

# **Canola Production**

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# Using Areas of Canola

- Canola is an oilseed crop which is cultivated for its high quality edible oil used in many foods such as margarines, frying oil and cooking oil.
- The high oleic acid content (> 60%) of canola oil extends its stability and shelf life.



# Cont'd

- Canola meal (or oil cake) is used in livestock feed.
- Canola meal is the fibrous material left after the oil pressing process.
- Typically, seed meal consists of 36–39% protein, 1.5–2.0% fat, 11–13% fibre and  $<10$   $\mu\text{mol}$  glucosinolate/g
- And this traits make it highly desirable as a livestock feed.



# Using Areas of Canola, cont'd

- Biodiesel as a liqued fuel
- Lubricant of engines
- Dye and varnish industry
- Soap production
- Cosmetic industry

Rapeseed seeds contain 35-50% crude oil, 15-35% raw protein, 20-30% carbohydrate.

Canola oil comprise 65% oleic, 20% linoleic, 9% linolenic, 4% palmitic and 2% stearic acid.



From field



To your vehicle



# Using Areas of Canola, cont'd

## Importance in beekeeping

- It is good nutrition resource for honeybees.
- Flowering early Spring
- Richness of nectar and pollen
- Suitable flower structure to take nectar and pollen
- Enhancing pollination by honeybees may increase seed yield up to 20%.



# Using Areas of Canola, cont'd

## Grazing Canola, in V6-V8 Stages



# Grazing, cont'd

- **For centuries, rapeseed has been used as high-quality, annual forage in Europe.**
- Preliminary research shows that canola produces a highly digestible, nutritious forage. Canola forage is slightly higher in protein, lower in fiber, and higher in energy than wheat in the vegetative stage.
- Since canola is relatively low in fiber, it can cause bloating of grazing cattle. When grazing canola, no more than 75 percent of the ration should be canola with the other 25 percent consisting of a lower quality, high-fiber hay.
- Canola should graze with younger cattle rather than older cows. Younger, smaller animals cause less physical damage to the crown of canola. They can not reach to graze below parts of plant, containing more nitrate level, it helps to remove the risk for nitrate poisoning.

# Grazing, cont'd

- **Best grazing time is accessed when plants reach the eight-leaf stage, 15-20 cm height.**
- Nutritionists recommend that canola forage should be treated as a concentrate rather than a forage crop.
- Hard Freezing is another method to using canola as a grazing crop.
- Cattle can more interested in the crop after a hard freeze.
- Research has shown that after a series of hard freezes:
  - total digestible nutrients increase by 4 to 5 percent,
  - relative feed value increases by 40 to 80 units
  - energy values increase,
  - fiber decreases,
  - crude protein decreases by 1 to 3 percent,
  - nitrate content of plant decreases.

# Grazing, cont'd

- Canola's potential as a dual purpose forage and grain crop is being evaluated.
- Different canola varieties produce varying amounts of fall forage for grazing. A slightly earlier planting date is advisable, but adjustments to seeding rates may not be necessary.
- Production of canola as a dual-purpose crop are limited at this time.
- !!!
- Grazing canola in the fall reduces grain yield by 30 to 50 percent, and grazing canola in the spring reduces grain yield by 70 percent.
- For this reason, grazing is not recommended if the production objective is to produce a high grain yield.
- But, new dual-purpose varieties are being developed. One such variety, 'Griffin', was released in 2013 and is now available to producers in USA.

# Rapeseed, *Brassica napus* L.

- The name for rapeseed comes from the Latin word *rapum* meaning turnip. It is also known as colza.
- Rapeseed belongs to the genus *Brassica* from *Brassicaceae* family.
- *Brassicaceae* (*Cruciferae*) family also comprise well known plants such as Turnip, Cabbage, Brussels sprouts and Mustard.
- *Brassica napus* species commonly called as rapeseed or colza in English.
- Rapeseed has been cultivated in Asia for thousands of years, but it was extended in Europe in the 13th century.
- From rapeseed plants, two different kind of oils can be derived:
  - Colza oil, toxic, non edible, from standard rapeseed
  - Canola oil, edible, from new breeding rapeseed, Canola

# Rapeseed vs. Canola

- Standard rapeseed oil contain high erucic acid in seed and high glucosinolats in seed meal. Beceause of this traits, it is not edible oil.
- Rapeseed oil was used for lamp oil and lubricaiton. Rapeseed contain high erucid acid in oil and high glucosinolate in meal. Higher erucic acid in oil has hazardous effects on human health, and higher glucosinolate in cake has hazardous effects on animals.
- Canola is a type of edible rapeseed. Canola is not indivudual species. It has breeded from 3 rapeseed species. It has genetically low in erucic acid and glucosinolates.
- Canola differs from standard or industrial rapeseed, since it has less than 2 percent erucic acid in the oil and less than 30 micromoles glucosinolate per gram of the meal.
- These two quality standards allow canola oil to be used as a healthy cooking oil and the meal as a high-quality protein supplement for livestock.

# *Brassica* sp.

- Canola-quality seed has been developed in three *Brassica* species.
- *Brassica napus*, also called *Argentine rape*, summer rape, winter rape, and Swede rape, is the most common canola grown.
- *Brassica rapa*, also called *B. campestris*, *Polish rape*, summer turnip rape, and field mustard, is grown on only limited acreage.
- *B. campestris* little early maturate one than *B. napus*, however, last one has more seed yield.
- *Brassica juncea*, Canola-quality brown mustard has been developed over the past few years, but all *B. Juncea* varieties are spring types.

# Cont'd

- Canola name came from shortened of "Canadian oil low acid". To another statement, "Can" for Canada and "o" for oil, and 'la' for low acid.
- Canada began developing rapeseed with low levels of erucic acid in the oil in 1957 to meet the growing demand for cooking oil.
- In 1974, the first true canola variety, 'Tower', was released. Tower is low in erucic acid and glucosinolates.
- Canola is also known as "double-low" or "double-zero" rapeseed, or "oilseed rape" in other major growing regions.

# Adaptation

- Canola is a C<sub>3</sub> type crop that is well adapted to warm and cool climatic conditions rather than tropic conditions.
- Canola need to total 2300-2500 °C temperature in its life cycle. For well growing of canola, temperature is to minimum 5 °C, and optimum 20 °C. Canola seeds can be germinate at 4-5 °C soil temperature, but optimum soil temperature is approximately 8 °C for germination in a week.
- Canola can be grown in dry farming system. It can provide satisfactory seed yield than wheat in the mid drought area.
- Canola request to 200-500 mm water in the growing season. Sufficient moisture increase yield of canola.

# Adaptation, cont'd

- There are two type canola related to resistance capability against cold weather and vernalization requesting.
  - Winter type
  - Spring type
- Winter type canola varieties can tolerate by  $-15\text{ }^{\circ}\text{C}$  cold weather if they had been reached rosette stage. In the winter season, they get their needed cold weather for enabling vernalization requesting.
- Spring type varieties die when exposed to cold weather under freezing and they do not need cold in seedling stage for flowering.

# Spring type vs. Winter type

- In general, winter canola has a 20 to 30 percent greater yield potential than spring canola.
- Spring canola flowers approximately 1 month later than winter canola, but it is harvested only 2 weeks later because of summer heat.
- Shorter vegetation period and grain-filling period reduces the yield potential of spring canola.
- Production of spring canola is only recommended for rotations requiring spring planting systems and winter-hardy regions, and preferably in the irrigated fields.



***Genetic differences in winter survival. Surviving after winter season, Winter variety (left) and Spring variety (right)***



# Soil Requirement and Field Selection

- **Canola grows best in medium-textured well-drained soils.**
- **But, it can be grown over a wide range of soil types.**
- Soil pH between 6.0 and 7.0 is optimal, below 5.5 and above 8.3 is limit.
- Low pH symptoms will be seen in the fall as crinkled, cupped, or strapped leaves . High pH can be resulted to micronutrient deficiencies
- Canola does not tolerate waterlogged conditions or flooding, or poor drainage.
  - Decreasing energy generation
  - Increasing cell stoplazmic acidity
  - Decline micronutrients transport
  - Risk of Fe, Mn toxicity



# Soil Requirement and Field Selection

## Herbicide application and weed histories

- Producers should account for weed histories and past herbicide applications when selecting a field.
- Application of some common herbicides is required waiting period before canola seeding.
- Most canola varieties are sensitive to ALSinhibitor herbicide carryover.
- Follow all herbicide label directions before seeding canola or any other sensitive crop.

## Pre-cultivated crops

- Rotation considerations are important when selecting a field for canola production.
- Several crops may have diseases in common with canola.
- Table 1 lists most of these crops and the recommended time intervals between their production and canola seeding.

**Table 1.** *Guide to selection of crops in a rotation with canola.*

<b>Crop</b>	<b>Rotation (years)</b>	<b>Comments</b>
Wheat Oats Barley	0	No diseases in common. Can be grown the year before or after canola. Keep in mind herbicide residue carryover.
Corn Sorghum	0/1	No diseases in common. Zero where herbicide residue is not a concern and one where atrazine is used.
Potatoes Clover Field beans Cotton	1	Common diseases are Rhizoctonia and Fusarium root rots.
Alfalfa Soybeans	2	Common diseases are Rhizoctonia and Fusarium root rots and Sclerotinia stem rot.
Sunflowers	3	Common diseases are Rhizoctonia and Fusarium root rots and Sclerotinia stem rot.

# Crop Rotation

- It is not recommended to plant canola in back-to-back years.
- Canola is a good pre-crop for wheat and barley in the rotation system.
- The yield of winter wheat following canola have shown a 10 to 25 percent increase compared to wheat following wheat.
- In cultivating canola, a broadleaf plant, is used some herbicides to control winter annual grassy weeds It allows wheat to benefit for from this clears fields.
- Most of the winter annual grassy weed species can be reduced by rotating to canola and then planting wheat.
- Roundup Ready canola varieties allow nonselective control of weeds of winter annual grass and broadleaf weeds.
- Canola also has a beneficial effect on wheat by reducing soil-borne diseases when it is incorporated as part of the rotation system.

# Crop Rotation, cont'd

- A two-year or three-year rotation is best to reduce disease and weed pressures associated with canola production.
- Maize, sunflower, sunflower, soybean, chick pea also are well going crops with canola in the crop rotation system as well as cereals.
- In the warm and mild-winter regions, it early come to maturity in May, and allow planting a second crop such as soybean, groundnut, sesame and maize if enough moisture available or opportunity of irrigation.
- **!!!**
- Sugar beet must come before canola in the crop rotation. After canola, a risk of nematode damage may rise for sugar beet crop.
- Crops such as mustard, oil turnip, crambe belonging to *Brassicaceae* family should never get rotation with canola.

# Selecting of variety and Seeds

Important traits are to be considered for selecting of variety:

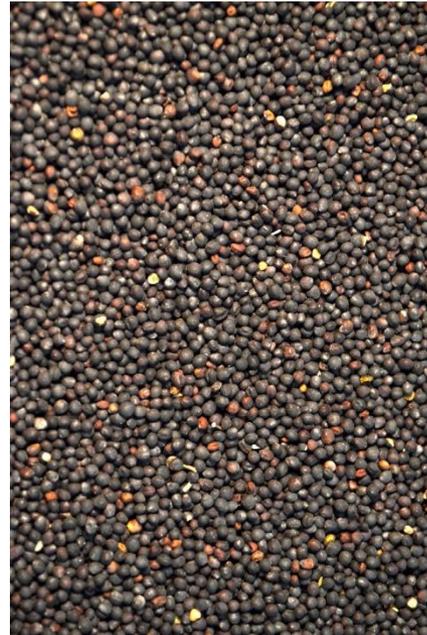
- Winter type or Spring type
- Vegetation period
- Uniform maturity
- Heat tolerance at flowering
- Pod shattering resistance
- Drough tolerance
- Cold weather tolerance
- Low-pH-tolerance
- Blackleg disease resistance



Six seed colour categories

# Seed treatments

- Seed Coating is more suitable for uniformly and easily seed sowing and other utilities than uncoating.
- A fungicide and an insecticide should be used on seeds to protect against soil-borne diseases and fall insect pressure, respectively, e.g. Thriam, Macozeb, Lindane.



Uncoated



Coated

- The seed dressing Gaucho<sup>®</sup> (imidacloprid) protects emerging seedlings from low numbers of RLEM, blue oat mite and aphids for approximately 3–4 weeks after sowing.
- Another seed dressing, Cosmos<sup>®</sup> (fipronil) protects Gaucho<sup>®</sup> (imidacloprid), Poncho Plus<sup>®</sup> and Cruiser Opti<sup>®</sup> are seed dressings registered for early season protection from aphids in emerging canola. Protects seedlings from low numbers of redlegged earth mites (RLEM).

# Selecting of a resistant herbicides variety

**Using genetically modified (GM) seeds  
is not allowed in Turkey!!!**

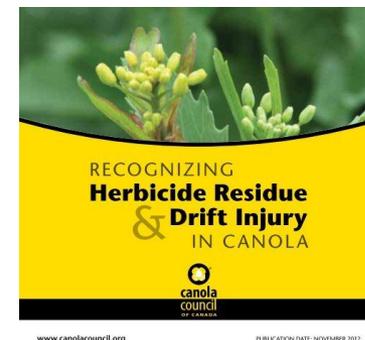
There are some GMO and non-GMO hybrid canola which have been developed as a resistant herbicides:

## GMO

- 1. Roundup Ready® (by Monsanto Ltd),
- 2. LibertyLink® (by BASF Group)
- 3. InVigor® (by Bayer CropSciences Pty Ltd)

## non-GMO

- 1. Clearfield® (CL), Imidazolinone residual tolerant (IMI)
- 2. Sulfonylurea (ALS-inhibitor) Residual Tolerant, SU residual tolerant



# Cont'd

- Roundup Ready® GM canola includes tolerance to the herbicide glyphosate.
- Roundup Ready® varieties can be sprayed with glyphosate before bolting to clean up winter broadleaf weeds.
- InVigor® GM canola has a tolerance to the herbicide glufosinate.
- Clearfield® varieties can be sprayed with IMI group herbicides eg. Beyond before bolting (at 2 to 7 leaf canola) to control winter annual grassy weeds.
- Sulfonylurea (ALS-inhibitor) Residual Tolerance varieties is used when canola follow wheat in crop rotation system. The sulfonylurea class of ALS inhibitor herbicides is used on a high percentage of winter wheat acres. These herbicides may exhibit residual periods of more than 1 year. If fields have a history of sulfonylurea herbicide use within the last year, a Sulfonylurea Residual Tolerance canola variety needs to be planted.

# Affecting Factors on Emerging and Establishment of Canola

- Shallow or deep sowing
- Soil temperature
- Soil moisture in upper side
- Soil compaction
- Crusting
- Uncovered seeds with soil
- Crop residue
- Waterlogging
- Freezing
- Soil borne pests and diseases etc.

These factors affect negatively germination, emerging, plant density and establishment of canola.

Lessening the negative impacts of these conditions before hand is critical to emerging and establishing a successful canola crop.

# Soil Tillage

- Primary soil tillage
  - Soil is to be operated in 20 - 40 cm depth.
- Secondary soil tillage
  - Soil is to be operated in 10 -15 cm depth.
- Seedbed preparaiton

# Primary and Secondary tillage implements

Primary tillage equipments: (in 20-40 cm deep)

Plough

Chisel

Disk plow

Secondary class tillage equipments: (in 10-15 cm deep)

Disc-Harrow

Cultivators

Rototiller

Harrows (spring or spike tooth)

Roller

Ridger

They can be mounted and combined.





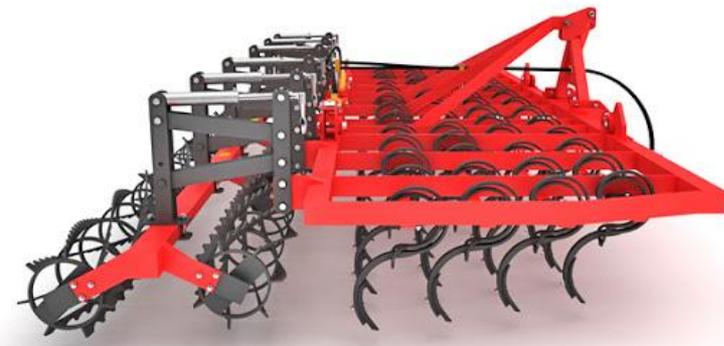
Çizel



Diskli pulluk



Diskaro



r+Döner tırmık

# Seedbed Preparation

- A well-prepared seedbed is more critical for canola because of small seed size. The 1000-seed weight of canola is typically 2.3–6.0 g. A seed is about 1-2.5 cm in diameter.
- The **seedbed should be:**
  - fairly level
  - moderately firm
  - moist throughout its depth
  - Satisfactory granular structure

## The **seedbed should not be:**

- too fine structure
- over operated soil
- hard and compact
- crust formation
- lost of moisture



# Seedbed Preparation, Cont'd

If the seedbed becomes too fine by overworked, it can cause losing soil moisture during operation and cause crust formation after raining.

If seedbeds becomes too coarse, it can result in poor seed placement, poor seed-to-soil contact, and soil moisture loss.

The best one is to remain between of them.

A moderately firm seedbed is essential for good seeding depth control and providing uniform emergence.

A moderate amount of crop residue on the soil surface can be desirable.

# Seed Sowing

Sowing time: When soil temperature reaches at 8 °C.

**Winter types can be sowed in September-October**, about 6 weeks before the first killing frost.

**Spring types can be sowed in April.**

Sowing density: 50-60 plant per square meter.

Row Spacing can be 15 - 35 cm, commonly **20 cm**

On the row, space between seeds can be around **5 cm**

Seeding depth:

**1.5 – 2.5 cm**, affected by soil structure, moisture and temperature

Seed quantity:

Aproximately **5 kg/ha**,

Sowing implement:

Small-grain and row-crop seeder equipments can be used to sow canola. Pneumatic drill or Fine-Grain drill can be used practically.

# Sowing Tips

- Before autumn first frost, plants have to reach 6-8 leafy rosette stage.
- But, it is not to form stem bolts at the center of the rosette to avoid killed winter conditions.



**Adequate growth for the winter.**

**Photo by Mike Stamm, K-State Research and Extension**

# Sowing Tips, cont'd

- In general, early planting should be preferred over late planting.
- But, too earlier planting and high plant density can cause excessive growing and elevated crown (rosette) on soil surface. In this case plants may be at greater risk of winterkill because the crown is elevated to an unprotected position above the soil surface.



# Sowing Tips, cont'd

- Planting too late may result in smaller plants that have insufficient carbohydrate reserves and inadequate size to maximize winter survival.
- Earlier or later sowing often cause decreasing of winter survival.
- Seeding date also influences canopy cover, weed suppression, and yield potential.



[Department of  
Agronomy](#)

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# Sowing Tips, cont'd

- Planting seed quality can change according to:
  - varying seed quality,
  - Seed vigor,
  - soil conditions,
  - planting depth,
  - crop residue,
  - and sowing method.
- Planting with pneumatic drill 5 kg/ha seed is enough.
- When using classical drill, seed quantity may be increased by 10 kg/ha.



# Sowing Tips, cont'd

- Row spacing can be arranged 15-35 cm, the space between seeds 5-10 cm.
- Hybrid varieties seeds are larger, more costly, and plants tend to be more vigorous compared to those of open-pollinated varieties. Therefore, hybrid seeds can be sowed with wider row spacing.
- As a general rule, seeding rates for hybrids are approximately 500,000 pure live seeds per hectare.
- For the winter type hybrid varieties, if seedling emergence success and surviving rate of plants after winter conditions is accepted as 65%, It can be calculated as about 700.000-900.000 seeds per hectare at the time of planting. Seed quantity may vary approximately 4-5 kg/ha according to changing seed size.

# Sowing Tips, cont'd

After winter come to end and began spring, plant establishment and crop canopy needed to be evaluated carefully.

If there are a very poorly established crop canopy caused by cold winter condition, it may be need to replanting canola in the early spring by using spring canola variety.

Canola field can need to abandoned completely, and destroyed plant establishment in the field, because of complete winterkill.



# Sowing Tips, cont'd

- Wide seed spacing resulting a thin stand can compensate for open space by developing additional branches if a thin stand is evenly distributed across the field.
- A thin stands can cause unbalanced ripening at harvest and increase weed problems as the crop cannot be fully covered on the soil surface.



<https://www.topcropmanager.com>



Oklahoma State University  
<http://canola.okstate.edu/>

# Sowing Tips, cont'd

- Narrow seed spacing results a thick canola stand.
- It surpass and don't allow growing to weeds.
- Promote early, uniform maturity .
- It results thinner stalks, which are easier to harvest.
- But, a thick stand may produce smaller, less vigorous plants, vulnerable to hard winter colds.



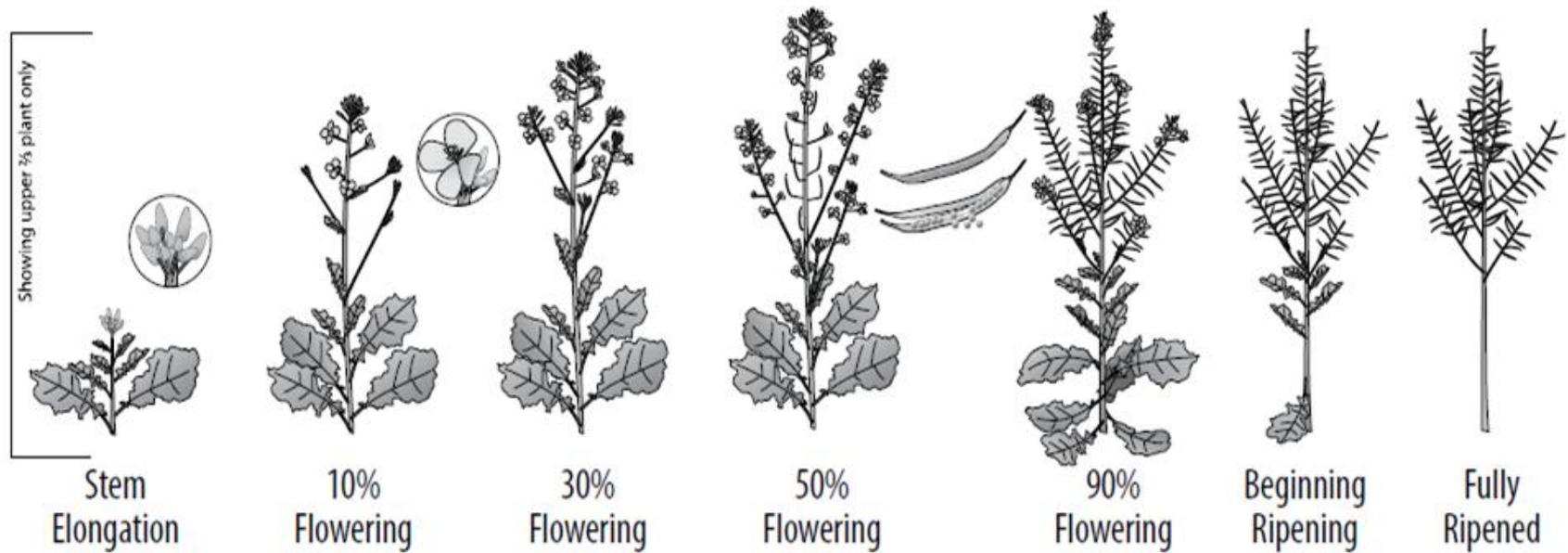
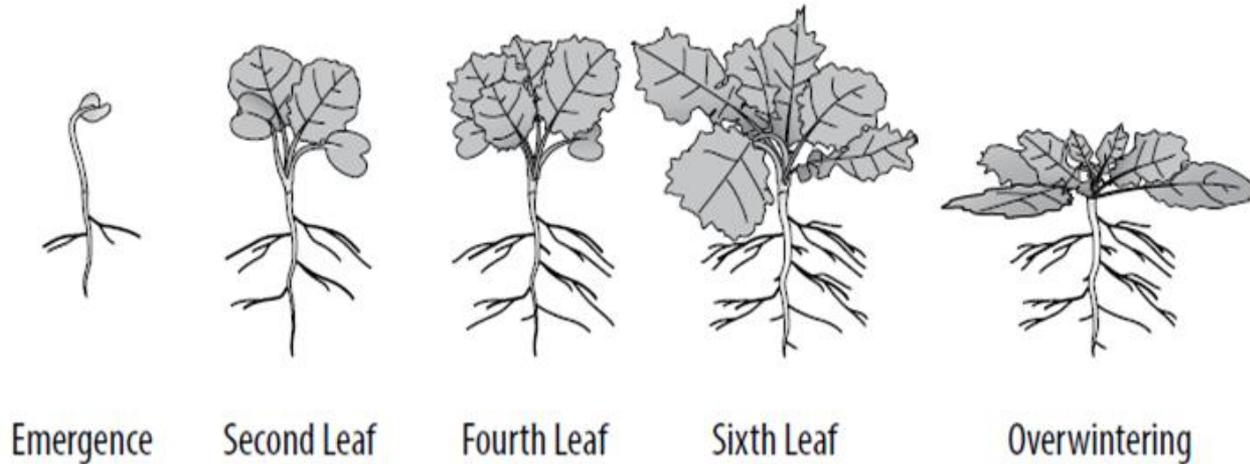
# Sowing Tips, cont'd

- Canola can emerge from greater depths, but seeding deeper than 2,5 cm may delay emergence, reduce seedling vigor, and delay crop development.
- Canola seeds are small, about 1.5-2.0 mm in diameter, so careful placement at a shallow depth is advised
- Press wheels of drill should have just enough pressure to lightly firm the seed and close the furrow.
- If the seedbed dries too fast, emergence from shallow depths may not be uniform.
- Canola has difficulty forcing its way through thick soil covers or crusted soil.
- During the seedling emergence period it is needed to keep moist the soil surface if crust occurs. Sprink irrigation can be applied.

# Growth and Development Stages

Figure 4. Canola growth and development stages.

<https://bookstore.ksre.ksu.edu/pubs/MF2734.pdf>





# Growth and Development

## • Growth Stages

- Emergening
- Seedling
- Rosette
- Geen Bud
- Bolting
- Flowering
- Pod Filling
- Rippening



<https://bookstore.ksre.ksu.edu/pubs/MF2734.pdf>

<http://www2.ca.uky.edu/agcomm/pubs/AGR/AGR227/AGR227.pdf>

# No Till Sowing

## Benefits:

### Saving

- Fuel consumption
- Labor force
- Operation time
- Cost, Money

- Preventing erosion
- Keep soil life activity
- Allowing early sowing

## Defects:

### Don't Allow

- Mixing manure
- Breaking hardpan
- Loosing soil
- Air-water balance
- Cuttig weeds
- Infiltration of water



35 cm row spacing, 2.6 kg/ha seeds



75 cm row spacing, 2.6 kg/ha seeds

# Fertilization

- Depending on the amount of soil N available to the crop, about 80–100 kg/ha N of fertiliser would be needed.
- Canola seed is very sensitive to fertiliser burn. N should not be in direct contact with the seed.
- The majority of the N should be either drilled in before sowing or banded 2–3 cm below and beside the seed at sowing.
- Applying half in the fall and half in the spring is a good recommendation.
- It is important to avoid crushing winter canola with applicator tires when it is frozen or after it bolts. Crushed plants will lodge and maturity will be delayed. For this reason, applicators with narrow tires and wide booms are preferred.

# Fertilization, cont'd

- Phosphorus is poorly mobile in most soils, therefore, topdressed or sprayed fertiliser cannot supply enough to correct a deficiency.
- In the soil, P is immobile, P fertiliser should be banded close to the seed at sowing.
- Depending on the amount of soil P available to the crop, about 40–60 kg/ha  $P_2O_5$  of fertiliser would be needed.
- After soil test, if it is seen K deficiency in the soil, about 30–40 kg/ha  $K_2O$  of fertiliser would be needed.

# Soil Moisture and Irrigation

- Water is essential for plant growth.
- Adequate soil moisture:
  - promotes faster germination and emergence
  - promotes root growth
  - promotes a large, abundant leaf area
  - helps plants to retain their leaves longer
  - lengthens the flowering period
  - increases the numbers of branches per plant,
  - flowers forming pods and seeds per pod
  - increases seed weight and seed yield
  - extends the number of days to maturity up to 10 days.

Grains Research and Development Corporation

<https://grdc.com.au/>

# Soil Moisture and Irrigation

- Soil moisture is vital for both germination and emergence. Canola seed will germinate when the seed moisture content has risen to approximately 24%.
- Rainfall in September-October for winter varieties, and in April for spring varieties provides the moisture need of canola seeds, in generally.

# Soil Moisture and Irrigation

- Moisture stress is more important during pod filling than at the vegetative stage. However, too much or too little water at any growth stage reduces yield potential.
- If dry condition prevailing in the stages of flowering and pod filling, irrigation can be needed by enabling 30 mm water in everytime in these stages.

# Soil Moisture and Irrigation

- Like wheat, canola will benefit from stored subsoil moisture.
- After fallows or mulching, stored subsoil moisture can help to maximise the amount of moisture needed to sowing, germination, emergence and growing of canola.

# Soil Moisture and Irrigation

- !!!
- Most additional soil moisture may cause yield reductions through poor soil aeration and/or increased lodging and diseases.
- Canola does not tolerate waterlogged conditions or flooding, or poor drainage. If this situations occur, you should drain the excess water.

# Weed Management

- At emergence, winter canola has difficulty competing with established weeds.
- Once canola plants are established, winter canola can suppress and out-compete most annual weeds.
- Spring weeds become a problem when canola stands are poor and areas of the field are left open.

# Weed Management

- If planting winter canola after wheat, it is critical to control volunteer cereals and cool-season winter annual grasses.
- But more attention must be given to previous herbicide applications.
- When canola follows the crops such as wheat, corn or cotton which be applied ALS-inhibitor herbicides, pay careful attention.
- Herbicide Carryover can have damaging effects on canola.
- ALS-inhibitor herbicides include the wheat herbicides (e.g. Agility SG, Ally XP, Amber, Beyond, Olympus, Peak); corn and sorghum herbicides (e.g. Accent, Autumn Super, Beacon, Peak, Permit, Python, Require Q , Resolve Q , Spirit); or the cotton herbicides (e.g. Envoke and Staple).

# Weed Management

- Clearfield<sup>®</sup> (CL) hybrid canola varieties have a tolerance against the ALS-inhibitor herbicides carryover.
- IMI tolerant (Imidazolinone-tolerant) canola varieties are grown as part of the Clearfield<sup>®</sup> production system.
- Some GM (Genetically Modified) varieties such as Roundup Ready<sup>®</sup>, LibertyLink<sup>®</sup>, InVigor<sup>®</sup> varieties have a tolerance with glyphosate and glufosinate herbicides. These herbicide groups can be used only determined canola varieties.

# Weed Management

- Damage from herbicide drift or tank contamination also can have a damage on canola.
- Damage from herbicide drift or tank contamination is generally from ALS-inhibitor and synthetic auxin herbicides like 2,4-D, MCPA, dicamba, and Tordon (picloram).
- All sprayer components, including the tank, pump, hoses, and nozzles must be thoroughly cleaned to avoid contamination.
- Select cleaning agents based on the herbicide and formulation used.
- Commercial tank cleaning agents, household ammonia, and detergents remove both water and oil soluble herbicides and are recommended on most herbicide labels.

# Weed Management

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# Weed Management

- Commonly pre sowing herbicides for use on canola is Trifluralin.
- Grass weeds can be managed in canola by using trifluralin pre sowing.
- It is mixed into soil 7-10 cm deep before 1-2 weeks from seed sowing as a part of the last tillage operation.
- This herbicide effectively control numerous winter annual grass weeds such as henbit (*Lamium amplexicaule*), common chickweed (*Stellaria media*), cheat (*Bromus secalinus*), downy brome (*Bromus tectorum*).

# Weed Management

- **There are many herbicide can be applied different period based of canola sowing and seedling growth.**
- **Application Timing(s)**
  - **EPP-early preplant,**
    - Apply before planting the crop to control existing weeds. Will not control weeds that have not emerged.
  - **PPI-preplant incorporated,**
    - Apply to soil surface before planting and incorporate into the upper 2 to 3 inches of soil.
  - **PRE-preemergence,**
    - Apply after planting but before crop emergence. Will not control weeds that have not emerged.
  - **POST-postemergence**
    - Apply postemergence when canola is in the 2- to 6-leaf stage.

# Weed Management

- Herbicide-resistant varietal systems such as triazine-tolerant (TT), Clearfield<sup>®</sup> and Roundup Ready<sup>®</sup> (RR) can be of use in managing weeds in canola, particularly broadleaf weeds.
- Clearfield (imidazolinone) resistant canola hybrids are available that allow the use of imaxamox (Beyond) herbicide for postemergence grass and broadleaf weed control.
- Be aware that herbicide-tolerant traits are passed on to volunteer canola.
- This must be considered when selecting herbicides to control the volunteer canola in fallow and subsequent crops.

# Diseases

- *Diseases that affect canola also may affect members of the mustard family (Brassicaceae, formerly Cruciferae), which includes common weeds such as mustards, pepperweed (Lepidium virginicum), and shepherd's purse (Capsella bursa-pastoris).*
- Diseases attack canola at all stages of development.
- They can be soilborne, seed borne, airborne, or spread from infected crop residues.
- The major diseases of canola are mildew, rapeseed root pus, lead mold, blackleg.

# Diseases

Diseases caused by the fungus:

- **Blackleg**
- **Sclerotinia Stem Rot**
- **Alternaria Black Spot**
- **Downy Mildew**
- **Powdery Mildew**
- **Verticillium wilt** (soilborn)
- **Seedling Disease Complex**
  - *Pythium spp.*, *Fusarium spp.*, and *Rhizoctonia spp.*

Diseases caused by the bacteria:

- **Black Rot**

Diseases caused by phytoplasma (a bacteriallike microorganism):

- **Aster Yellows**

Diseases caused by the fungus and bacteria:

- **Winter Decline Syndrome**
  - *Fusarium spp.*, *Rhizoctonia spp.*, and *Xanthomonas spp.*

# Nematodes

Canola is susceptible to both;

- Sugar beet cyst nematodes
- False root-knot nematodes

Rotating canola with sugar beets should be avoided. At least, sugar beet must come before canola in the crop rotation.

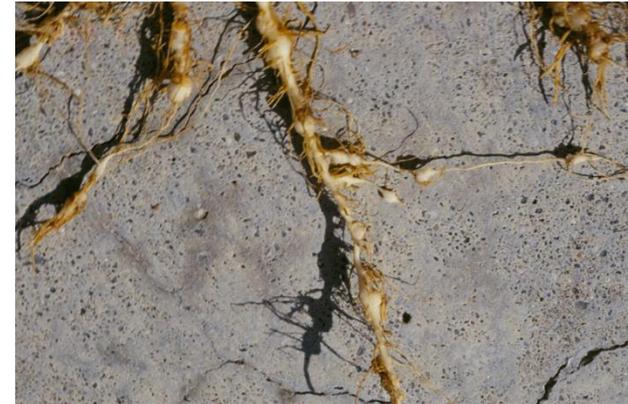
Rotation with cereals, pulses, alfalfa etc.

Chemicals with active ingredients such as azadirachtin (1.2%), 1,3 dichloropropene + chloropicrin

- No other nematodes are known to cause economic losses to canola.



Sugar beet cyst nematodes



False root-knot nematodes

# Insects

- Winter canola attracts many insect pests. Some feed on canola and mustards only, while others have a wider host range.
- Insect pests of canola can:
  - reduce yields by defoliating plants,
  - damaging flower buds or seedpods,
  - or damaging crowns and roots.
- Others transmit plant pathogens such as aster yellows virus. Seedling canola is especially vulnerable to chewing insects, because plants die if the aboveground portion is completely eaten.
- Damage caused by insects is more severe when canola is under stress, especially drought stress.
- Canola pests can occur throughout the entire growing season

# Insects

- Because canola is still a relatively new crop to Turkey, there are no economically important damage caused by insects, except a few.
- The important pests for Turkey are:
  - Cabbage aphid (*Brevicoryne brassicae*)
  - Cabbage gall weevil (*Ceutorhynchus pleurostigma* M.)
  - Flea beetles (*Phyllotreta* spp.)
  - Diamondback moth (*Plutella xylostella*)
  - Cabbage worms (*Pieris rapae*, *Pieris brassicae* L.),

# Harvest

- Canola can be directly harvested when the moisture content of mature seed is 8%.
- Spraying a chemical desiccant can hasten harvest and reduce the risk of harvesting seeds with excess moisture.
- The most commonly used desiccant is diquat (Reglone®) in Australia. Glyphosate (specifically Weedmaster DST®) also can be used for this aim.
- Diquat (Reglone®) has no detrimental effects on the seed or its oil quality if applied at the correct time. The correct time for desiccation is when 70–80% of seeds have changed colour in middle pods.
- The crop will be ready to harvest within 4–7 days after the desiccant is applied.
- After 4 days from applied desiccant, harvester must be ready, and harvest must be complete harvesting over a period of 1–2 days to reduce the seed lost from scattering.

# Windrowing during Harvest

- Canola is an indeterminate plant, which means it flowers until limited by temperature, water stress or nutrient availability.
- As a result, pod development can last over 3–5 weeks, with lower pods maturing before higher ones.
- However, in the novel breed varieties this traits satisfactorily arranged.
- Some canola varieties are often windrowed to ensure that all pods are mature at harvest and to reduce shattering losses. Firstly it is cut by swather or windrower and made windrow on the field.
- By cutting the crop and placing it in a windrow on the stubble, the pods and seeds can dry faster than a standing crop (by as much as 8–10 days).

# Windrowed Canola during Harvest

Prof. Dr. Ali Irfan ILBAS



Edmonton, September 4, 2019. - Ed Kaiser/Postmedia

<https://www.thetelegram.com/news/local/newfoundland-and-labrador-government-exploring-viability-of-canola-oil-409865/>

**The Telegram**

# Windrowing during Harvest

- Windrowing should start when 50–70% of seeds have changed colour to red, brown or black.
- Windrowing too early, for example, by 4–5 days, can lead to yield losses of up to 10% and reduce oil content. Windrowed canola is much less susceptible than a standing crop to wind, rain and hail damage.

- Within 6–10 days of being cut, seeds will reach a uniform harvest moisture content of 8% in the windrow. And windrow can be harvested.



# Direct Harvesting

- Direct harvesting is cheaper than windrowing.
- Direct harvesting is the primary option for these varieties:
  - shorter pod maturity periods
  - pod maturity more uniform
  - more tolerant to pod shattering.
- Canola is ready to direct harvest when almost all pods are dry and rattle when shaken, pods are pale brown, and the seeds are dark brown to black and seeds have <8% moisture content.

# Direct Harvesting

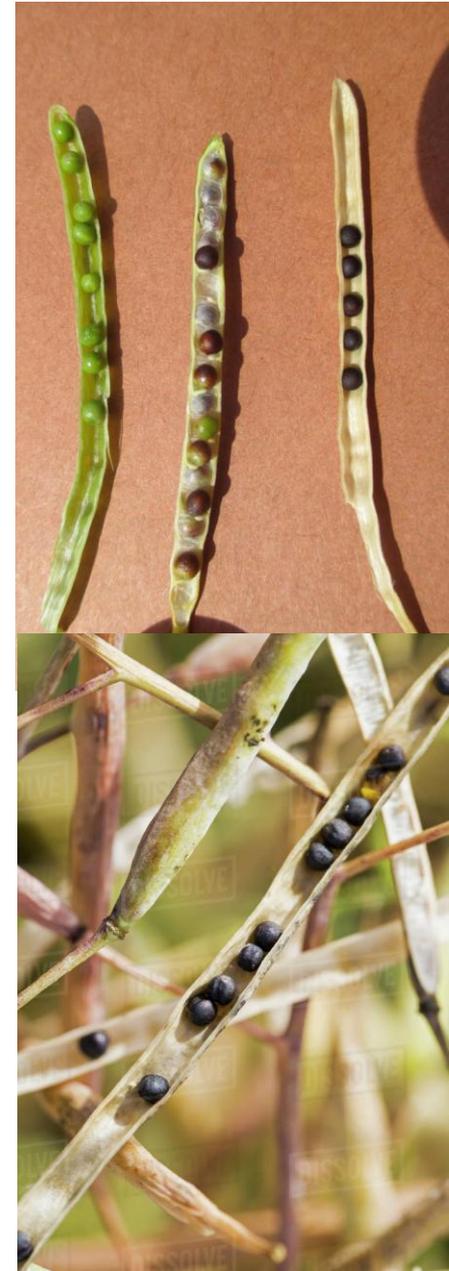


Prof. Dr. Ali Irfan ILBAS

<https://www.cargillag.ca/expert-network/expert-blog/straight-cut-canola>

# Direct harvesting

- Crop harvesting time is based on grain moisture and color, not plant.
- The greatest proportion of losses occurred at harvest. Some varieties have significantly smaller losses than other varieties both before and at harvest.
- The selected variety must have the property that the seed does not spill out of canola shells by scattering and have property of uniform maturity.
- Seed yield can be reach of 5 ton/kg in good condition with suitable variety, it will be 2 ton/da in the dry and poor soil condition, averaga2.5-3.5 ton/ha.



# Storage

To retain the canola's market value, care must be taken:

- to maintain oil quality,
- visual appearance,
- freedom from moulds,
- freedom insect pests,
- freedom chemicals residue.

For safe storage and optimum quality;

- A. Stored seeds should be clean and dry
- B. Silos should be in the cool and well aerated conditions
- C. Protect against mould development and insect damage
- D. Inspect of stored canola regularly

# Storage

## A. Stored seed should be clean and dry

- Timing of harvest and combine settings are important **for minimising trash and impurities and seed damage**. Presence of fine admixture and foreign plant material and dust in the oilseeds have a serious fire risk. The presence of damaged seeds is more attractive to storage pests such as the rusted flour beetle (*Tribolium castaneum*).
- **Moisture content in oilseeds** must be much lower than in cereal grains. **It should be about 7%** based on oil content. If seed oil content is high (e.g 50%) seed moisture should be 6%. if it is 40-45%, content of seed moisture should be 7%. it never be excess to 8%.

## B. Silos should be in the cool and well aerated conditions

- Stored oilseeds temperatures should be in the range 18°–23°C. **Keeping it at ≤20°C is better** by aeration.
- Aeration to promote uniform, cool and dry storage conditions is a key strategy for maintaining oil and seed quality. **Keep relative humidity of <60% in the storage.**

# Storage

## **C. Protect against mould development and insect damage**

Oilseeds are also more susceptible to quality deterioration and have fewer insect-control options.

1. To prevent developing of moulds, the fumigation can require in the a gas-tight, sealable silo.

2. Several insect pests will infest stored oilseeds, usually favouring the grain surface. Against them can be used some natural insecticides such as diatomaceous earth (DE) products such as Dryacide<sup>®</sup> and Some products based on pyrethrin + piperonyl butoxide (e.g. Rentokil's Pyrethrum Insecticide Spray Mill Special<sup>®</sup> or Webcot SPY<sup>®</sup> natural pyrethrum Insecticide)

They can be applied as dust or slurry spray or fogging-misting treatments onto internal surfaces of storage areas and equipment. They are not to be applied as a oilseed treatment. Pay attention directions on the label of insecticides.

# Storage

There are some common insects in the canola storage such as the rust-red flour beetle (Figure 4), Indian meal moth (*Plodia interpunctella*), warehouse moths (*Ephestia spp.*) and psocids (*Liposcelis spp.*) in Australia.

## **D. Inspect of stored canola regularly**

Monitoring storages fortnightly and keep records can be protect possible deterioration of oilseed.

Make visual inspections and smell the canola for the risk of mould development, canola self-heating and oil quality deterioration.

Check canola temperature at a number of locations in the storage.

Sieve grain and use probe traps to detect insect pests.

# Marketing

- Most canola oil is used for human consumption, price of it vary demands of vegetable oil.
- Canola oil also makes an excellent feedstock for biodiesel. Thus, the demand for canola oil is expected to increase.

# Breeding