



Scouting Carinata

Trained Carinata Agronomists



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Carinata Growth Stages

*The scout should note the growth stages of
the crop on the scouting report.*



Carinata Growth Stages



Germination

Cotyledons emerge approximately 4-20 days after planting, depending on soil conditions and planting depth.



Seedling Stage

Carinata plants have 3-5 true leaves. Plant growth is slow during this stage, especially during colder weather.

Carinata Growth Stages



Rosette Stage

Rate of plant growth is faster and more true leaves grow out.



Elongation

Plant stems begin to elongate and buds are set for branching. The carinata crop should be fertilized at this stage.

Carinata Growth Stages



Bolting Stage

Plants will produce an elongated shoot with buds at the terminal. Flowers will appear within days of bolting and new flowers will be set as the main stem continues to grow. The flower buds will be in the terminals. Branches will grow out with additional buds and flowers at branch terminals. Plant growth is rapid during the bolting stage.



Carinata Growth Stages



Flowering Stage

Flowers are present during this stage, normally in March, and lasting into April, but plant growth has slowed. Pods begin to appear at this point. Flowers are self-pollinating, but bees and other pollinators will help with pollination. This is the ideal stage for a preventative fungicide application, i.e., around 20% flower.



Pod-Fill Stage

Pods begin to develop immediately upon pollination. Pod-Fill Begins in March and lasts into May. Seed continues to develop until early May. Flowers and pods both are present during this stage.

Carinata Growth Stages



Pod-Fill Stage



Maturity Stage

During this stage the seed has become fully formed. Pod color changes from green to yellow to brown and is drying throughout this process. The grain is harvest ready when moisture content is at less than 10%.

Carinata Growth Stages



Harvest Stage

Plants have dried down and turned brownish in color. Moisture content of grain is less than 10%. This stage should be in approximately mid-May.



Carinata Diseases



Sclerotinia Stem Rot

Sclerotinia sclerotiorum is present in dead plant material in the form of survival structures called sclerotia. Sclerotinia stem rot (SSR) causes rapid wilting of the foliage and plant death. Cool and moist conditions and a dense, fast growing stand are favorable for SSR development

Scouts should look for bleaching along the base of the stem and white, cottony mycelial growth during humid conditions. Be aware of stunted, early maturing plants which contrast with taller, greener adjacent plants. Look for black sclerotia, the hardened resting structures, at the base of the stem. Sclerotia may be found inside of infected stems by breaking them open. This disease can be very aggressive and thin out a stand of carinata

quickly. A scout should always visit the areas of a field that don't drain well because SSR is likely to appear in those areas first. SSR should be reported as low, moderate, or high. Low would be a few isolated infected plants. Moderate would be single or multiple infected plants found in several spots. High would be would be a case of expanding patches of infected plants throughout the field. If SSR rot is found at all in a field action with a fungicide is probably warranted.

A preventative fungicide application before petal drop is suggested, especially if conditions for SSR are present or expected.



Alternaria Black Spot

Alternaria brassicae, *Alternaria raphanin*, and *Alternaria alternata* cause Alternaria Black Spot. Severe spotting causes foliage to wither and die and can also cause floret abortion. Alternaria Black Spot can cause premature pod ripening and affect the grain quality. A scout should look for black lesions on the leaves stems and pods. Disease severity should be reported on a scale of 0 to 5. This scale is discussed below.

Turnip Mosaic Virus

Turnip Mosaic Virus (TuMV) is for the most part mechanically transmitted and in a non-persistent manner by more than 80 species of aphids. Cruciferous weeds such as wild radish are hosts for both the virus and aphid vectors. Carinata plants infected with TuMV in the seedling and early rosette stage will be stunted, pale, mottled, and distorted. A scout should look for patches of plants displaying these symptoms. The scout should be simultaneously aware of the aphid levels in the field and report them accordingly. TuMV should be reported as a percentage of infected plants in the field.



Alternaria Black Spot



Turnip Mosaic Virus (TuMV)

Disease Rating Scale

A severity scale of 0 to 5 is used for *Sclerotinia sclerotiorum* and Alternaria Black Spot.

Rating of 0: no disease detected in field.

Rating of 0-1: disease is present in field, but lesions are not on every plant and may not be found on every check in a field. The next scout may not necessarily find the disease.

Rating of 1: there are lesions on most plants in the field on the foliage and/or stems. The next scout that comes to the field should be able to find the disease.

Rating of 1-2: lesions are on every plant and more foliage is being affected.

Rating of 2: lesions are coalescing and may be found on top foliage and bottom foliage.

Rating of 2-3: foliage where lesions have coalesced is beginning to turn brown.

Rating of 3: defoliation is occurring and plant vigor is beginning to decline. In the case of *Sclerotinia sclerotiorum*, an occasional plant will be dead.

Rating of 3-4: defoliation is progressing and lesions are coalescing on the youngest foliage. Plant growth has halted. In the case of *Sclerotinia sclerotiorum*, increasing plant mortality will be observed.

Rating of 4: all of the original, older foliage is gone. Plants are about two-thirds defoliated. In the case of *Sclerotinia sclerotiorum*, there will be many dead plants at this rating.

Rating of 4-5: plants are eighty to ninety percent defoliated. Only a few younger leaves remain. In the case of *Sclerotinia sclerotiorum*, a majority of the plants in the field would be dead.

Rating of 5: no foliage is left and only stems remain. In the case of *Sclerotinia sclerotiorum*, few living plants would remain.

Rating by Incidence

Turnip Mosaic Virus should be reported as a percentage of infected plants.



Insect Pests

Diamondback Moth Larvae

Larvae of the diamondback moth, *Plutella xylostella*, may be detected by the irregular holes which they cause with their feeding.

Diamondback moth larvae should be reported as a percentage of plants with one or more larvae present. If incidence of diamondback moth larvae is at or near 100% and if defoliation is greater than 15% control measures should be taken with a labeled insecticide.



Aphids

Cruciferous crops, of which carinata is one, are hosts to several species of aphids. The turnip aphid, *Lipaphis erysimi* and the cabbage aphid, *Brevicoryne brassicae*, are two of these species. Aphids should be reported by recording the percentage of plants with aphids and noting the colony size. Pictured is a large aphid colony capable of stunting and distorting a carinata plant when in seedling and rosette stages. If large colonies become common and small, stunted, and distorted plants begin to appear in a carinata field control measures with a labeled insecticide should be taken.

Aphid populations may be controlled by entomopathogenic fungi. When a fungal pathogen becomes active in an aphid population the population will crash and tend to remain low for the remainder of the year.

A fungal outbreak among aphids is referred to as an Epizootic. A scout may notice dead aphids covered by a brown, wooly fungal mass. This is not the fungus that killed the aphids, but rather, a secondary fungus that proliferates on the dead aphids. Aphid parasitoids, wasps which measure 1/10 inch in length, also inhabit aphid colonies and are generally more effective at lowering aphid numbers than predators.

The female wasps lay their eggs in the aphids and the wasp larvae kill the aphids by feeding and developing inside of their hosts. The swollen exoskeleton of the aphid is referred to as a “mummified” aphid. When the fully developed wasp emerges from its host it creates an exit hole. The carinata scout should look for and report entomopathogenic fungi and parasitoid activity. such as pictured below in the second photograph.



Flea Beetles

Flea beetles, *Epitrix hirtipennis*, can cause delayed growth in heavy infestations. They feed on the carinata foliage and cause scattershot style holes in the foliage. If defoliation reaches 15% during the rosette or flowering stages control measures may be necessary.



Cutworms

Cutworms are the larvae (caterpillars) of several species of night-flying moths in the family Noctuidae. The granulate cutworm, *Feltia subterranean*, and the black cutworm, *Agrotis ipsilon*, are two of the prevalent species. Cutworms chew through the plant stems at the base. They primarily feed on the roots and foliage of young plants and will often cut off the plant from underneath the soil surface. During the rosette and bolting stage a scout should be on the lookout for cut off leaflets or entire plants which have fallen over. Using a pocket knife the cutworm larvae can be located by scratching around in the soil.

In carinata cutworms should be reported as low, moderate, or high and on the basis of stand reduction. If a sporadic plant with damage is found this would be low. Occasional expanding patches of dead plants would be moderate. If thinned out areas of plants are found throughout the field this would be high.



Yellowmargined Leaf Beetle

The yellowmargined leaf beetle, *Microtheca ochroloma* Stal, is a pest of cruciferous crops. Both the larvae and adults of this species feed on the foliage and leaf margins and are capable of defoliating the host. A percentage of infested plants should be reported by the scout and an estimated percentage of defoliation should also be recorded.





Weeds

Wild Radish

Wild radish, *Raphanus raphanistrum*, is a highly competitive weed in many crops and can cause significant yield losses. The fibrous stems of wild radish complicate harvest by clogging the harvest equipment and it is an alternative host for insect pests and diseases. The grower needs to get ahead of wild radish before planting by applying a burndown herbicide at least once and possibly twice in fields with extreme wild radish populations.

A scout should report wild radish levels as low, moderate, and high. Wild radish flowers earlier than *carinata* and its yellow blooms will show as patches of yellow in contrast with the green *carinata* during the bolting stage. Herbicides cannot be used to control wild radish at this point. The weed would have to be hand rogued.





Cold Damage

Cold Damage

Carinata is frost tolerant and may survive temperatures as low as the middle teens for a night or two. If the plants have already had some exposure to light frosts or freezes they will be more hardened and will outgrow freeze damage.





Herbicide Residual Effects

Herbicide Residual Effects

Carinata plants may be adversely affected by herbicide residues in the soil. Scouts should note on the scouting report symptoms such as stunting, yellowing, cupping, and distortion. Pictured here are carinata plants displaying cadre (Imazapic) effects.



Scouting Procedures



A scout should carry to the field several items:

1. *Hand-lens.*
2. *Handheld counter.*
3. *Pocketknife.*
4. *Notepad and pen.*

Enter each field in different spots each scouting trip, if possible, and change the walking patterns throughout the seedling, rosette, and elongation stages. Try to cover the different soil types within a field and check the low spots.

Make notes of consistency of emergence, stand population, plant growth and color, and field conditions such as soil moisture. Weed species and weed populations should be noted.

Look in the terminals and on the foliage of one hundred plants while walking. Use the notepad and handheld counter to keep count of the number of plants with aphids and diamondback moth larvae. Use the pocketknife to locate cutworms.

As the crop matures into the bolting stage and branches grow out a complete circuit of the field will become more difficult. The scout should access the field from several different spots and walk shorter distances into the field as plant density allows.

The scouting report should include the name/s of the scout/s and the date. The scouting report form should have a space for writing in the growth stage of each planting. The important insect pests and diseases endemic to the area should have their own spaces reserved on the scouting report. Write any relevant observations into the notes section, (e.g., residual herbicide effects noted). Send report to supervisor for review and appropriate recommendations.

Carinata should be scouted weekly from the germination through the pod-fill stage. During the maturity and harvest stages one scouting trip should be made every two weeks.

Scouting Carinata

