MARYLAND COOPERATIVE EXTENSION
UNIVERSITY OF MARYLAND
COLLEGE PARK•EASTERN SHORE

Fact Sheet

Fact Sheet 635

Canola Production Guidelines

What Is Canola?

Canola is a modern, high-quality form of rapeseed. Rapeseed is a member of the *Brassica* (Mustard) genus of plants, which includes popular garden plants such as cabbage, turnip, kale, cauliflower, kohlrabi and rape. Agricultural varieties of the *Brassica* genus fall into three groups--cabbages, swedes and turnips. The swede group is currently attracting the most interest in the United States and Canada because it includes the oil-bearing rapes. Some varieties of rape have been used as a forage crop since the 13th century and can be found today over much of Europe, Asia, Canada and the United States Canola, bred from these earlier plant cousins, is a relatively new crop and is more commonly known as oilseed rape or rapeseed. The name Canola is a registered trademark of the Canola Council of Canada.

Canola is rapidly gaining value as an agronomic crop. Its seed, when crushed, contains as much as 40 percent vegetable oil. The oilmeal that remains after crushing contains approximately 33 percent protein, 8 percent fat and 10 percent fiber. Canola, also known as double-zero or double-low oilseed rape, was developed by plant breeders for the production of an edible vegetable oil and oilmeal low in saturated fats. The oil from improved varieties of rapeseed has important potential in the human diet as a cooking oil, while the oilmeal can be an important source of protein for animals. Canola is distinguished from other forms of rapeseed by its low levels of erucic acid--a long-chain fatty acid found in edible vegetable oil that can cause adverse health effects in large amounts--and glucosides--toxic sulfur compounds contained in oilmeal that, in large amounts, may be injurious to livestock.

Benefits of Growing Canola

Canola is a new crop in Maryland Although there will be, at least initially, some difficulties with growing Canola because of insects, diseases, harvest and other problems, the potential benefits to Maryland farmers far exceed any potential disadvantages. Most of these problems can be minimized or eliminated through careful management and continued experience in growing Canola.

Some of the important advantages of growing Canola include

- Canola will generate more income than wheat when yields are comparable because of Canola's higher value per bushel.
- Canola fits easily into a double-crop rotation with soybeans, substituting for wheat or barley.
- Canola can be produced with the same equipment required for wheat production.
- Canola reduces weather risks by allowing production of an oilseed crop during the winter when drought is not as likely as during the summer.

Factors Affecting the Growth of Canola

Since Canola is a new crop in Maryland, knowledge is limited about the factors that affect its growth. However, guidelines have been established to promote successful production of Canola in Maryland. The guidelines presented in this fact sheet cover how to

- Select a Canola variety.
- Establish planting dates and methods.
- Decide which and how much fertilizer to use.
- Choose when and how to harvest.
- Determine the advantages of double-cropping.
- Administer effective pest management.

Varieties

There are both fall- and spring-seeded types of Canola. Research has found that the spring-seeded varieties are better suited to the cooler northern latitudes, such as Canada, where winterkill is a problem; the fall-seeded winter varieties are most useful in the more southern latitudes, such as Kentucky, Maryland and Virginia.

Most of the variety development research has been conducted by Canadian plant breeders, pathologists, physiologists and crop quality chemists, although significant breeding work is now being carried out in the United States. New lines have been selected for improved quality, yield, disease resistance, test weight, winter hardiness, lodging resistance, early maturity, oil content and triazine herbicide tolerance.

Variety testing has been underway at the University of Kentucky for some time, and more recently at Virginia Polytechnic Institute and State University. Some of the results from these two experiment stations are presented in Tables 1 and 2.

Table 1. Virginia Canola variety trials from the Eastern Virginia Research Station, Warsaw[a]

Variety	Yield (bushels per acre)	Test weight1[b] (pounds per bushel)	Height (inches)	Relative maturity[c] (days)	Lodging (percent)
Ceres	70.9	44.1	53	16	0
Diadem	70.2	45.2	54	23	1
AMC 106	70.0	44.8	52	14	0
AMC 105	69.6	45.6	55	16	0
AMC 110	68.6	45.8	58	23	0
AMC 118	68.4	43.2	50	18	0
Winfield	66.7	42.9	48	14	0
AMC 112	65.4	47.3	54	20	4
AMC 114	64.8	45.9	55	20	5
AMC 120	64.8	45.4	53	20	5
Allstar	62.9	45.5	52	14	10
001	61.6	45.6	47	9	0
Cobra	61.3	43.8	50	14	0
CC1	60.1	44.8	52	10	0
Arabell	58.3	43.6	57	22	4
Cascade	56.4	44.7	48	10	5
Touchdown	56.4	44.7	57	20	5
CE 1017	56.3	44.7	49	10	2
AMC 115	56.1	44.4	53	20	0
CE 1019	55.3	44.2	55	21	8
CE 1018	54.2	455	47	13	2
CE 1016	53.6	44.0	47	8	0
Lirabon	53.0	44.6	54	17	0
Crystal	52.8	41.6	55	18	0
Liborius	52.3	45.5	57	20	0
Lindora	50.5	44.6	56	15	2
$LSD_{(.05)}$	8.6	2.4	2	4	6

[a]Source M. Alley and R. Sagaral, Virginia Polytechnic Institute and State University 1989-90.

[b]A standard bushel of Canola weighs 50.0 pounds.

[c]Relative maturity is given as days after June I

Table 2. University of Kentucky Canola variety trials[a]

Variety	Princeton			Lexington	Company
	1988	1989	Average yield (bushels per acre)	1989	
Ceres	--	67.6	--	45.5	Ameri-Can
Cobra	--	65.4	--	42.6	Ameri-Can
Liborius-00	--	63.7	--	42.3	Canola, Inc.
Lirabon-00	67.9	63.1	65.4	46.3	Canola, Inc.
Diadem	--	58.1	--	51.3	Ameri-Can
Touchdown	78.5	57.5	67.9	43.1	Allelix
Winfield	85.0	56.4	70.6	42.7	Allelix
Lindora-00	68.6	56.0	62.2	45.3	Canola, Inc.
Allstar	72.1	46.2	59.1	44.7	Allelix
Cascade	52.4	39.1	45.7	21.6	Ameri-Can

[a]Source: J. Herbek and L. Murdock, University of Kentucky. 1988-89.

Planting

Ensuring the highest probability for profitable production of Canola requires making effective planting decisions. Among those decisions are selecting the proper date, method of planting and seeding rate to obtain optimum stand.

Date. Little research has been conducted to determine the best production practices for the Mid-Atlantic area. However, limited research in Kentucky indicates that Canola should be planted early enough in the fall so that sufficient growth is attained to minimize winterkill. This normally means that plants should attain a height of 8 to 10 inches before freezing temperatures occur. Experience so far indicates that Canola should be planted 3 to 4 weeks ahead of winter wheat for the plants to develop adequate root systems and crowns that can resist winterkill.

Method. Canola seed is much smaller than alfalfa seed and dark gray or black. Canola can be seeded successfully using methods similar to those used for planting alfalfa. The most promising methods are drilling and, to a lesser extent, broadcasting (using a cultipacker seeder). For either method to work satisfactorily, a well-prepared seedbed is necessary. In some cases, no-till seeding has been attempted using paraquat or glyphosate for existing weed control. However, this method has resulted in lower yields and poorer stands than the drill or conventional broadcast methods.

The use of a good drill, calibrated to handle small seed, seems to provide the best stands. Because of the small seed size, planting depth must be shallow. If soil moisture is limited and seeding depth is three-eights of an inch or less, germination and stands may be reduced. Precise drilling will place the seed slightly deeper into the soil, improving chances of more acceptable germination during dry weather. For best results in medium- to heavy-textured soils, seed should be placed three-eighths to one-half of an inch deep. In coarse-textured sandy soils, seed should be placed three-fourths of an inch to an inch deep, but never deeper than an inch.

Seeding rate and stand. Canola should be seeded at a rate of 4 to 8 pounds per acre, depending upon the method of seeding. For drilling or broadcasting, use rates of 4 to 6 pounds per acre or 6 to 8 pounds per acre, respectively. For top yields, a stand of five to seven plants per square foot should be the goal.

University of Kentucky data indicated that yields were not reduced significantly even at five plants per square foot. It was not until stands dropped to three plants per square foot that there was any significant reduction in seed yields (Table 3).

Table 3. Canola stand density and yields from Princeton, Kentucky[a]

Stand density (plants per square foot)	Harvest counts (stems per square foot)	Yield (bushels per acre)	Percentage yield
8	8.0	74 a[b]	--
6	60	74 a	100
4	4.2	68 a	92
3	4.2	60 b	81
2	4.5	53 b	72
1	4.7	44 c	60

[a]Source: J. Herbek and L. Murdock, University of Kentucky. 1988-89.
[b]Values followed by the same letter are not significantly different

Fertilizer

Soil fertility requirements for Canola appear to be very similar to those for wheat. Soils should be tested before seeding. Phosphorus and potassium should be applied according to soil test results and in amounts similar to those required by wheat. For example, at medium soil test levels, 60 to 80 pounds per acre each of P_2O_5 (phosphorus) and K_2O (potash) should be satisfactory. Soil pH should be between 6.2 and 6.5 for best results. Lime should be applied if the soil-test-based recommendation calls for it.

Similar to other high-protein crops, Canola is sensitive to sulfur deficiency. Sulfur is an essential element in several amino acids, which are the building units for protein; therefore, crops such as Canola that are high in protein will also have a high requirement for sulfur. Low soil sulfur levels can be corrected with an application of 20 to 40 pounds per acre of sulfate sulfur.

Nitrogen requirements. Nitrogen is required in relatively large amounts by Canola plants. According to the Canola Council of Canada, a 35-bushel-per-acre crop will contain, at maturity, about 105 pounds of nitrogen per acre in the above-ground portion of the plant. Assuming an average seed nitrogen content of 3.8 percent, harvesting 35 bushels per acre of Canola seed would remove 66 pounds of nitrogen per acre from the soil. A 50- or 70-bushel-per-acre crop would remove 94 or 132 pounds of nitrogen per acre, respectively.

Part of the Canola crop's nitrogen requirement should be applied in the fall at seeding as a starter fertilizer, particularly on nitrogen-deficient soils. In the fall of 1989, University of Maryland System researchers conducted a test on a Galestown sandy loam soil where four Canola varieties received 0, 20 or 40 pounds of nitrogen per acre at seeding. The nitrogen was supplemented with 30 pounds per acre each of P_2O_5 and K_2O and I pound per acre of boron. The seed yields harvested in mid-June of 1990 are reported in Table 4.

Table 4. Influence of starter nitrogen on four Canola varieties[a]

Variety	Nitrogen (pounds per acre)			Average
	0	20	40	
001	39.7	48.8	41.8	43.4
CCI	39.4	47.9	50.8	46.0
Liborius-00	34.8	44.7	49.7	43.1
Lirabon-00	31.5	37.7	38.8	36.0
Average	36.4	44.8	45.3	

[a]Source: University of Maryland System, Lower Eastern Shore Research and Education Center, Poplar Hill Facility, Quantico, Maryland 1990.

From the results of this test, it appears that 20 pounds per acre of nitrogen at fall seeding increased yields by about 8 bushels per acre. If Canola seed sells for $4 to $6 per bushel, this level of management appears to have the potential of being quite profitable.

Research data indicate that the total nitrogen requirement for Canola is similar to that of high-yielding, intensively managed wheat. It is recommended that a well-managed Canola crop receive about 120 to 150 pounds of nitrogen per acre. Most of this should be topdressed in the spring, the same as with wheat.

In another University of Maryland System test in 1989-90, two Canola varieties were seeded in early October on a Matapeake silt loam soil. Fall fertilization consisted of 300 pounds per acre of 5-10-10 broadcast before planting. An additional 80 pounds per acre of P_2O_5 and K_2O and I pound per acre of boron were broadcast in early February. Single nitrogen applications were also applied at this time. Split nitrogen applications were applied in mid-March. The yield results for this test are given in Table 5.

Table 5. Influence of nitrogen rate and split versus single nitrogen applications on grain yields of two Canola varieties[a]

Nitrogen treatment (pounds of nitrogen per acre)	Variety		
	Lirabon-00	Liborius-00	Average
	Bushels per acre		
0	14.1	12.5	13.3
80	32.7	32.4	32.6
100	35.4	39.8	37.6
120	43.7	45.2	44.4
140	48.6	50.0	49.3
80+40	39.4	44.0	41.7
40+80	50.0	42.4	46.2
$LSD_{.05}$	--	--	8.3

[a]Source: University of Maryland System, Lower Eastern Shore Research and Education Center, Poplar Hill Facility, Quantico, Maryland. 1989-90.

Maximum yields were obtained on this nitrogen-responsive soil with 120 to 140 pounds of nitrogen per acre topdressed in February at green up. Split nitrogen applications were not superior to the single application in this case, probably because this was a fine-textured silt loam soil from which nitrogen was slow to leach. If this had been a coarse-textured sandy soil where leaching could have been a problem, or had excessive precipitation caused more than normal leaching to occur, the split application may have been better.

As with fertilizing other small grains, any nitrogen applied in the fall should be adequate to support good root and above-ground growth so that the plant can resist winterkill. Normally, an application of 25 to 30 pounds of nitrogen per acre at seeding is adequate. In no case should more than 30 to 40 pounds of nitrogen per acre be applied in the fall.

A top-dress application of up to 120 pounds of nitrogen per acre should be made in the late winter or early spring at green up. This application should be made before stem elongation so that application equipment does not damage the young plants. Excessive nitrogen rates can cause severe lodging problems; the potential for lodging should be considered carefully before deciding on the amount of nitrogen to apply.

Harvesting

The Canola plant ripens quickly and unevenly, starting at the bottom of the plant, making harvesting one of the most critical and time-sensitive operations in the production of Canola. When Canola is ready to harvest, 98 percent of the pods will be brown and the main stems will still be slightly green. When ideally ripe, the seeds will rattle around in the pod, but the pod will not shatter. Harvesting too early results in too many low-quality green seeds. Waiting until the pods are too ripe can result in excessive shattering and yield losses.

Even though the seed reaches physiological maturity at approximately 35 to 40 percent moisture, seed cannot be harvested until moisture drops to about 15 percent or below. Seed can be combined at about 15 percent moisture, but cannot be stored safely with more than 10 percent moisture and will not be accepted favorably by Canola buyers. If seed is combined with more than 10 percent moisture, dockage is likely because of the presence of green seed. When marketed, seed quality is also docked if the moisture content exceeds 9 percent. If harvesting must be done when moisture content exceeds 10 percent, it is essential that drying facilities be available that can handle the small Canola seed.

Farmers need to achieve a delicate balance between seed moisture content and harvest date. The ideal time to combine is when the seed contain 9 to 12 percent moisture, the ideal being 10 percent. Any delays due to weather or other reasons may cause excessive shattering and yield losses. Researchers have tried applying desiccants to the crop before harvest to encourage more uniform drying, but this practice has not effectively increased yields or seed quality.

Precise combine settings are critical for efficient harvesting of Canola. The seeds are very small, and even with near-perfect settings and combining conditions, some seed will be lost. But losses often appear worse than they actually are. For example, 75 seeds per square foot left behind the combine may appear to be excessive, but that translates to only about one-half of a bushel per acre.

Following are some suggested combine settings for harvesting winter Canola:

- Keep the auger set high above the table to facilitate proper feeding of bulky plant material.
- Use a slow reel speed matched to ground speed to minimize wrapping and shattering losses.
- Set the cylinder speed on conventional machines at 450 to 500 rpm; 450 rpm on rotary machines.
- Set concaves wide--between 50 and 75 percent open.
- Set air volume to about 80 percent of that used for combining wheat. Air should be sufficient to

provide a clean seed sample--no more is needed.

- Set groundspeed initially about two-thirds as fast as that used for combining wheat. Ideal ground speed will become evident with experience.
- Be aware that these suggested combine settings are for harvesting winter Canola. Settings found in combine operator manuals are often meant for harvesting spring Canola and do not apply to Maryland growers.

Double-Cropping

Canola production offers farmers an alternative to wheat or barley for double-cropping to soybeans. Canola matures in approximately the same length of time as wheat; in some seasons it may be slightly earlier. The maturity date depends on the variety selected and may vary plus or minus a week or more compared to wheat. Thus, the Canola variety chosen for double-cropping ahead of soybeans must be selected carefully.

Weed Control

In general, weeds are not a problem in Canola. Trifluralin can be used as a preplant incorporated herbicide for rapeseed, and tillage before seeding destroys any emerged weeds. Proper tillage, early planting and recommended fertilization encourage development of a good crop canopy, which minimizes any further weed development.

When double-cropping soybeans behind Canola, volunteer Canola can become a weed problem. Preliminary Maryland research suggests that Gemini, a soil-applied herbicide, is effective for control of volunteer Canola. For postemergence control, the herbicide Classic effectively controlled volunteer Canola in this preliminary study.

Canola is extremely sensitive to herbicide residues in the soil. Use caution when planting Canola behind corn or soybeans where herbicides have been used, and consult herbicide labels for rotational restrictions.

Disease Control

Since Canola is a new crop in Maryland, little is known about any potential disease problems. Several diseases are of potential concern, such as Sclerotinia, blackleg and Alternaria pod blight, but they have not yet become a serious problem for Canola in Maryland. If they should become a problem, they are best controlled by following a 3- or 4-year rotation program. Under no circumstance should Canola be grown more than once every 3 to 4 years in the same field.

Insect Control

In Maryland, Canola has not yet developed any specific insect problems. However, several potential pest insects, such as armywomns, aphids and cabbage seedpod weevils, are present throughout the State and may move from their preferred hosts to Canola during the spring. Generally, these pests will first appear around the edges of the field and move into the interior.

Aphids. Aphid populations should be a problem only during periods of cool spring weather, similar to grain aphid problems in barley and wheat. Aphids typically feed on the underside of the leaves, on the new shoot growth and among the flowers. Heavy infestations may reduce yields. Warm, sunny weather favors the increase of aphid predator and parasite populations that normally control this pest.

Cabbage seedpod weevils. Cabbage seedpod weevils overwinter as adults. Adults fly into Canoia fields during the full-bloom period and feed on the flowers. This damage usually is not significant. Economic

damage generally occurs during the pod set and fill stages. The 1/5-inch weevil grub feeds inside the seed pod, eating five to six seeds before leaving the pod and pupating in the soil. Until Maryland becomes a major Canola producer, the cabbage seedpod weevil probably will be a low-risk problem. However, the presence of adults at flowering signals a potential problem, thus scouting during pod set is important. Research indicates that three to four weevils per sweep during early pod formation is the threshold for treatment.

Armyworms. Armyworms present a high risk whenever Canola fields are next to heavily infested barley fields. Mature armyworms will move into adjacent crops after destroying the barley. It is recommended that the armyworms be controlled in the barley before they migrate. Prevention through regular crop rotation is the best insect control.

Profitable Canola Production

The following guidelines should be helpful for planning the most efficient and profitable production of Canola in Maryland.

- **Variety selection.** Select a fall-seeded winter variety that will best fit your farming program. Maturity date is especially important if Canola is to be double-cropped with soybeans. Use only certified, treated seed.
- **Planting date.** Plant 3 to 4 weeks ahead of the normal winter wheat planting date so that Canola plants will be well established before cold weather to minimize the potential for winterkill.
- **Planting method.** Use a drill on a well-prepared seedbed; this is the preferred tool for seeding Canola. Seed should be placed three-eighths to one-half of an inch deep in medium- to heavy-textured soils and three-fourths to an inch deep in coarse-textured sandy soils. If broadcasting, finish with a culti-packer to cover seed.
- **Seeding rate.** Seed at a rate of 4 to 6 pounds per acre when using a precision drill. Set a final-stand goal of five to seven plants per square foot If broadcasting, use 6 to 8 pounds of seed per acre.
- **Fertilization.** Fertilize at rates similar to those recommended for wheat. Use a starter fertilizer in the fall at seeding that contains 15 to 25 pounds of nitrogen per acre plus recommended P_2O_5 and K_2O.
- **Nitrogen requirements.** Topdress with up to 120 pounds of nitrogen per acre in the spring at green up. The rate should be lowered if lodging is a potential problem. Split nitrogen applications (one-third at green up and two-thirds in mid-March) are recommended on coarse-textured soils subject to leaching.
- **Harvesting.** Begin harvesting when seed has dried down to 15 percent, preferably 9 to 12 percent, moisture Dockage may occur at higher moisture contents. The ideal moisture content recommended for harvesting is 10 percent Dry seed to at least 10 percent moisture for storage and 9 percent before marketing.
- **Insect and disease control.** Rotate Canola with other crops to minimize insect and disease problems Do not grow Canola in the same field more than once every 3 to 4 years. Control insects in adjacent fields before they can migrate to Canola.
- **Weed control.** Use tillage, early planting and proper fertilization to obtain a good crop canopy and reduce weed competition. Weeds are not a major problem in Canola. Canola is extremely sensitive to herbicide residues in the soil. Read herbicide labels for rotational restrictions.

The techniques of growing profitable Canola in Maryland continue to be perfected This fact sheet provides effective guidelines for growing profitable Canola. If you need additional information, contact your county Extension office.

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