

Growing Lentils in Montana

by Dennis Cash, Ron Lockerman, Howard Bowman and Leon Welty¹ MSU Extension crop specialist, crop physiologist, Extension agronomist, and Superintendent of Northwestern Agricultural Research Center, respectively.

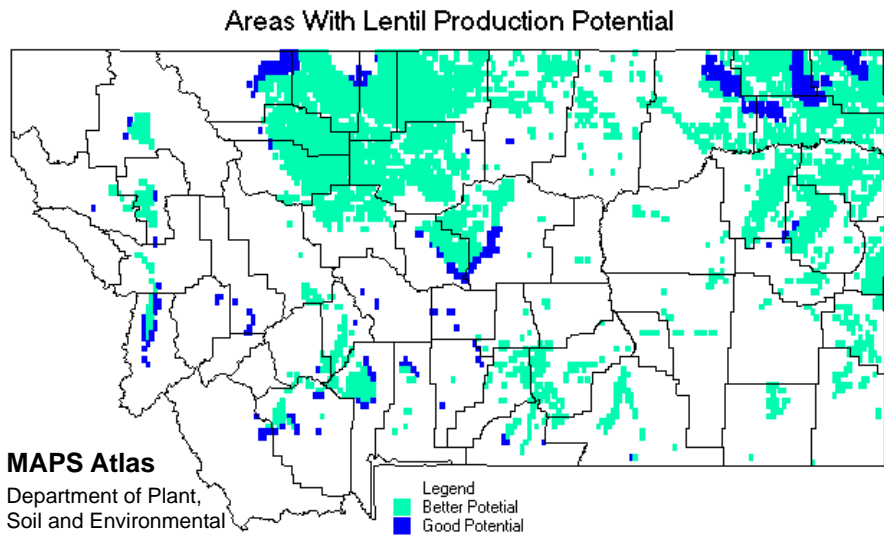
An overview of lentil production for specialty crop producers, including weed control, diseases, harvesting and references.

Lentils (*Lens culinaris* Medik.) are produced on over 1.5 million acres throughout the world. They are primarily used for domestic consumption in casseroles, salads, soups and stews. Lentils provide an excellent source of protein (20 to 35 percent), but are limited in the sulphur-containing amino acids methionine and cystine. However, consumption of lentils with cereals provides a balanced diet high in fiber, protein and essential amino acids.

Lentils in the United States are primarily grown for export. The principal production areas have been the Palouse region of eastern Washington, northern Idaho and northwestern Montana. Interest has increased in using lentils as a rotation crop with cereal grains in these and other areas throughout the northwestern United States and the Canadian prairie provinces.

Traditionally, lentil production in Montana has been primarily confined to the Flathead Valley. Lentils are an excellent alternative crop, and acreage in Montana is now approaching 10,000 acres. Lentils are widely adapted to most of the dryland crop area in Montana (see map above). Lentils are a leguminous crop that provides an excellent rotation crop with small grains.

Production of lentils or other



legumes in a crop fallow or continuous grain system improves soil "health," and also provides for an opportunity to disrupt problem weed and disease cycles. Additionally, markets are expanding for lentils, and they may become an excellent cash crop in Montana.

Types and Uses of Lentils

Lentils are an annual legume that grow from one to two and one-half feet in height. Excessively tall plants can result in delayed flowering during long periods of cool growing season conditions. Many cultivars branch profusely depending on crop density.

Both large-seeded ("Chilean") and small-seeded ("Persian") lentils are produced in North America.

"Laird" and "Tekoa" are large-seeded cultivars with seed weights averaging about 6,500 per pound. The large-seeded cultivars normally have yellow seeds with very little pigmentation in the flowers. "Eston" and "Indianhead" are small-seeded cultivars with seed weights of about 12,600 and 19,700 per pound, respectively. Seed color of lentils ranges from yellow or red to black (Indianhead).

Flower color of lentils is white, lilac or blue. Flowering in lentils is acropetal, from the bottom of the plant to the top. Flowers are predominantly self-pollinated or may be cross-pollinated by small insects. In general, cold temperatures at planting, warm growing temperatures and long days promote early flowering and good seed set.

Cultural Considerations

Lentils are primarily a cool-season crop that have excellent potential for dryland production in many areas of Montana. They are moderately resistant to high temperatures and drought. However, lentils do respond to drought stress in the latter flowering stage to stimulate seed maturation. Precipitation in the range of 10 inches during the growing season is sufficient to produce excellent yields.

Lentils should be seeded early when the soil temperature is above 40 degrees F. They are very frost tolerant and young plants have been reported to withstand temperatures as low as 21 degrees F. During germination, lentil cotyledons remain below the soil surface (hypogeal), which provides better frost protection than epigeal germinating crops such as dry beans, which position their cotyledons above the ground during the germination process.

Lentils should be planted in a firm, weed-free seedbed with little crop debris. Rocks are troublesome for lentil harvest, and rocky fields should be rolled or avoided. Lentils require fertilizer rates similar to that of field peas (Table 1).

Lentils are capable of fixing atmospheric nitrogen when infected with *Rhizobium* bacteria (*R. leguminosarum*). Commercial peat based inoculum is often applied to the seed before planting to ensure good nodulation even though the bacteria may already be present in the soil. Soil nitrate levels above 44 pounds per acre have been reported

to inhibit nitrogen fixation. High levels of phosphorus are needed for plant growth and optimum nitrogen fixation. Fertilization can occur in the fall prior to spring seeding of lentils or during spring field preparation. Fertilizer should be broadcast and incorporated or deep-banded to reduce seedling injury.

Lentils can be seeded with a grain drill in six- to seven-inch rows at a depth of one to two inches. Seeding rates will vary from 40 to 70 pounds per acre, depending on variety. The drill should be calibrated to deliver about 10 seeds per square foot. Seeds should be of good quality (not cracked or chipped) and handled carefully and slowly through augers or air seeders to minimize damage to the cotyledons.

Weed Control

Weed competition can reduce vigor and yield of lentils. Lentil seedlings are fairly non-aggressive, and severe weedy fields should be avoided. Moderate weed infestations should be controlled by cultural or chemical methods prior to growing lentils. Four herbicides are currently labeled for weed control in lentils. These include sethoxydim (Poast[®]) and trilliate (Far-Go[®]) for grass control, and imazethapyr (Pursuit[®]) and metribuzin (Sencor[®]) for broadleaf weeds. Because lentils, peas and other specialty crops are produced on limited acreage in Montana, many herbicides available in Canada or other areas have not yet been labeled for use in Montana. Producers should refer to the most recent ver-

sion of “*Montana, Utah, Wyoming Weed Management Handbook*,” (EB23) which is published annually, and is available from MSU Extension Publications, 115 Culbertson, Bozeman, 59717. (Call 406-994-3273 for credit card orders). All label instructions for herbicides should be followed carefully.

Lentil Diseases

Several diseases can reduce establishment and yield of lentils. The major potential diseases of lentils in Montana are seedling rot, root rot and stem, leaf or pod blights. Seedling and root rots are soil-borne fungal diseases caused by several species of *Fusarium* and *Pythium*, or *Rhizoctonia solani*. Most of these organisms are long-lived in the soil, and inhabit other broadleaf crops or weeds; therefore, the major preventative control measure is a long rotation cycle (more than three years) with small grains. Stem and pod rots are primarily caused by *Sclerotinia sclerotiorum*, *Botrytis cinerea*, *Ascochyta* sp. and *Colletotrichum truncatum*. Both *Ascochyta* and anthracnose (caused by *C. truncatum*) are seed-borne diseases, and can be avoided in Montana by buying high-quality, disease-free seed.

The other diseases are indigenous to Montana, and are favored by cool, moist growing conditions. Montana producers are encouraged to use disease-free seed, eliminate crop debris and utilize long rotation periods to limit the buildup and spread of these potential disease problems.

Varieties

The Montana Agricultural Experiment Station (MAES) does not currently issue variety recommendations for lentils. The MAES Research Center near Kalispell, as well as several other locations, has conducted variety trials (Table 2).

The results of these evaluations may be indicative of adaptability and performance at other locations. The results are not widely published, but the MSU Extension Service can assist with obtaining additional infor-

Table 1. Lentil fertilizer guidelines for Montana.

Phosphorous (P)		Potassium (K)	
Soil Test Level (ppm)	Apply (P2O5) (lb/A)	Soil Test Level (ppm)	Apply (P2O5) (lb/A)
>15	0-20	200	0-15
9-15	30	150	35
< 9	40	100	55
		< 50	75

Table 2. Lentil and spring grain yields in dryland Montana research trials.

Location		"Red Chief"	T2001 Green	"Crimson"	"Newana" spring wheat	"Lewis" barley
		lb/A			bu/A	
Bozeman	(1990)	2178	—	—	41	70
	(1992)	—	1300	—	103	109
	(1993)	1238	—	1091	74	121
	(1995)	—	1163	1211	69	114
Conrad	(1995)	—	2913	2468	80	95
Kalispell	(1990)	1666	—	—	96	92
	(1991)	2158	—	1525	116	110
	(1992)	2210	—	1917	88	111
	(1993)	446	—	885	64	134
	(1994)	878	—	1074	101	87
	(1995)	801	—	942	119	114
	(1996)	2372	—	2179	91	117
Moccasin	(1995)	—	693	600	30	39
Sidney	(1990)	1080	—	—	45	59
	(1992)	—	2754	2048	93	103

mation. Data from surrounding states or Canada may also provide useful information.

Varietal choice should be made considering both adaptation and potential marketability. The common lentil of the Palouse region has been Chilean; however, specialty markets for green or red lentils for sale in Canada have recently been strong.

Harvesting Lentils

Lentils require a growing season of 80 to 100 days depending on seeding date, precipitation and heat units. Early seeding will increase plant height and facilitate better harvesting. Lentils are ready to be swathed or desiccated when the bottom pods are brown and rattle.

As pods begin to dry down, maturity will advance very rapidly with

hot, dry conditions. Late pods at the tops of the plant will still be green; however, delaying cutting will result in large losses due to seed shattering. Lentils should be swathed as low to the ground as possible, which will dictate slow cutting. Due to time constraints, many Canadian producers now use desiccants, and direct cut lentils. Direct harvest results in reduced shatter losses and risk of weather losses and delays.

A flexible ("flex") combine header with automatic height adjustment is ideal for lentil harvest. "Pick-up" reel attachments or "vine lifters" are also useful for lodged crops. Very low cylinder speeds (<500 rpm) should be used to minimize seed splitting. Ideal threshing occurs at about 14 percent moisture; however, if bin aerators are avail-

able, the crop can be combined at 16 to 18 percent moisture. Lentils should be handled carefully in all augers and conveyors. Lentils can be safely stored at 15 percent moisture or less. Many new advances in harvest procedures and equipment have been recently developed, and producers are encouraged to examine products marketed in Canada or the Palouse region.

Yield

Lentil yields in Montana research trials have ranged from 450 to 2900 pounds per acre (Table 2). Producers in the Palouse region and the Canadian provinces typically harvest 900 to 1300 pounds per acre. Market prices for lentils over the last eight years have ranged from \$10.95 to over \$23.00 per hundred weight

(FOB Lewiston, ID), reflecting potential gross returns of \$109.50 to over \$230.00 per acre for dry-land lentils that produced 1000 pounds per acre.

Summary

Lentils are a promising crop for Montana producers as an alternative cash crop and as a rotational crop. Lentils are widely adapted to the major grain producing areas in Montana, and provide an excellent rotational crop. Acreage of lentils and peas has expanded in surrounding states and provinces, and Montana producers can benefit from the increased marketability and flexibility of lentils. As producers adjust their farming operations in response to farm program changes, lentils provide a promising alternative crop. Interested producers should contact their local county

MSU Extension service agent, MAES agronomists, or Montana State University for additional information on lentil production in Montana.

References and Resources

Montana Pulse Growers Association. Annual conference, newsletters, field tours. P.O. Box 1, Wilsall, MT 59086.

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Extension Service, Madison, WI 53706.

Pulse Crop News. Quarterly publication produced by Alberta Pulse Growers Association, P.O. Box 624, Lacombe, Alberta, Canada T0C 1S0.

Pulse Production Manual. 1993. Alberta Pulse Growers Commission, 5030 50th Street, Lacombe, Alberta, Canada T4L 1W8 178 pp.

U.S.A. Dry Pea and Lentil Council, 5071 Highway 8 West, Moscow, ID 83843.

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