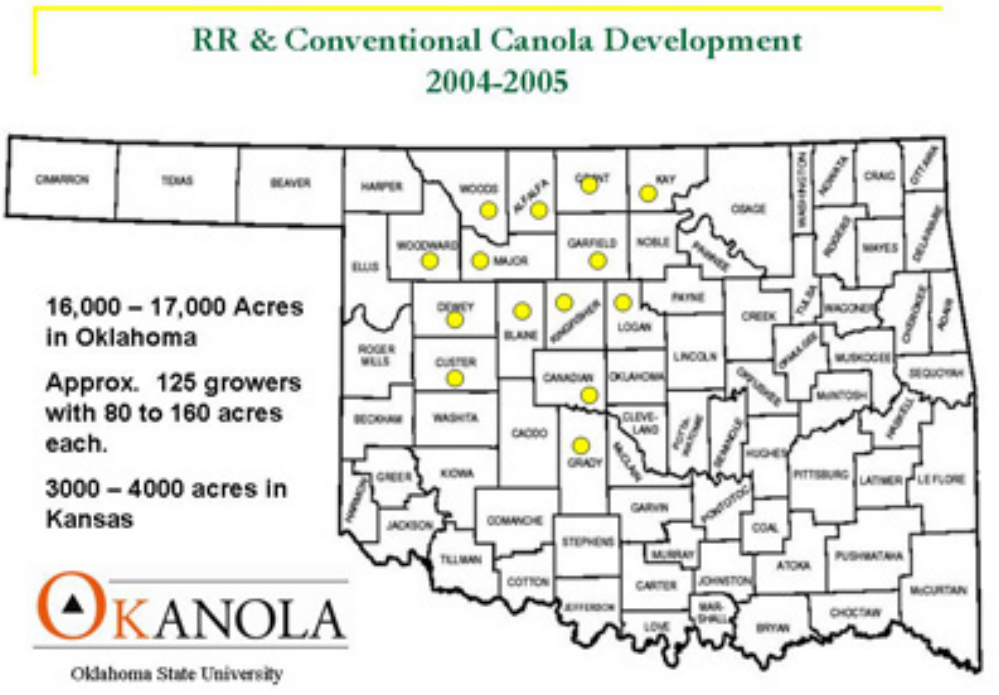
Crop Profile for Oklahoma Canola

Prepared: October 30, 2007

General Production Information

- Canola is a low erucic acid oilseed crop developed from oilseed rape, mainly used for edible oil and meal for feed
- The United States imports the equivalent of 2 million acres of production each year
- 1 million acres are planted to Canola in the United States with 90% of the acreage being in the Dakotas and Minnesota.
- With improvements to winter canola varieties 60,000 acres were planted in 2006 in the southern Great Plains with the majority being centered in Oklahoma and Kansas.
- Canola can potentially improve yield and quality of Oklahoma winter wheat planted after a canola rotation; limited research has shown a 15% increase in winter wheat yields following canola.
- Canola makes a good crop to rotate to to control troublesome weeds in wheat such as feral rye, jointed goatgrass, and rescuegrass.
- Approximately 125 growers of canola in Oklahoma with about 80-160 acres each, totaling 16-17 thousand acres of canola.



Year	Acres Planted (in thousands)
1997	725
1998	1,113
1999	1,076
2000	1,503
2001	1,494
2002	1,513
2003	1,082
2004	865
2005	1,047

Table 1: U.S. Canola Acreage

Crop Rotation

Rotating winter canola with winter wheat should improve the marketability of the wheat because of improved consistency and quality after a canola rotation. Crop rotation has the potential to be a major part of the long-term weed management strategy, essential for Oklahoma to be a reliable supplier of high quality wheat.

Soil Fertility

Canola grows best in medium-textured, well-drained soils, but it will grow over a wide range of soil textures. A soil pH between 6.0 and 7.0 is optimal, and yields may be significantly reduced when the soil pH is below 5.5. Canola does not tolerate water-logged conditions and should not be grown in fields prone to standing water, flooding, or poor drainage. Germinating canola seedlings are very susceptible to many herbicides commonly used in other crops currently grown Oklahoma. Rotation restrictions of these products are found on the product label and should be followed.

Production Regions

Most canola production in Oklahoma is in the Northwest and North Central counties of the state with a small amount in the panhandle.

Canola Varieties

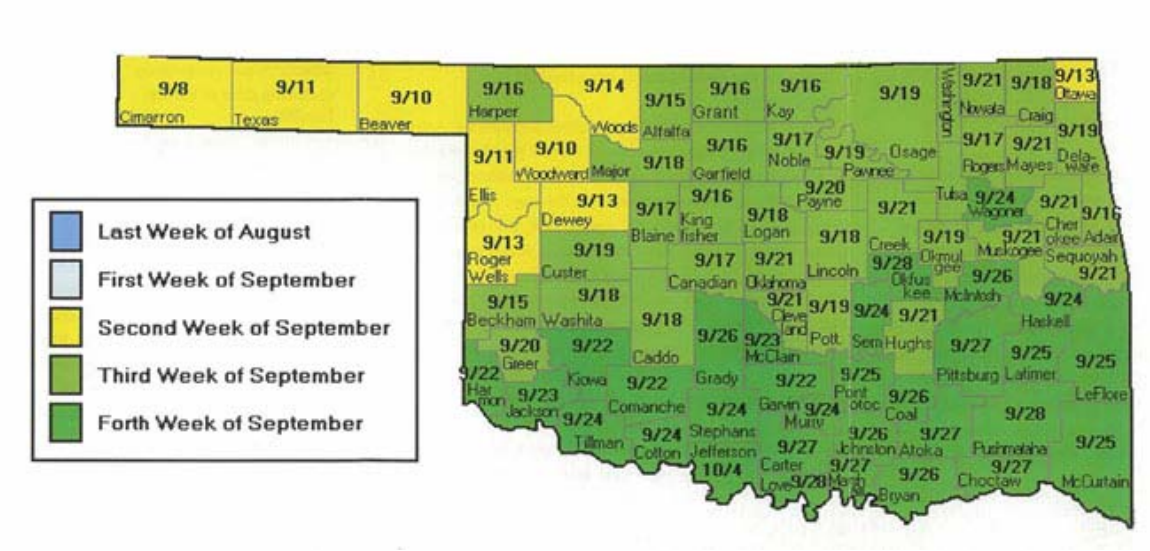
The current winter canola varieties available as of now are Sumner, Wichita, and Abilene. Wichita was the first winter variety adapted to the Great Plains, which was founded and certified seed for fall planting in 1999. With good heat stress and better than

average resistance to shattering and lodging, Wichita variety is grown in over twelve states. Its plants can grow 60 inches tall, while the average total of oil content of the seed is 37%. Abilene variety was released in 2002, which is very similar Wichita. However, Abilene ripens one to two days later, is slightly taller, and flowers a day or two days later than Wichita. Abilene has good heat stress with excellent cold tolerance and a resistance to Blackleg disease. Sumner was released in 2003, which tends to yield approximately 150 lbs/A less than Wichita. Although, Sumner is a good choice if SU herbicides are applied the previous fall or spring. Sumner is tolerant to carryover SU herbicides, resistant to Blackleg disease, flowers and harvests three days earlier than Wichita.

Cultural Practices

Seedbed Preparation - The seedbed should be fairly level, moderately firm and moist. You should sink no deeper than the heel of your work boot. If the seedbed is too fine or overworked, it can lose soil moisture and crust. A moderate amount of crop residue on the soil surface is desirable. To help conserve moisture, each tillage operation should be shallower than the one before. Apply pre-plant fertilizer before final tillage operation. The last tillage should occur less than one week before planting. It should bring moisture close to the surface. Rollers or packers can be sued to firm soil and allow moisture into the planting zone. Consider using state seed bed for planting and minimize potential for crusting.

Seeding Dates - Canola should be planted 6 weeks before the first killing frost date for the area (less than 25 degrees F). Seeding date is important to establishing a crop that has sufficient growth for good winter hardiness. Planting early tends to decrease winter survival due to excessive growth. Late planting does not allow for sufficient root reserves to maximize winter survival.



Seeding Rates - Average seeding rates with good seedbed preparation should range from 4.5 to 6 lbs per acre. A final stand of 4 to 10 plants per square foot is ideal. High planting rates produce smaller, less vigorous plants that are more prone to winterkill.

Seeding rates should be reduced if planted earlier than optimum and increased if planted later than optimum. Carefully evaluate a damaged crop in the spring before destroying it. A spring stand of only one or two plants per square foot can compensate for wider spacing between plants by promoting branching.

Seeding Depth and Row Spacing - Canola seeds are small, and careful placement at a relatively shallow depth is required. Best germination and emergence occur at 1/2 to 1 inch under conditions of good soil moisture. Canola has difficulty emerging from crusted soil. The 6 to 14" row spacing found on most commercial grain drills is acceptable for canola. Row spacing from 6 to 14" has little impact on yields. Narrower (6 to 8") spacing provides quicker row closure and can decrease wind shattering prior to harvest. If soil crusting caused by heavy rain is a problem after planting but before emergence, consider a rotary hoe or other light tillage operation and use with caution.

Planting - Grain drills and air seeders can be used to plant canola, but seedbed conditions are more critical for its establishment than for wheat. Factors that hinder stand establishment include: a lack of soil moisture at planting time, soil compaction (even by tillage and planting tools), water-logged soils, crusting after planting, and planting equipment causing deep furrows. These conditions need to be eliminated before a stand can be established. No-till canola production shows promise and stale seed beds work well.

Worker Activities

Minimal worker exposure will result in the production of canola. Canola applications will be done by commercial applicators either by air or ground. Producer applications will be made with closed cab tractors or cabbed self propelled spray rigs. No hand labor is involved with the production of canola in Oklahoma with weed control done chemically and harvest is all mechanical. Fields will be scouted routinely by producers and/or certified crop advisors especially for aphid pressure.

Insects Pests

Arthropod pests of canola are varied and sometimes difficult to manage. Chemical pesticides should not be used as a substitute for good agronomic practices or as "preventative insurance" because it is rarely economically or environmentally justifiable. Some canola pest problems can be avoided by following good cultural practices, such as selecting varieties that are adapted to Oklahoma growing conditions, planting at an optimal date and providing proper fertilization and good weed control. Pesticide recommendations in this publication were correct as of the "Modified Date." Always check the label that came with the purchased insecticide for the most current rates and restrictions.

A recent survey of producers done by the OSU Department of Agriculture Education, Communications and Leadership showed that aphids were the top insect pest followed by cabbageworms. Warrior insecticide was the choice of producers to use for insect pests

with Capture being a distant second. For 2005 17 out of 30 proudcers responding made an application of an insecticide for insect control.

Foliage Feeders

Cabbage Aphid

(brevicoryne brassicae)

Cabbage aphid is a small blue-gray aphid with short cornicles, usually covered with a powdery wax secretion.

Damage: High populations can cause stunting and discoloration of leaves. Feeding by cabbage aphid can stop terminal growth and reduce yield. Damage is of little consequence after pod formation is completed. Threshold: No thresholds exist from Oklahoma data.

Green Peach Aphid

(Myzus persicae)

The green peach aphid is pale green to yellow with long cornicles and three dark lines on its abdomen.

Turnip Aphid

(Lipaphis erysimi)

A turnip aphid is pale gray green with short, swollen cornicles, 1/16 inch long. Winged adults can be recognized by presence of transverse dark bands on last two abdominal segments.

Controls

Cultural – Localized aphid infestations can be hand-picked or pruned out. Before planting vegetables, check surrounding weeds and other plants for aphids and destroy where found. Remove any aphids discovered on transplants before planting. Always remove all crop residues immediately after harvest.

Biological – Many natural enemies, including parasitic wasps and lady beetle larvae, help keep aphid populations in check.

Chemical – Is as follows in the table below.

(Group)	Trade Name	Common Name	Rate per Acre	Comments
(20B)	Azadirachtin	Aza-direct Ecozin	Apply per label	No PHI for harvest.
(3)	Capture	Bifenthrin	2.1 to 2.6 fl. oz.	35 day for PHI harvest.

(1B)	Methyl parathion	phosphorothiaoate	1 pt.	28 day for PHI harvest. Do not graze treated fields.
(3)	Proaxis 0.5 CS	*Gamma*-cyhalothrin	3.84 fl. oz.	30 day PHI for harvest or grazing
(3)	Warrior with Zeon	Lamda-cyhalothrin	3.84 fl. oz.	30 day PHI for harvest or grazing
				Spray in evening during bloom to avoid killing honeybees. Notify beekeepers before spraying if possible.

Table 2: Cabbage Aphid Insecticides

Beet Armyworm

(Spodoptera exigua)

Green caterpillar, darker above with a white stripe along the side of the body and a small black spot above the second pair of true legs, three pairs of true (thoracic legs) and four pair of abdominal prolegs.

Damage: Caterpillars can reduce seedling stand and chew conspicuous, irregular-shaped holes in leaves. Threshold: Seedling, treat when scouting indicates one or more per row-ft. Treat when defoliation becomes severe, and larvae are present.

Controls

Cultural – Border harvesting is a useful method for preserving natural enemies because it helps retain parasite larvae in the field. Early cutting will give satisfactory control if the infestation appears late in the cutting cycle.

Biological – Natural enemies can provide good control of armyworms in many fields. Predators include bigeyed bugs, spiders, minute pirate bugs, damsel bugs, and lacewings. The parasitic wasp, *Hyposoter exiguae,* is the most important of at least 10 parasites attacking this pest. Sample for parasitism by pulling the heads from older caterpillars and squeezing the body contents out toward the head end. *Hyposoter* larvae are a light, translucent green color. Viral diseases of armyworms are also important natural control agents. Diseased caterpillars first appear yellowish and limp. After death they hang from plants as shapeless, dark tubes oozing the disintegrated body contents.

Chemical – Is as follows in the table below.

(Group)	Trade Name	Common Name	Rate per Acre	Comments
(20B)	Azadirachtin	Aza-direct Ecozin	Apply per label	No PHI for harvest.
(3)	Capture	Bifenthrin	2.1 to 2.6 fl. oz.	35 day for PHI harvest.
(1B)	Methyl parathion	phosphorothiaoate	1 pt.	28 day for PHI harvest. Do not graze treated fields.
(3)	Proaxis 0.5 CS	*Gamma*-cyhalothrin	3.84 fl. oz.	30 day PHI for harvest or grazing
(3)	Warrior with Zeon	Lamda-cyhalothrin	3.84 fl. oz.	30 day PHI for harvest or grazing
(11B1,2)	Dipel Javelin Leipnox, Xentari	*B. thuringiensis*	Apply per label	No PHI for harvest.

Table 3: Beet Armyworm Insecticides

Cabbage Looper

(Trichoplusia ni)

Green caterpillar with a thin white line along each side of the body, three pairs of thoracic legs, and three pair of abdominal prolegs.

Damage: Caterpillars chew conspicuous, irregular-shaped holes in leaves. Threshold: Treat when defoliation becomes severe, and larvae are present.

Controls

Cultural – None specified.

Biological – Important parasites include the egg parasite *Trichogramma pretiosum*, the larval parasites *Hyposoter exiguae, Copidosoma truncatellum,* and *Microplitis brassicae,* and the parasitic tachinid fly *Voria ruralis.* A nuclear polyhedrosis virus disease is also important under certain circumstances; the bodies of diseased caterpillars turn into shapeless sacks of dark liquid and can often be spotted hanging from leaves. Be sure to monitor for natural enemies; if looper populations are close to treatment thresholds but you find a significant percentage of parasitized or disease-killed individuals, delay treatment for a few days to see if these natural controls will bring populations down on

their own. If treatment is necessary, use of *Bacillus thuringiensis* insecticide will minimize injury to natural enemies.

Chemical – Is as follows in the table below.

(Group)	Trade Name	Common Name	Rate per Acre	Comments
(20B)	Azadirachtin	Aza-direct Ecozin	Apply per label	No PHI for harvest.
(3)	Capture	Bifenthrin	2.1 to 2.6 fl. oz.	35 day for PHI harvest.
(1B)	Methyl parathion	phosphorothiaoate	1 pt.	28 day for PHI harvest. Do not graze treated fields.
(3)	Proaxis 0.5 CS	*Gamma*-cyhalothrin	3.84 fl. oz.	30 day PHI for harvest or grazing
(3)	Warrior with Zeon	Lamda-cyhalothrin	3.84 fl. oz.	30 day PHI for harvest or grazing
(11B1,2)	Dipel Javelin Leipnox, Xentari	*B. thuringiensis*	Apply per label	No PHI for harvest.

Table 4: Cabbage Looper Insecticides

Diamondback Moth

(Plutella xylostella)

Adult moths are light grayish-brown with a white diamond shaped marking along back when wings are folded. Larvae are slightly tapered at each end and pale green in color. Wriggle rapidly when disturbed.

Damage: Larvae feed on all plant parts, preferring the undersides of older leaves.
Threshold: No threshold established.

Controls

Cultural – None specified.

Biological – Natural enemies often effectively control diamondback moth in California. In southern California, the ichneumonid wasp, *Diadegma insularis*, has been identified as the most common parasite. *Trichogramma pretiosum* may also attack diamondback eggs. Various predators such as ground beetles, true bugs, syrphid fly larvae, and spiders can be important factors in controlling populations. Microbial diseases are not known to be a significant mortality factor.

Chemical – Are as follows in the table below.

(Group)	Trade Name	Common Name	Rate per Acre	Comments
(20B)	Azadirachtin	Aza-direct Ecozin	Apply per label	No PHI for harvest.
(3)	Capture	Bifenthrin	2.1 to 2.6 fl. oz.	35 day for PHI harvest.
(1B)	Methyl parathion	phosphorothiaoate	1 pt.	28 day for PHI harvest. Do not graze treated fields.
(3)	Proaxis 0.5 CS	*Gamma*-cyhalothrin	3.84 fl. oz.	30 day PHI for harvest or grazing
(3)	Warrior with Zeon	Lamda-cyhalothrin	3.84 fl. oz.	30 day PHI for harvest or grazing
(11B1,2)	Dipel Javelin Leipnox, Xentari	*B. thuringiensis*	Apply per label	No PHI for harvest.

Table 5: Cabbage Looper Insecticides

Plant Fluid Damage

False Cinch Bug

(Nysius raphanus)

Adults 1/8 inch long, dirty gray, with brown or black markings, piercing mouthparts.

Damage: Feeds in groups. Large numbers may cause wilting of heads or small plants. Threshold: No thresholds exist from Oklahoma data. Thresholds suggested from Colorado data are: Flowering: Treat when there is an average of five to 10 per head.

Early seed pod: Treat when there is an average of 10 to 20 per head.

Controls

Cultural – Cultural practices that promote thick vigorous stands are recommended to minimize chinch bug damage.

Biological – None specified.

Chemical – Are as follows in the table below.

(Group)	Trade Name	Common Name	Rate per Acre	Comments
(20B)	Azadirachtin	Aza-direct Ecozin	Apply per label	No PHI for harvest.
(3)	Capture	Bifenthrin	2.1 to 2.6 fl. oz.	35 day for PHI harvest.
(1B)	Methyl parathion	phosphorothiaoate	1 pt.	28 day for PHI harvest. Do not graze treated fields.
(3)	Proaxis 0.5 CS	*Gamma*-cyhalothrin	3.84 fl. oz.	30 day PHI for harvest or grazing
(3)	Warrior with Zeon	Lamda-cyhalothrin	3.84 fl. oz.	30 day PHI for harvest or grazing

Table 6: False Cinch Bug Insecticides

Seedling Damage

Flea Beetle

(Epitrix cucumeris)

Shiny, black beetle about 1/16 inch long that jumps when disturbed.

Damage: Early spring. Plant tissue is scraped from leaf, small holes chewed in leaves. Can cause delayed development in cool growing conditions. Threshold: None established.

Controls

Cultural – Control weeds in and around planting sites to deprive larvae of food sources needed for successful development. Remove old crop debris and other surface trash to deprive over wintering beetles protective cover. Use later planting dates when warmer temperatures assist plants in outgrowing or overcoming flea beetles feeding damage. Rotating or isolating current-year plantings from those of the previous year.

Biological – None specified.

Chemical – Are as follows in the table below.

(Group)	Trade Name	Common Name	Rate per Acre	Comments
(20B)	Azadirachtin	Aza-direct Ecozin	Apply per label	No PHI for harvest.
(3)	Capture	Bifenthrin	2.1 to 2.6 fl. oz.	35 day for PHI harvest.
(1B)	Methyl parathion	phosphorothiaoate	1 pt.	28 day for PHI harvest. Do not graze treated fields.
(3)	Proaxis 0.5 CS	*Gamma*-cyhalothrin	3.84 fl. oz.	30 day PHI for harvest or grazing
(3)	Warrior with Zeon	Lamda-cyhalothrin	3.84 fl. oz.	30 day PHI for harvest or grazing

Table 7: Flea Beetle Insecticides

Diseases

Canola is a member of the mustard family (*Brassicaceae*, formerly *Cruciferae*), which includes such common weeds as mustards, pepperweed (*Lepidium virginicum*), and shepherdspurse. Diseases that affect these weeds may also affect canola. Diseases attack canola at all stages of development. They are commonly soilborne, seedborne, or airborne and spread from infected crop residues. The incidence of major diseases is low, but will likely increase as canola acres increase in the Great Plains.

The producer survey showed that canola diseases are not a major problem in canola production at this time. Aster Yellow was the most identified disease by producers with powdery mildew second. No fungicide applications were noted by producers.

Aster Yellows

(not specified)

Aster yellows is caused by a phytoplasma, a plant pathogenic micro-organism. The phytoplasma inhabits the phloem (nutrient-carrying vessels) of infected plants and is carried from plant to plant by sap-sucking leafhoppers. Not all leafhoppers are infected with the pathogen. Leafhopper feeding, in itself, is not considered an economic threat to crops.

The pathogen can over-winter in biennial and perennial crops and weeds—providing a disease source for the next year—but most infections are carried north from the United

States by migrating leafhoppers. The phytoplasma survives in living plant tissue and is not soil- or seed-borne.

Controls

Normally, there is little need to control aster yellows in annual field crops since incidence of the disease is usually less than two percent and does not result in significant economic loss. Management of aster yellows in annual crops is limited to:

Cultural - Seeding crops in the fall or as early in the spring as possible may help avoid infection since the crop has a chance to mature, making it less attractive to the migrating leafhoppers. Controlling perennial weeds in and around susceptible crops will help, because weeds can also be a source of the aster yellows phytoplasma. Not planting near perennial forages, herbs or spices that are known to be infected with aster yellows.

Biological – None specified.

Chemical - Using insecticides (active ingredient dimethoate) that are registered for leafhopper control in canola. Several applications may be needed over the course of the season as new leafhoppers move into the area.

Trade Name	Common Name	Rate of Product	Comments
Dimethoate	Dimethoate	½-1 pt. per acre (as for alfalfa)	When insect pest population is high, use higher label rate.
Dimate	Dimethoate	½-1 pt. per acre (as per alfalfa)	This pesticide is highly toxic to bees; do not apply if bees are visiting the areas to be treated when a crop or weeds are in bloom.

Table 8: Aster Yellows Insecticides

Blackleg

(Leptosphaeria maculans)

Blackleg infections may occur on cotyledons, leaves, stems and pods. The plant is susceptible to blackleg infection from the seedling to pod-set stages. Lesions occurring on the leaves are dirty white, round to irregularly shaped, and are usually dotted with numerous small, black pycnidia, which are the spore-bearing structures of the fungus. Pycnidia appear as tiny round specks, which may be seen more easily with the aid of a hand lens.

On stems, blackleg lesions can be quite variable, but are usually found at the base of the stem, or at points of leaf attachment. Stem lesions may be up to several inches in length, and are usually white or grey with a dark border. Numerous pycnidia form in the center of the lesion. Stem lesions may also appear as a general blackening at the base. Severe infection usually results in a dry rot or canker at the base of the stem. The stem becomes girdled and, as plants ripen prematurely, the crop is more likely to lodge. Seed may be shriveled and pods shatter easily at harvest, resulting in seed loss.

Controls

Cultural – Crop rotation allows for the decomposition of infected canola residue. Canola should not be seeded in canola stubble or adjacent to canola stubble that has had infected plants during the previous three years.

Biological – None specified.

Chemical – A foliar fungicide may be warranted if blackleg symptoms are easily observed at the seedling and rosette stages or if a susceptible variety is being grown. Refer to product labels for information on timing and application of foliar fungicides.

Several seed treatment products are registered for control of blackleg including Helix (Thiamethoxam), Maxim (Fludioxonil), Thiram (Thiram), and Prosper (Clothianidin). Quadris (Azoxystrobin) is a foliar fungicide registered for blackleg control in the United States.

Trade Name	Common Name	Rate of Product	Foliar or Seed Treatment	MOA	Comments
Helix	Thiamethoxam	23 oz. per 100 lbs. of seed	seed		For use in commercial seed treatment facilities with closed transfer systems only.
Maxim	Fludioxonil	.167-.334 oz. per 100 lbs. of seed	seed		May also be used in combination with Divedend for damping off.
Thiram	Thiram	4.3 oz. per 100 lbs. of seed	seed		
Prosper	Clothianidin	19.2-25.6 oz. per 100 lbs. of seed	seed		Prosper can be mixed with Poncho 600 for longer season control.

Quadris	Azoxystrobin	6.2-15.4 oz.	foliar		Should be integrated into an overall disease management strategy that includes selection of varieties with disease tolerance, certified seed, seed treatment and crop rotation.

Table 9: Blackleg Fungicides

Scleroninia Stem Rot

(*Sclerotinia sclerotoirum*)

Sclerotinia stem rot is caused by the fungus *Sclerotinia sclerotiorum* and is considered a serious problem in many areas throughout the world. Sclerotinia (white mold) is most severe under warm, wet conditions when canola is flowering. A wide range of field crop hosts exists including dry beans, sunflowers, and soybeans. Frequent rotation with these crops may cause a rapid buildup of the disease in the soil. Sclerotinia is present throughout the Great Plains, but its impact has been minimal except for occasional outbreaks in sunflowers, dry beans, and soybeans under irrigation on the High Plains where cooler nighttime temperatures favor its development.

The first noticeable symptom of Sclerotinia stem rot is the presence of prematurely ripened plants. Stems become bleached and tend to shred. Under high moisture conditions, a white moldy growth may develop on the surface of stems and pods. Hard black known as sclerotia, appear in or on the stems near the soil line as well as on infected pods. Sclerotia fall to the ground at harvest or when the stems break from lodging. During the spring, sclerotia near the soil surface germinate to produce small golf-tee shaped structures known as apothecia. Apothecia release asco spores during wet weather and periods of heavy dew. Spores are carried on air currents and infect flower petals. Infected petals fall on leaves or stems, which become sites for the fungus to invade the plants. Symptoms of stem rot appear approximately 10 to 14 days after infection.

Controls

Cultural – If possible when irrigating, keep the soil surface dry during flowering to minimize the risk of this disease. Prevention is the best means of control. However, once the disease is present in the soil, use a 4-year rotation with a non-susceptible crop. Keep in mind that deeply buried sclerotic are main dormant in the soil for 8 years and can be brought near the surface by cultivation. To reduce the incidence of conditions favorable for Sclerotinia infection, use lower plant densities and reduce nitrogen rates to facilitate air movement, light infiltration, and drying.

Biological – None specified.

Chemical – Foliar fungicide treatments can be effective, but timing is critical; make applications at the early to mid bloom stages. Quadris and Ronilan (Vinclozolin) are registered for use in managing Sclerotinia stem rot.

Trade Name	Common Name	Rate of Product	MOA	Comments
Quadris	Azoxystrobin	6.2-15.4 oz.		Should be integrated into and overall disease management strategy that includes selection of varieties with disease tolerance, certified seed, seed treatment and crop rotation.
Ronilan	Vinclozolin	1.0 pound per acre		When stands are uneven and crop development is not uniform, two applications of 8 ounces of Ronilan per acre is recommended.

Table 10: Scleroninia Stem Rot Fungicides

Powdery Mildew
(*Erysiphe cruciferarum*)

Powdery mildew is characterized by a white dusty growth on aboveground plant parts. The disease is favored by moderate temperature, high humidity, excessive N fertilizer, and excessive canopy density. Powdery mildew should remain only a minor disease in Oklahoma.

Controls

Cultural – None specified.

Biological – None specified.

Chemical – Because powdery mildew is predicted to remain as a minor disease, no chemicals have been specified for control.

Alternaria Black Spot
(*Alternaria* spp.)

Damage from Alternaria black spot (caused by the fungi *Alternaria spp.*) is widespread and is worse in wet years when seed yields can be significantly reduced by pods splitting or early death of the plants. All aboveground parts of the plant are susceptible to black, brown, or gray spots on the leaves, stems, and pods, which are the most common

symptoms of Alternaria black spot. Often the spots are surrounded by a light green or yellow halo.

Alternaria survives in infested crop residue, on infested seed, and on some alternative weed hosts. Infested seed either rots in the soil or produces infected seedlings. Windblown spores germinate, penetrate plant tissues, and cause lesions within a few days. These lesions produce more spores, which cause new infections on the same or neighboring plants.

Controls

Cultural – A rotation of three years between canola crops, and controlling susceptible weeds and volunteer canola reduce the incidence of this disease. In a heavily infested crop, swathing or timely harvest reduces shattering caused by Alternaria.

Biological – Control is achieved by sowing clean, disease-free seed.

Chemical – None specified.

White Rust
(*Albugo candiada*)

White to cream colored masses appear on the underside of leaves. Raised green blisters form that turn white during wet weather. Major symptoms is swollen, twisted and distorted inflorescences called "stagheads" that become brown, hard and dry as they mature. Yield losses of 20% have been recorded.

Controls

Cultural – Use seed from a staghead-free field, or clean fragments of staghead from seed. Rotate with non-cruciferous crops. Control volunteers and cruciferous weeds. A rotation of several years may be necessary in a heavily infested field to reduce soil-borne disease levels.

Biological – None specified.

Chemical – None specified.

Weeds

Weed management is a key component of any winter canola production system. In Oklahoma, winter canola is commonly grown in rotation with wheat, sorghum, and corn. The benefits of weed control linked with crop rotations are achieved by following appropriate weed management practices. Yield losses due to weeds are minimized with successful early season weed control.

Producers in the survey listed downy brome and Italian ryegrass as the major weed problems. Glyphosate was the most used herbicide by the producers in conjunction with

the Roundup Ready Canola. RT master was the next used herbicide. 17 out 30 producers sprayed for weeds in 2005.

Winter Broadleaves

Soil Application (PPI)

Trade Name	Common Name	Rate of Product	MOA	Comments
Sonalan	Ethalfuralin	1.5 pt/A Course 2 pt/A Medium 2.5 pt/A Fine	9	Incorporate with two passes in different directions.
Treflan	Trifuralin	1 pt/A Course 1.5 pt/A Medium 2 pt/A Fine	9	Incorporate with two passes in different directions.

Table 11: Winter Broadleaves: Soil Application

Foliar Application (POST)

Trade Name	Common Name	Rate of Product	MOA	Comments
Glyphosphate	Glyphosphate, round-up ready varieties only	.5-.78 lb. per acre	9	One application no later that the 6 leaf stage.

Table 12: Winter Broadleaves: Foliar Application

Fallow/Burndown

Trade Name	Common Name	Rate of Product	MOA	Comments
Glyphosphate	Glyphosphate	.75-2 lbs. per acre	9	Apply before planting the crop to control existing weeds. Will

				not control weeds that have not emerged.

Table 13: Winter Broadleaves: Fallow/Burndown

Winter Grasses

Soil Application (PPI)

Trade Name	Common Name	Rate of Product	MOA	Comments
Sonalan	Ethalfuralin	1.5 pt/A Course 2 pt/A Medium 2.5 pt/A Fine	8	Incorporate with two passes in different directions.
Treflan	Trifuralin	1 pt/A Course 1.5 pt/A Medium 2 pt/A Fine	8	Incorporate with two passes in different directions.

Table 14: Winter Grasses: Soil Application

Foliar Application (POST)

Trade Name	Common Name	Rate of Product	MOA	Comments
Assure	Quizalofop	7-12 lb per acre	9	Apply after crop and weed emergence but before grasses tiller
Glyphosphate	Glyphosphate, round-up	.5-.78 lb. per acre	9	One application no

	ready varieties only			later that the 6 leaf stage.
Poast	Sethoxydim	.5-2.5 pt. per acre	8	Apply to actively growing grass weeds within size limits on label.
Select	Clethdim	4-5 oz. per acre	7	Apply to grasses after crop and weed emergence. Annual grasses that emerge after application will not be controlled.

Table 15: Winter Grasses: Foliar Application

Fallow/Burndown

Trade Name	Common Name	Rate of Product	MOA	Comments
Glyphosphate	Glyphosphate	.75-2 lbs. per acre	9	Apply before planting the crop to control existing weeds. Will not control weeds that have not emerged.

Table 14: Winter Grasses: Fallow/Burndown

Rotational Cropping Restrictions in Months for Canola Herbicides

Herbicide	Alfalfa	Canola	Corn	Cotton	Peanut	Sorghum	Soybean	Wheat
Assure	4	0	4	0	4	4	0	4
glyphosphate	0	0	0	0	0	0	0	0
Poast	0	0	4	0	0	4	0	4
Select	1	1	1	1	1	1	1	1
Sonalan	B	0	B	B	0	B	0	B
Stinger	10.5	0	0	a	a	10.5	18	0
Treflan	0	0	14	0	0	14	0	14

a. see labeled specific crop rotation
b. following cropping season

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References

Boyles, Mark, et. al.. Great Plains Canola Production. Kansas State University Agricultural Experiment Station and Cooperative Extension Service: July 2006. http://www.oznet.ksu.edu/library/crpsl2/MF2734.pdf

Early-Season Vegetable Insect Pests, K-State Research and Extension Pub Entomology 506, 2003. http://www.oznet.ksu.edu/dp_hfrr/extensn/problems/fleabeet.htm

Foster, Rick and Brian Flood. 1995. Vegetable Insect Management, Meister Publishing Company, Willoughby, Ohio.p.116. http://everest.ento.vt.edu/~idlab/vegpests/vegfs/cabbageaphid.html

Oklahoma State University. Oklahoma Cooperative Extension Service. *Management of Insect and Mite Pests in Canola*. Oklahoma: Tom A. Royer and K.L. Giles, 2005. http://pods.dasnr.okstate.edu/docushare/dsweb/Get/Document-3045/CR7667web.pdf

Schmidt, Walter. (Northwest District Agronomist). "Canola Production in Ohio." http://ohioline.osu.edu/agf-fact/0109.html

University of California Agriculture and Natural Resources 2005. http://www.ipm.ucdavis.edu/index.html

U.S. Canola Production US Canola Association http://www.uscanola.com/index.asp?Type=B_BASIC&SEC={5CDA1D60-89B2-4F79-B96F-0B5AB2FBF781}