
<i>Articum lappa</i>	Burdock	-	-	-	-	0	64	100
<i>Asclepias tuberosa</i>	Butterfly milkweed (Reg)	85	40	58	58	-	-	-
<i>Asclepias tuberosa</i>	Butterfly milkweed (Clay)	85	43	43	48	-	-	-
<i>Astragalus membranaceus</i>	Chinese milk vetch	50	38	58	43	-	-	-
<i>Borago officinalis</i>	Borage	-	-	73*	-	30*	48*	-
<i>Calendula officinalis</i>	Calendula	-	-	-	-	78*	90*	80*
<i>Echinacea angustifolia</i>	Narrow leaf coneflower	65	13	54	34	56	-	19
<i>Echinacea pallida</i>	Pale purple coneflower	88	48	90	63	-	-	-
<i>Echinacea purpurea</i>	Purple coneflower	81	33	93	63	-	-	-
<i>Eupatorium perfoliatum</i>	Boneset	88	73	88	82	-	-	-
<i>Eupatorium pupureum</i>	Joe-pye weed	88	75	-	-	-	-	-
<i>Glycyrrhiza glabra</i>	Licorice	88	78	89	100+	-	-	69
<i>Glycyrrhiza uralensis</i>	Chinese licorice	83	68	62	70	-	-	-
<i>Hypericum perforatum</i>	St. John's wort	90	83	60	62	-	-	-
<i>Lespedeza captiata</i>	Round head lespedeza	-	-	73	82?	-	-	-
<i>Matricaria recutita</i>	German chamomile	-	-	-	-	76*	95*	45*
<i>Monarda didyma</i>	"Panorama Red Shades" bergamot	53	13	-	-	-	-	-
<i>Monarda fitulosa</i>	Wild bergamot	88	78	65	55	-	-	-
<i>Oenothera biennis</i>	Evening primrose	-	-	-	-	0 (76*)	0 (48*)	0 (100*)
<i>Origanum vulgare</i>	Oregano	-	-	-	-	100	-	-
<i>Rumex acetosa</i>	Sorrell	-	-	-	-	81	100+	100
<i>Salvia apiana</i>	White Sage	-	-	-	-	-	0 (98*)	-
<i>Silybum marianum</i>	Milk Thistle	-	-	-	-	95*	93*	0*
<i>Stevia rebaudiane</i>	Stevia	-	-	-	-	90*	-	100*
<i>Tanacetum parthenium</i>	Feverfew	15 (95*)	3	17 (94*)	0	0 (70*)	-	19 (100*)
<i>Taraxacum officinale</i>	Dandelion	-	-	-	-	67	53	25
<i>Trifolium pratense</i>	Red clover	-	-	-	-	20	61	63
<i>Urtica dioica</i>	Nettles	-	-	-	-	-	100	25
<i>Valeriana officinalis</i>	Valerian (standard)	-	-	-	-	-	75	69
<i>Valeriana officinalis</i>	Valerian 'Arterner Zuchtung'	-	-	-	-	-	-	100
<i>Verbascum thapsis</i>	Mullein	5 (95*)	0	15(55*)	0	-	-	25 (60*)
<i>Verbena hastata</i>	Blue vervain	-	-	-	-	-	92	-

*Number not in parentheses is the percentage alive exactly one year, or the spring after planting. Number in parentheses and/or marked with an asterisk is the percentage alive if it had been harvested like an annual crop (fall after planting).

Average Dry Weight (across sites) of Plant Roots Harvested in the Fall (g/plant)

Species	Common Name	Year 1	Year 2
<i>Althea officinalis</i>	Marshmallow	86	-
<i>Articum lappa</i>	Burdock	27	-
<i>Asclepias tuberosa</i>	Butterfly milkweed (Reg.)	2	39
<i>Asclepias tuberosa</i>	Butterfly milkweed (Clay)	2	46
<i>Astragalus membranaceus</i>	Chinese milk vetch	1	25
<i>Echinacea angustifolia</i>	Narrow leaf coneflower	1	9
<i>Echinacea pallida</i>	Pale purple coneflower	5	35
<i>Echinacea purpurea</i>	Purple coneflower	4	26
<i>Eupatorium perfoliatum</i>	Boneset	14	231
<i>Eupatorium pupureum</i>	Joe-pye weed	10	253
<i>Glycyrrhiza glabra</i>	Licorice	5	53
<i>Glycyrrhiza uralensis</i>	Chinese licorice	5	52
<i>Oenothera biennis</i>	Evening primrose	12	-
<i>Taraxacum officinale</i>	Dandelion	19	-
<i>Urtica dioica</i>	Nettles	16	-
<i>Valeriana officinalis</i>	Valerian (standard)	12	-
<i>Valeriana officinalis</i>	Valerian 'Arterner Zuchtung'	4	-

Aster Yellow Infection Rates (percent of live plants with visual symptoms)

Spring 2001 Species	Common Name	Fall 2001		Spring 2002	
		Wichita	Olathe	Olathe	Olathe
<i>Echinacea angustifolia</i>	Narrow leaf coneflower	0	6.3	19	25
<i>Echinacea pallida</i>	Pale purple coneflower	29	20	7	26
<i>Echinacea purpurea</i>	Purple coneflower	100	96	95	99

kcsaac/ for hot links to other herb websites.

North Carolina, see website at www.ces.ncsu.edu/depts/hort/hil/. Check out the specialty crop fact sheets for information on both culinary and medicinal herbs.

Seed Sources:

Horizon Herbs, LLC, P.O. Box 69, Williams, OR 97544. Phone: (541) 846-6704; fax: (541) 846-6233; email: hhcust-serv@HorizonHerbs.com; website at www.chatlink.com/~herbseed/. Seeds grown by well-known herbalist/writer Richo Cech and his family.

Johnny's Seeds, See website at www.johnnyseeds.com, or contact at 184 Foss Hill Rd, Albion, Maine 04901. Phone: (207) 437-4301. Sells vegetable seed to gardeners and professional growers. Good selection of culinary and medicinal herb seed, including some organically grown seed.

Prairie Moon Nursery, Route 3, Box 1633, Winona, MN 55987-9515. Phone: (507) 452-1362; fax (507) 454-5238; website at www.prairiemoonnursery.com; email: pmnrsy@luminet.net. Large selection of seeds for prairie

plantings and restoration, including medicinal plants from the prairie.

Richters Herbs, see website at www.Richters.com. Phone: +1.905.640.6677; Fax: +1.905.640.6641, Goodwood, Ontario, Canada. LOC 1A0. Company founded in 1970 to sell bedding plants and herbs. Good selection and fun catalog.

Seedman.Com, Jim Johnson, Seedman, 3421 Bream St., Gautier, MS 39553. Phone: (800) 336-2064; fax: (228) 497-5488; email: support@seedman.com; website at www.seedman.com/medicine.html. Carries large and varied selection of seeds from around the world.

Associations:

Great Plains Herb Growers Association– for those considering herb production on a commercial scale. One-year membership, newsletter \$25.00. Send to Rhonda Janke, 2021 Throckmorton, KSU, Manhattan, KS 66506. Can be added to mailing list for free future herb workshop update mailings. Contact Christy Dipman, (785) 532-6173, email cdipman@oznet.ksu.edu.

The Herb Growing & Marketing Network, P.O. Box

245, Silver Spring, PA 17575. Phone: (717) 393-3295; fax: (717) 393-9261; website at www.herbnet.com and herb-world.com; email: HERBWORLD@aol.com. Nonmembers can learn a lot from visiting this website and reading the newsletters. Member benefits include website 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 a year.

Books– General:

The Complete Book of Herbs: A Practical Guide to Growing and Using Herbs, by Lesley Bremness. 1988. Penguin Books: New York. Lots of information about growing herbs here.

Complete Illustrated Guide to the Holistic Herbal by David Hoffmann. 1996. HarperCollins Publishers: London. Nice photographs, good listing of herbs.

The Complete Medicinal Herbal, by Penelope Ody. 1993. Dorling Kindersley: New York. Great photos, some history, nice reference tables in second section.

The Green Pharmacy, by James A. Duke. 1997. St. Martin's Press: New York. This very affordable book offers scientific insight and practical herbal remedies for everything from baldness to bad breath. Dr. James Duke was a career research scientist for the USDA in Beltsville, Maryland.

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.

Handmade Medicines: Simple Recipes for Herbal Health, by Christopher Hobbs. 1998. Interweave Press: Loveland, Colorado.

Herbs for First Aid: Simple Home Remedies for Minor Ailments and Injuries, by Penelope Ody. 1997. Keats Publishing: Los Angeles.

The Honest Herbal, by Varro E. Tyler. 1993 (third edition). Haworth Press: 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, by Kelly Kindscher. 1992. University of Kansas Press: Lawrence. KS.

Physician's Desk Reference for Herbal Medicines. 2000 (second edition). Medical Economics Company: Montvale, New Jersey. The most thorough reference I've found yet for describing herbs and supplements derived from herbs, summarizing the known efficacy and warning about side effects and drug/herb interactions.

The Village Herbalist, by Nancy and Michael Phillips. 2000. Chelsea Green Publisher: CITY?, see 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. The focus of this book is people, however.

Books– For Large-scale Growers:

Herb and Spice Production Manual, by Connie Kehler. 1999. Produced by the Saskatchewan Herb and Spice Association; printed by Print It Centre, Regina, Sask. (Available through Richters Catalog.)

Grower's Crop Monographs. Frontier Organic Research Farm: Norway, IA. (Available through Frontier's website.)