

Growing Canola for Oilseed or Cover Crop Use

Canola is a European crop that migrated to America, with a stop in Canada along the way. In fact, the crop we call canola is actually a type of European rapeseed that was developed by Canadians, using conventional plant breeding, into a food crop providing healthier and safer vegetable oil for human food use. The name “canola” derives from the phrase “Canadian oilseed low in acid.” Canadian plant breeders worked for many years to develop varieties of canola that had lower levels of erucic acid, and also lower levels of glucosinolates. These efforts by Canadian scientists during the 1960s and ’70s produced the healthier types of rapeseed we now call canola. Worth noting is that high erucic acid rapeseed (HEAR) continues to be grown for nonfood markets (see more on HEAR in the “plants related to canola” section on page 6).

Grown in many countries, canola is now considered the second biggest oilseed crop in the world after soybeans. The European Union is the largest producer of canola, followed by China and then Canada. U.S. farmers typically grow 1.5 million to 2 million acres of canola, which is only about a third of the amount of canola used in the U.S. Thus, opportunity exists for significantly expanded production of canola to meet domestic demand. A limiting factor has been the number of processing and delivery points for farmers interested in growing canola. Much of the canola imported into the U.S. comes from Canada, which produces almost ten times the canola compared to U.S. farms. The biggest canola-growing region in the U.S. is the Northern Plains, particularly North Dakota with over a million canola acres. Oklahoma, Kansas, Minnesota, Montana, and Washington also have tens of thousands of acres each of canola production. Canola has been grown on a small number of farms in Missouri on and off since the late 1980s, mostly in the southern half of the state.

In general terms, canola is similar in geographic adaptation to wheat, with both winter and spring types of canola as with wheat. Winter canola is a group of varieties that need to be planted in the fall and are ready for harvest by early to mid-summer. Spring canola, like spring wheat, is planted in early spring and harvested in



Figure 1. Canola field in spring bloom. (Photo credit: R. Myers)

the latter half of the summer. Both spring and winter canola have been tested in Missouri, but the clear advantage has been for growing winter canola, due to both higher yields and less insect pests. The earlier harvest of winter canola also makes double-cropping possible after canola harvest with a second crop like soybeans or sunflowers.

Uses of canola

Vegetable oil

Canola is one of the major oilseed crops grown in the world, with most vegetable oil produced from canola seed used for cooking oil or as part of human food products such as crackers, chips, breads, and other foods containing vegetable oil. The demand for canola oil stems in part from the fact it is lower in saturated fats than other vegetable oils. Canola oil is also relatively high in omega-3 and moderately high in vitamins E and K. For cooking use, it is considered to have a neutral flavor and it has a high heat tolerance. One notable fact for moviegoers is that some cinema chains have switched to canola oil for making their movie theater popcorn due to the health benefits of canola oil; other theaters continue to use coconut oil for popcorn, despite coconut oil being much higher in saturated fats.

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Biodiesel

Biodiesel is fuel derived from renewable resources, as opposed to diesel fuel, which is from nonrenewable petroleum. The majority of biodiesel currently on the market comes from vegetable oils, but it can also be made from animal fats. Among the vegetable oils, canola in Europe was the first vegetable oil to be routinely used to make a biodiesel substitute for diesel fuel, particularly in Germany. In Germany and a few other European countries, farmers deliver their canola crop to a cooperatively owned processing facility where the seed oil is converted into biodiesel and the remaining seed material, called “meal,” is used for livestock feed. The farmers use the biodiesel to run their tractors and other equipment on their farms. In the United States, biodiesel is much more commonly made from soybean oil than canola, but there is a modest amount of canola used in biodiesel in the states, mainly in the Northern Plains. Canada also generates millions of gallons of biodiesel from canola.

Livestock feed

While 38 to 45 percent of the canola seed is vegetable oil (fats) and is used for that market, the remainder of the seed consists of carbohydrates and protein solids and is processed as meal for use in livestock feed. This is true of all oilseeds, and while the oil is the highest-value part of the seed, a good price needs to be obtained for the remaining seed meal in order for the crop to be profitable. Canola meal is considered a decent feed material for a variety of livestock, and can be substituted for soybean meal, but the protein content is lower than soybean meal; canola meal crude protein is typically 36 to 39 percent versus 45 to 48 percent in soybean meal.

The method of canola processing will affect the fat content of the remaining seed meal. Removing the oil with an expeller involves squeezing the seed to get the oil out, which leaves more oil in the meal than using solvent chemicals to extract the oil. Sometimes higher fat meal is desired for some livestock rations, but because the oil is more valuable than the meal, high fat meal should be priced higher than regular meal.

When mixing any livestock feed, including canola meal, ration-balancing should be done to get the right blend of fats, proteins, and carbohydrates. Consideration should also be given to palatability and any anti-nutritional factors. For all these reasons, canola meal is generally limited to 10 to 20 percent of the ration of various livestock feed mixes.

While unprocessed canola seed can in theory be fed to poultry, cracking the seed coat is recommended to improve digestibility of the seed. Thus, a grinder or some type of processing equipment is usually used with whole seed before feeding it to livestock. Grinding whole seed

canola for poultry or other livestock feed has the benefit of providing a high-fat food source, but as with canola meal, the percent of the livestock ration for ground canola seed is typically 20 percent or less.

Cover crop

The dramatic growth in cover crop use across the U.S. has led to an interest in finding the best species of plants for various cover crop needs. The first member of the mustard family to gain popularity for cover crop use was radishes, followed by turnips (popular for cattle grazing). Both radishes and turnips normally winterkill in the central and northern parts of the Corn Belt, a fact that has been considered a plus for many first-time cover crop users who want a cover crop that's easy to manage. However, as farmers have gained experience with cover crops, many find they value a cover crop that will survive the winter and provide additional soil protection and soil health benefits in early spring before a summer cash crop is planted. For that reason, some farmers have been turning to canola or rapeseed for use as an overwintering cover crop. From a cover crop standpoint, there is little if any difference between winter canola and winter rapeseed varieties; there may be a slight difference in impacts on certain pests due to higher glucosinolate levels of rapeseed, but that is not sufficiently well-studied. For cover crop use, finding readily available seed and selecting a variety with good winter hardiness is generally more important than whether the variety is a canola or industrial rapeseed type. Dwarf Essex rapeseed is a variety sometimes sold by cover crop seed companies. It is a winter type of industrial rapeseed, and while commonly available, appears to produce less biomass in Missouri than some of the better canola-type varieties.

In planting canola as a winter cover crop, farmers should make sure they are getting a true winter canola rather than a spring canola variety, which will not normally overwinter in Missouri (assuming that winter survival is desired). Depending on where the canola is used in the rotation, some consideration should be given to a light fall nitrogen application to encourage good growth and enhance the odds of winter survival; if following soybeans, fall nitrogen fertilization will be less critical than if following corn or winter wheat. A rate of 30 to 50 pounds of fall nitrogen can make a big difference in whether canola survives the winter. Some other factors that will enhance winter survival of canola, as described in the planting section of this guide, are earlier planting date (August or first part of September) and a low seeding rate.

To terminate the canola cover crop in the spring, it can be sprayed with glyphosate or, after flowering is finished, rolled or mowed. Rolling or mowing the canola

too early in the spring is likely to result in regrowth of the canola, requiring a chemical application to control it. Tillage is another option for termination. But excessive tillage is discouraged from a soil conservation and soil health standpoint.

A canola cover crop can also be grazed with cattle, though excessive grazing in late fall will reduce the odds of winter survival. If grazing is a major goal with a cover crop system, some of the winter cereals would likely prove to be the more profitable option, but canola can certainly be part of a system of providing some diversity in forage material and crop rotation. If grazing a pure stand of canola, roughage in the form of hay or cornstalks is needed to balance the diet. Alternatively, the canola can be planted in a cover crop mix with cereal crops such as oats, wheat, or triticale.

Place of canola in the crop rotation

In Missouri, as in many other states, canola often replaces wheat in the rotation. In primarily wheat-growing areas, canola may be rotated with wheat, but in Missouri, the rotation is usually with corn and soybeans. Canola growers in southern Missouri will typically grow corn, plant canola in September following corn harvest, then plant soybeans immediately after canola harvest the next June. This provides three crops in two growing seasons, and a nice diversity of crop types. The canola essentially provides a cover crop in the season between the corn and beans, similar to winter wheat which is used in the same way. A good rotation that includes both wheat and canola in southern Missouri is to plant a rotation of corn-canola-soybeans followed by corn-wheat-soybeans. A cover crop of oats alone or mixed with crimson clover can be used following soybeans in this sequence to give a good overall program of plant diversity, with seven to eight species of plants grown in a four-year period. The four-year cycle of using canola also helps reduce any chance of disease from growing canola too often; it's generally best to not grow canola in a field more than once every three years if possible. Having canola in a rotation is believed to help reduce the number of soybean cyst nematodes, though it does not eliminate them.

Double-cropping

Winter canola has proven to work well for double-cropping systems in Missouri. An advantage some Missouri farmers have commented on is that canola leaves less residue than wheat, making it easier to plant double-crop soybeans. One caution is that canola, like wheat, will leave some seeds in the field after harvest, and those seeds are likely to sprout after a rain, creating potential competition for a double crop such as

soybeans. Fortunately, many broadleaf herbicides labeled for soybeans will control canola, as will glyphosate (assuming a Roundup Ready canola variety was not used). Other double crops that can be grown after canola in southern Missouri besides soybeans include sunflowers, sorghum, cowpeas and pearl millet.

Using canola with cover crops

If canola is grown as a cash crop for seed harvest, it can still be used with cover crops to create a diversified crop rotation. The general approach depends on whether a double crop will be planted after canola harvest. In the southern half of Missouri, the most profitable system is to plant soybeans or possibly sunflowers after the canola harvest. Another option in all parts of Missouri is to plant a mix of forage species that grow fast in warm weather, such as a mix including sorghum-sudan or pearl millet, and get a good amount of forage growth for fall grazing. In northern Missouri, where double cropping may not be feasible due to earlier fall frosts, a diverse mix of covers can be planted after canola harvest to improve the soil ahead of corn or soybeans the next year. Alternatively, a short season summer cover could be planted like buckwheat or cowpeas for soil improvement and then winter wheat can be planted in October.

Varieties

The first thing to pay attention to in ordering canola varieties is to get the winter type of canola for use in Missouri, rather than the spring type used in more northern states. Secondly, some types of winter canola are hybrids and some are open-pollinated. There are good yield varieties of both hybrids and open-pollinated types, so it's worth studying the latest canola variety trial results to identify superior varieties. A link to the latest canola variety trial information can be found on the U.S. Canola Association website (see the "more information" section).

A third factor to consider with winter canola is whether to buy an herbicide-resistant variety or not. There are two types of herbicide-resistant winter canola varieties currently on the market. One type is Roundup Ready varieties tolerant of glyphosate; those are considered GMO varieties. The other is Clearfield varieties tolerant of Beyond herbicide. Clearfield varieties are nontransgenic, having been developed by conventional plant breeding, and therefore meet non-GMO market standards. Some farmers prefer not to use herbicide-resistant varieties, particularly Roundup Ready material, to avoid issues with controlling canola volunteers in a following rotation crop. Since weeds are not a major issue with winter canola, having

an herbicide-resistant variety may be of less benefit compared to some crops.

Planting

Site selection and winter survival

Canola is adaptable to a range of soils, but the one situation to avoid with winter canola is poorly drained soils which can reduce winter survival of canola. Generally, canola winter survival is better on fields with some slope for surface drainage or soils with decent internal drainage.

Much of the fall management with winter canola needs to be done with the goal of maximizing the size of the canola crowns going into the winter months. The crown of the plant is the storage tissue that forms at the top of the root, just below the stem. Several management practices affect the size of the crown, including plant population, seeding date, and nitrogen and phosphorous fertilization. Reducing the chances of the crown being pushed out of the soil (heaving) in early spring is also important. Having good soil drainage, a firm seedbed, and residue depth can all affect the heaving process.

Canola seedlings are sensitive to some broadleaf residual herbicides that are used on corn or soybeans in Missouri. Therefore, careful attention should be paid to locating canola in a field where potential herbicide carryover problems do not exist. Making adjustments to the herbicides used on the preceding crop before canola may be needed to avoid issues. If there is uncertainty about whether a residual herbicide will create a problem, a small amount of canola can be hand-seeded in the relevant field in early August and watered to help it establish. If those canola seedlings can survive past a few weeks, the field is probably acceptable for planting in September.

Seeding depth and seedbed preparation

As a small-seeded crop, canola seedlings need to be planted shallow, typically at half an inch. The traditional thinking with canola has been to prepare a seedbed that is finely tilled to accommodate the relatively shallow seeding depth of canola, and then to firm up that seedbed with a roller or at least a good set of press wheels along the furrow. Canola seems to survive winter better when grown in a firm as opposed to a fluffy (loose) seed bed.

Canola can be successfully grown in a no-till situation. However, attention should be given to achieving uniform seeding depth and managing for any insect pests that may attack the emerging canola seedlings. If canola is the only green thing in the field after it starts to emerge in the fall, a number of insects

may attack it in a short period of time, making the seedlings seem to disappear almost overnight. Either daily scouting is in order under no-till or heavy residue situations until the canola is a couple of inches tall, or a preventative insecticide may be needed (scouting is preferable if possible to avoid possibly unneeded pesticide application).

Seeding dates

Winter canola needs to be planted a few weeks earlier than winter wheat. For the southern part of Missouri, seeding should be completed by late September and preferably a week or two earlier than that. In central Missouri, the cutoff date for planting is about mid-September. In northern Missouri it should be planted by the first week in September. Canola planted later than these target dates may establish but will have a much harder time getting through the winter.

Planting too early is also not advisable because of the chance of the canola plants starting to flower (bolt). For example, canola planted in July is likely to bolt in the fall, and once that happens, winter survival of the plants is much less likely. In northern Missouri, canola should be planted no earlier than about the third week of August, and in the rest of the state, seeding should wait until the beginning of September.

Seeding rate

Relatively low seeding rates can work well for canola. A low seeding rate provides the advantage of less crowding among plants growing in the fall, leading to larger crown sizes and better winter survival. On a weight basis, the seeding recommendation is to drill about 3 pounds of canola seed per acre. As long as at least one to two plants are established per square foot on a uniform basis, yield potential should be unaffected. Canola has a great ability to compensate for thin stands by producing many pod-bearing branches in the spring.

Row spacing

Most farmers use a grain drill to plant canola, with a narrow row spacing in the 6 to 7.5 inch range. Row spacing of up to 15 inches can be used if applicable to the available planting equipment, though narrower rows are generally preferred. A row spacing that is too wide can lead to more erosion in the winter and require plants to be more crowded within the rows, leading to smaller crown sizes.

Fertility management and pH

Proper fertilization is essential for optimizing canola yield and profit. Like most non-leguminous crops, canola is particularly responsive to nitrogen fertilizer, and benefits from both a fall and spring application

of nitrogen. A typical application rate for nitrogen is 40 to 50 pounds in the fall near planting time and then 80 to 100 pounds in late March or early April. If canola follows a legume in the rotation, the nitrogen rates can be cut back by 20 to 30 percent depending on the legume. Canola fall growth also benefits from phosphorous fertilization on soils with a P test less than “high,” and often an application of sulfur can be beneficial. A rate of 20 to 30 pounds of sulfur is recommended on low sulfur soils, and 10 to 20 pounds on moderate sulfur soils. Potassium is less critical for fall growth in canola but should be applied if soil test levels are low. Soil pH should ideally be in the range of 6.0 to 7.0 for best canola growth, but canola can generally tolerate a pH of 5.5 to just over 8.0.

Pest management

Weeds

As a winter annual crop in Missouri, canola generally has few serious weed problems. However, attention must be paid to starting canola off well in fall and minimizing weed competition as seedlings are getting established. If that can be accomplished, usually little other weed control is needed due to canola’s vigorous growth and tendency to shade out and smother other weeds. If a field is relatively weed-free with some residue cover that reduces weed emergence, it might be possible to establish a field of canola in the fall without herbicides. However, most farmers do use some fall herbicides to ensure a weed-free crop stand is obtained.

Fall herbicide options include Treflan (trifluralin) and Sonalan (ethalfluralin) for preemergent weed control, and Select (clethodim), Assure II (quizalofop), or Poast (sethoxydim) for postemergent grass control. Stinger (clopyralid) is a postemergent broadleaf herbicide labeled for canola. For broad-spectrum postemergent weed control, in Roundup Ready varieties, Roundup (glyphosate) can be used; similarly, for Clearfield varieties, Beyond (imazamox) can be used.

Diseases

The main disease that can affect winter canola in Missouri is white mold stem rot (*Sclerotinia sclerotiorum*). Blackleg is another fungal disease that can occasionally occur with some potential to reduce canola yield. Using a diversified multiyear crop rotation and avoiding poorly drained fields can help reduce incidence of these two diseases in canola. Once an outbreak occurs, little can be done, but generally yield loss will be minor. A fungicide can be applied early in the growth cycle to reduce chance of disease, but such preventative applications do not usually pay for themselves in

Missouri. Another disease that occasionally shows up on plants but is normally minimal is aster yellow, which is caused by phytoplasmas. The flowers on an affected plant have a distorted appearance and do not develop seed pods. There is no particular control for aster yellow but the chance of any significant yield loss from aster yellow is small. More details on canola diseases (and other pests) can be found in the Great Plains Canola Production Handbook (see the “more information” section).

Insects

Winter canola in Missouri is seldom seriously affected by insect pests with one notable exception: during the very early seedling phase, canola seedlings are susceptible to being completely killed by insect pests, particularly in high residue environments, such as planted no-till into wheat stubble. In high residue situations either a preventative insecticide application should be considered or almost daily scouting during the seedling emergence stage is recommended, with prompt insecticide treatment as needed. Once the canola seedling is two to three weeks past emergence, the danger is over and a little insect nibbling is usually easily tolerated by the growing plants. Around that stage, the weather starts to turn cold and insect activity drops off naturally. Spring time insects will eat some on canola leaves but rarely cause any significant damage. Attention should be given to the developing canola pods to make sure they are not being too badly damaged, but again, any extensive damage to the pods would be unusual based on past experience in Missouri.

Harvesting

The process of harvesting winter canola is almost identical to harvesting winter wheat or other small grains. The same type of harvesting equipment is used in Missouri, which is to direct combine the crop and haul it off with trucks or wagons. One difference from wheat is that canola seed is more likely to leak out of cracks in trucks, so duct tape may be needed for larger gaps. Also, as a dark-colored seed high in oil content, canola can heat up quickly when sitting on a truck, so it should not be left out on a truck in hot sunlight for a prolonged period.

In some regions of the country, farmers like to swath canola to aid the dry down process, but direct combining has proven to work well in Missouri. The higher humidity in Missouri versus more western states reduces the amount of seed shattering that occurs. However, to get uniform dry down of the crop, some farmers in Missouri like to apply a desiccant such as Reglone (diquat) a week ahead of harvest by airplane or high clearance sprayer. If Reglone is applied, it should be done

when about 60 to 75 percent of the seed has turned from green to brown. Whether or not a desiccant is applied, harvesting should start when pods have turned tan or brown. Harvesting should be done on a timely basis to avoid seed loss.

Typical combine settings are:

- Cylinder speed: 450 to 650 rpm
- Upper sieve: ¼ to ⅜ inch
- Lower sieve: ⅛ to ¼ inch
- Concave: ¾ inch in front and ⅛ to ¼ inch in rear
- Air (fan) speed: 400 to 600 rpm

Storage, test weight, and transportation

The recommended maximum seed moisture for short-term canola storage is 10 percent, and long term storage should be at 8 percent or less. Given that canola is a small seed that packs densely together, drying canola with forced air in a grain bin can take more time and effort than some larger seeded grains. Fortunately, canola usually dries down well in the field before harvest.

As was noted in the harvest section, canola leaks out of small gaps in trucks or storage very easily, so taping or caulking small gaps before transporting or storing the seed is necessary. Canola being truck transported should be tarped to prevent blowing seed.

For most markets, standard test weight for canola is 50 pounds per bushel.

Marketing and economics

Canola is normally marketed similarly to other commodity crops, with the main difference being that there are fewer grain elevators that accept delivery, especially in a state like Missouri where the acreage is small. At the time of writing this publication, there were no regular delivery points in Missouri, and farmers growing the crop were trucking it to facilities in Oklahoma, Kansas, or elsewhere in the south. However, if enough growers were willing to collaborate, it would be possible to set up a local delivery point and then send the grain on to processing at a relevant facility.

Since there is no current processing of canola in Missouri, cost of transportation does eat into profits. Over the last 20 years, there have been many years where potential income from canola exceeded typical income from winter wheat in Missouri, if transportation costs were equivalent. Unfortunately, with the higher transportation cost for canola, the profit advantage over wheat often disappears. Still, the advantage canola can provide for diversifying a rotation can provide an economic boost to other crops in the rotation by

disrupting pest cycles and contributing to improved soil health.

Cost of production for canola is very similar to winter wheat, other than the postharvest cost of transportation. In some cases there may be slightly higher fertilizer costs for canola, such as when sulfur is applied, or there may be an application of a desiccant to dry down the crop that would not typically be done with wheat, but otherwise costs should be equivalent.

Yields of canola in Missouri have typically been in the 2,000 to 2,500 pound per acre range. This is lower than wheat and lower than the canola yields obtained in some states, so while canola is certainly adapted to Missouri, it is not necessarily the optimum environment for growing it. Still, there is potential to make a profit off canola depending on the market price available and keeping transportation and production costs in check. Current canola prices can be easily found through an internet search by looking at pricing for selected elevators and cooperatives in Kansas and Oklahoma.

Special notes about plants related to canola

Canola is part of the mustard family of plants, what botanists call the Brassicacea. Within that family, there are many plant species of economic importance, although canola occupies by far the largest acreage worldwide. A close sibling of canola is high erucic acid rapeseed, sometimes referred to by its acronym HEAR or simply called industrial rapeseed. Industrial rapeseed plants look identical to canola but they differ from canola in being a group of varieties that have higher levels of erucic acid in the seed. Erucic acid is a valuable material for certain industrial products, including as a slippage agent in plastics (for example, helps keep the plastic in a bread wrapper from sticking together), but it is undesirable in food products, and thus was bred out of canola varieties.

Both winter canola and winter rapeseed varieties are part of the species *Brassica napus*. Most spring canola varieties are also classified as *Brassica napus*, but in recent years, a small number of canola-type spring varieties have been developed from other species such as *Brassica rapa*, *Brassica juncea* and *Sinapsis alba*.

While industrial rapeseed is like an immediate sibling of canola, other plants in the mustard family are more akin to cousins, including the various mustard plants used for condiments. For example, among the mustards, there are the white and yellow mustards (*Brassica alba* or also classified as *Sinapsis alba*), black mustard (*Brassica nigra*) and brown mustard (*Brassica juncea*), which is also known as Indian or oriental mustard (or by many other common names, as is the case with

most of these mustards). Other plant “cousins” include turnips (*Brassica rapa*), radish (*Raphanus sativa*), and other common garden vegetables that are part of the *Brassica oleracea* species, such as broccoli, cabbage, and cauliflower.

Also worth noting are the wild cousins of canola that show up as eye-catching yellow patches of flowers in the spring, sometimes confusing people who think they saw a canola field. In the Midwest, the most common weedy cousins of canola that have similar yellow spring flowers are yellow rocket (*Barbarea vulgaris*) and wild mustard (*Brassica kaber*, also labeled as *Sinapsis arvensis*). These wild weedy members of the mustard family are not generally a problem for corn or soybean production

but can be troublesome if they occur in canola fields, or sometimes in winter wheat fields.

More information

The U.S. Canola Association, a nonprofit farmer-focused organization, maintains a website with a variety of information on canola, including information on canola variety testing. They also publish a free online monthly newsletter on canola. More information on the association is online at <http://uscanola.com>.

A detailed, university-developed grower manual on canola, called the Great Plains Canola Production Handbook, is available online at <https://agronomy.k-state.edu/extension/crop-production>.