SDSU
Extension Extra
South Dakota State University / College of Agriculture & Biological Sciences / USDA

ExEx8167
May 2010
Plant Science
3 pages

Camelina Production

Kathleen Grady, Extension oilseeds specialist
Thandiwe Nleya, Extension agronomist, WRAC

I. HISTORY AND DESCRIPTION

Camelina [*Camelina sativa* (L.) Crantz] is an oilseed plant currently being researched as a potential new crop for South Dakota. It is a member of the Brassicaceae (or mustard) family, which includes mustard, canola, rapeseed, Crambe, broccoli, and several other vegetable crops. Camelina is commonly known as gold-of-pleasure or false flax. It originated in Northern Europe and Central Asia, where it has been grown for at least 3,000 years. It was grown as an agricultural crop in Europe and the Soviet Union through World War II. European production dwindled after the 1950s, as rapeseed/canola production increased. Camelina has been grown on a commercial basis in Montana for the last several years. According to the National Agricultural Statistics Service office in Helena, Mont., 22,500 acres of camelina were planted in 2007 and 12,200 acres in 2008.

Camelina is a cool-season crop. Seeds are very small (less than 1/16 inch), oblong, with a ridged surface. They germinate at low temperature (34-36°F), and young plants are very frost resistant. Young plants form a rosette of foliage close to the ground, and then stems elongate (bolt) and become heavily branched before flowering. Small pale-yellow flowers bloom in clusters at the top of the branches. Plants are 2–3-feet tall at maturity. Seedpods are pear shaped and contain 8–10 seeds. Camelina is more resistant to seed shatter than canola.

II. USES

In the United States, camelina is primarily grown as a bio-fuel crop. The seed contains 30–40% oil. Camelina oil is used to produce biodiesel, and the meal co-product can be used as a livestock feed. Camelina oil also has use as a biolubricant and in industrial and cosmetic products.

The oil has a unique composition that may give it even higher value as a food crop. The oil is high in omega-3 fatty acid (alpha-linolenic acid) and also contains antioxidants (tocopherol, vitamin E) that give it a longer shelf life than flaxseed oil. Camelina oil contains 35–40% alpha-linolenic acid, compared to 50–60% for flaxseed oil. It may be used as cooking oil or as an additive to increase the nutritional value of bakery products or other foods.

Camelina meal, the product remaining after the oil has been extracted from the seed, typically contains 10–12% oil and 40% protein. It may be used to enhance the food quality of fish, meat, poultry, and dairy products. Omega-3-enriched meat, milk, and eggs have added value. The FDA allows the use of camelina meal for up to 10% of the total ration, by weight, of diets fed to poultry broilers and has limited approval in Montana for up to 2% of the weight of the total ration fed to feedlot beef cattle and growing swine. However, the meal contains anti-nutritive compounds (glucosinolates) that can reduce livestock performance at high concentrations. Research is currently underway to evaluate the impact of higher levels of camelina or glucosinolates on livestock performance and product quality.

Camelina seed has a gum layer that can be removed and used as a soil amendment to help prevent erosion of exposed soils during construction projects. The gum may also be applied to other crop seeds to aid germination in difficult environments.

III. ADAPTATION

The range of adaptation of camelina has not been fully explored. The flax-growing regions of the upper Midwest should provide a suitable environment. Camelina is more frost-tolerant and reportedly more drought-tolerant than canola. However, excessive heat and drought during flowering and seed set will reduce yields. Claims that camelina may be grown on marginal (low-productivity) land not suitable for the production of other crops remain to be proven. Winter types are available, but the extent of winter-hardiness is not known.

IV. PRODUCTION PRACTICES

A. Rotation and field selection

Camelina should work well in a small-grain rotation. It grows well following wheat, barley, peas, or lentils.

Avoid fields following canola, mustard, or other Brassica crops. There are no broad-leaf herbicides labeled for use on camelina, so it is essential to select relatively weed-free fields for camelina production. Herbicide history should be known for the field selected. No carryover restrictions have been established for camelina, but until such information is available, the minimum application to planting intervals for canola should be followed. The effect of camelina on subsequent crops is still under investigation. No incidences of injury to small grain crops following camelina have been reported.

B. Variety selection

Breeding effort on camelina in North America has been limited. Some European varieties are being grown, including 'Calena', 'Celine', and 'Ligena'. Montana State University released two public camelina varieties in 2007, 'Blaine Creek' and 'Suneson'. Several private companies have camelina breeding programs. Blue Sun Biodiesel released 'Cheyenne' in 2007, and Sustainable Oils and Great Plains–The Camelina Company also develop and market camelina varieties.

C. Seeding

1. Seedbed and seeding method

A firm, moist seedbed is ideal for seeding camelina. No-till seeding has been successful. Camelina may be planted with a grain drill or by broadcast seeding followed by a packer. Good seed-soil contact is essential.

2. Planting date

Camelina is a cool-season crop that benefits from early spring planting. Research in Montana has shown that best yields are obtained when planting is done between March 1 and March 31. Camelina planted later than April 15 showed yield decline of approximately 100 lbs per week of delay.

3. Seedbed depth

Recommendations are to drill seed very shallow (¼ to ½ inch) into a firm seedbed. Good seed-to-soil contact is important. Emergence and seedling establishment is best when the crop is seeded into moist soils. Broadcasting the seed into a clean seedbed has also been used but with limited success. Good seed-to-soil contact is more difficult to achieve with the broadcasting method. Early planting to allow seed incorporation into the soil is recommended when broadcast seeding.

4. Seeding rate

Best stand establishment has been achieved by using seeding rates of 3–5 lbs/acre into good soil moisture conditions. Seeding rates lower than 3 lbs/acre often results in poor germination and low plant populations. No-till fields with high residue levels or where weeds are a potential problem, and dry conditions have been shown to adversely affect germination and seedling establishment. It is recommended to increase seeding rates in such poor seedbed conditions or if seed is broadcast.

D. Fertilizer

Very few fertilizer response trials have been conducted on camelina in the northern Great Plains. While the crop has been generally promoted as a low input crop, adequate fertility is required to produce good yields. Recommendations from Montana State University are to apply 70 to 90 lbs N/acre for a 1,500 lb crop or approximately 1 lb N per 20 lbs seed production. However, under dryland conditions, water is a major limiting factor and growers tend to use lower nitrogen rates. Minimum levels of 30–40 lbs N/a are recommended if expected yields are in the range of 1,200–1,500 lb/a. Camelina has not shown response to P, K, and S where these elements are present in the soil at minimum levels of 12 ppm, 30 ppm and 15 lb/a for P, K, and S, respectively. Further research on fertilizer application rates and methods for camelina grown in varying environmental conditions is needed.

E. Weed control

The only herbicide currently registered for use in camelina (Gold of Pleasure) is Poast®, which provides post-emergent control of grassy weeds. As with all pesticides, read and follow label instructions. Poast has no effect on broadleaf weeds. It is important to select fields relatively free of broadleaf weeds for camelina production. The crop is susceptible to competition from broadleaf weeds in the rosette stage, prior to bolting, but is quite competitive once established. A dense, uniform stand of camelina will defend against weed growth.

F. Diseases and insect pests

Diseases of potential concern to camelina production include sclerotinia stem rot, Alternaria blight, downy mildew, powdery mildew, and blackleg. Most of these diseases are favored by high-moisture conditions, and none have been a major problem in camelina thus far. Likewise, no insect pests have been observed to be of major concern. Camelina appears to be tolerant to flea beetles, which can be a problem in canola. No fungicides or insecticides are registered for use on camelina. Fields should be monitored for insects and disease on a regular basis. Field rotation (3–4 years between susceptible crops) will reduce the chances of developing future insect or disease pest problems.

G. Harvesting

Camelina can be direct cut or swathed and then combined. Direct cutting is the preferred method and may begin once pods turn golden brown and seed moisture is 8 percent or less. Lower plant stems may remain green. The crop should be monitored closely once ripening begins to avoid over-ripening and seed shatter. Header height should be set as high as possible to avoid taking in of excessive green material while still harvesting the entire crop. Although camelina is more resistant to shatter than canola, pods may shatter if batted by the reel, so reel speed should match ground speed. The concave should be opened up to

allow plant material to pass through easily without crushing or cracking of seeds. A 9/64" screen installed over the bottom sieves reportedly produces good separation of the seed from seedpods and stem pieces. Camelina seed is very small and light, so adjust fan speeds accordingly. All equipment used for harvest and transport should be checked for leaks and sealed with tape or caulking.

If green weed material in the crop necessitates swathing, it should be done when the pod color changes from green to about 65% yellow. The crop matures quickly once color change begins, so swathing must be done in a timely manner to prevent seed shatter. Cutting height should be as high as possible to reduce blowing of windrows.

H. Drying and storage

Camelina seed is susceptible to spoiling under high-moisture conditions. Seed moisture should be no more than 8% for best storage

V. PERFORMANCE RESULTS

Camelina varieties supplied by Sustainable Oils were tested at Brookings, S.D., in 2007, 2008, and 2009. Table 1 shows the average, minimum, and maximum yields of the varieties tested.

Table 1. Camelina yields for Sustainable Oils varieties grown at Brookings, S.D.

	2007	2008	2009
Seeding date	April 18	April 18	April 14
		(lbs/acre)	
Average yield	896	1,033	1,283
Minumum yield	722	757	1,148
Maximum yield	984	1,269	1,476
No. of entries	12	20	20

The public variety 'Blaine Creek' and nine varieties from Great Plains–The Camelina Company were tested at Wall, S.D., in 2009. Blaine Creek yielded 494 lbs/acre, and the average yield over all varieties was 600 lbs/acre (table 2). Previous years' trials at Wall tested a number of Blue Sun Biodiesel varieties, along with a few European camelina cultivars. Overall, camelina appears to be poorly adapted to southwestern South Dakota. Hot, dry conditions that prevail during flowering and seed shatter that occurs at crop ripening reduce harvestable yield significantly in this environment.

Table 2. Yields of camelina varieties grown at Wall, S.D.

	2005	2006	2007	2009
Seeding date	April 28	April 13	April 16	April 24
		(lbs/acre)		
Average yield	287	177	330	600
Minumum yield	187	81	238	494
Maximum yield	416	266	442	702
No. of entries	14	16	20	10

In contrast, yields of over 2,000 lbs/acre have been obtained in plot trials at Minot, N.D., and Havre, Mont. Statewide average yield in Montana was 598 lbs/acre in 2007 and 569 lbs/acre in 2008. Irrigated camelina yields of 2,400 lbs/acre have been reported.

VI. ECONOMICS AND MARKETING

Camelina has been touted as a "low-input" crop. It has been shown that good yields can be obtained with timely planting, good management, and adequate moisture. However, this is a relatively new crop and many questions remain about its production and use. Few chemicals have been registered for use on camelina, so rescue of a crop that becomes infested with weeds, disease, or insects would be difficult. Uses of the oil and meal are still under investigation. Presently, the oil can be sold or used on-farm for biodiesel, and the meal can be used in poultry or livestock feed rations on a limited basis. Other high-value uses remain to be developed. Markets are currently geographically limited, and producers should be certain they have a contracted buyer and factor in transport costs before planting camelina.

References/Sources of Information

Ehrensing, D.T. and S.O. Guy. 2008. Oilseed Crops--Camelina. Oregon State Univ. Ext. Serv. EM8953-E. http://extension.oregonstate.edu/catalog/pdf/em/em8953-e.pdf.

Lafferty, Ryan M., Charlie Rife and Gus Foster. 2009. Spring camelina production guide for the Central High Plains. Blue Sun Biodiesel special publication. Blue Sun Agriculture Research & Development, Golden, CO. http://www.gobluesun.com/upload/Spring%20Camelina%20Production%20Guide%202009.pdf.

McVay, K.A., and P.F. Lamb. 2008. Camelina production in Montana. MSU Ext. MT200701AG (revised). http://msuextension.org/publications/AgandNaturalResources/MT200701AG.pdf.

Putnam, D.H., J.T. Budin, L.A. Field, and W.M. Breene. 1993. Camelina: A promising low-input oilseed. P. 314-322. In: J. Janick and J.E. Simon (eds.), New Crops. Wiley, New York.

South Dakota Cooperative Extension Service

SDSU

EXEX8167 Access at http://agbiopubs.sdstate.edu/articles/ExEx8167.pdf.