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CANOLA ADVANTAGE

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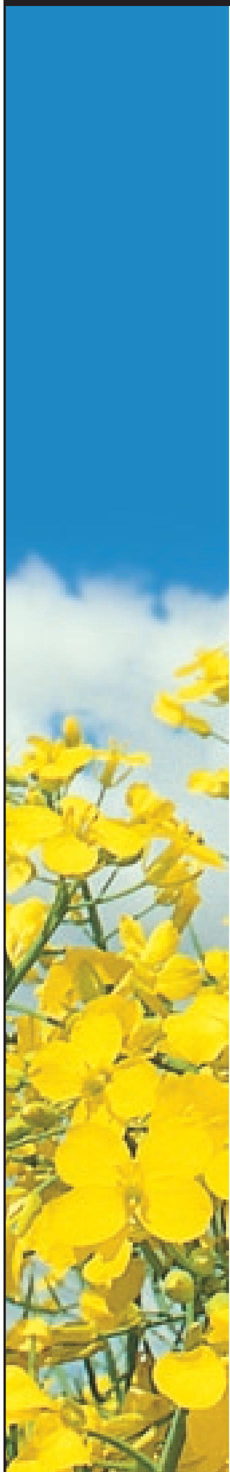

Missing pods or blanks on the main stem! What could be the cause?

Each year across western Canada, many producers and agronomists encounter canola crops with blanks or missing pods on the main stem.

Typically, a missing pod can result from any stress on the plant because stress inhibits proper fertilization of the flowers. It is important however, to accurately determine the cause of the stress in order to take steps to reduce its impact on future crops. In many cases the cause may seem obvious, but it is often a good idea to investigate further to ensure there are no other contributing factors.

Under normal growing conditions, flowering on the main stem will last from 14-21 days. With *Brassica Napus* varieties, about 70-80% of the seed produced is from self pollination which means that the crop does not rely on wind or insects to help in the process. Flowering begins with the lowest buds on the main stem and continues upward. Flowering on the first secondary branch begins 2-3 days after the first flower opens on the main stem.

Typically, fertilization of the pistol (female portion) within the flower occurs within 24 hours of the release of pollen. Canola plants initiate more buds than they can develop into productive pods. The flowers open but the young pods fail to enlarge and elongate and will eventually fall from the plant.

This abortion of flowers and pods is natural. The amount of abortion will depend upon the carrying capacity established by leaf, stem and branch growth plus environmental stresses imposed during flowering and seed set. Research has shown that typically only 40 to 55% of the flowers produced on a plant develop into productive pods.

1) **Heat Stress damage**
   Heat stress is most often associated with temperatures above 25 ºC during flowering but heat stress can occur during early pod filling as well. Research has shown that the plants are more sensitive to heat stress at early flowering than at pod fill.

   For canola, the ideal temperatures for growth are estimated to be between 13 and 22 ºC, under good moisture conditions. Research has shown that when the average mean temperature in July and August is above 20 ºC, canola yields will decrease. Heat stress has been exhibited at lower temperatures when plants are growing in dry soil conditions (drought stress).

Photos from Canola Growers Manual (pages 506, 507).

Figure 8. Heat Injury to Flowers Resulting in Steril Pods

Figure 9. Heat Effect on Flower Clusters

2) Moisture Stress

Most people associate moisture stress with dry soil conditions which can cause pod abortion (blanks), but waterlogged or saturated soils can also cause blanks on the main stem. Excess water impacts pod formation due to several nutrient aspects including nutrient loss, lack of oxygen reducing root uptake of nutrients, and nutrient deficiency inducing premature senescence via hormones. A plant hormone, ethylene, is also emitted from waterlogged soil which accelerates senescence. Canola roots require a good mix of water and air in the soil in order to function properly. Soil that's waterlogged for three days or more at flowering will reduce the number of pods per branch as well as the number of seeds per pod. Waterlogged soil combined with high temperatures will further reduce yields.

3) Heavy rain/Irrigation

It has been observed that irrigation or heavy rain can damage or knock flowers off the stems and reduce pollination, resulting in blanks. Later formed flowers however, often compensate for this damage.

4) Insects

A number of insects can and do create blanks on the main stem and side branches. At early bud stage or as newly formed buds emerge, insects can either eat the buds or damage flower buds while feeding for pollen. In normal years, the plants will compensate but in dryer years, the insects can be yield robbers at the early bud stage. Sweep net sampling and plant examination at the early bud stage is encouraged. Insects that feed on flowers include diamondback moth larvae, lygus bugs, alfalfa loopers, and cabbage seedpod weevils.

Pictures from the Canola Growers Manual (pages 1006, 1012, 1017, 1022). Photos by Roy Ellis.

Figure 4. Alfalfa Looper Larva

Figure 16. Cabbage Seepod Weevil

Figure 26. Diamondback Moth Larva

Figure 32. Adult Lygus Bug

5) Herbicide stress

In the past couple of years, there have been reports of missing pods on the main stem, where heat, insect or fertility issues were not significant enough to explain the level of damage observed. In documented cases, the damage was traced back to late herbicide applications. In these cases, spraying of the crop was delayed until the early bud stage due to environmental conditions which did not allow application at the proper crop stage.

Although canola is tolerant to herbicides, this tolerance is often accomplished at least partly through metabolism of the product by the plants, which can cause some stress. Late application at more advanced crop stages puts stress on the crop at a time that can result in aborted flowers or pods. In normal conditions, the plant can compensate by producing more flowers. However, when combined with another stress such as drought or nutrient deficiency, the plants may be less able to compensate and yield loss can occur.

Example of reduced pod formation in herbicide tolerant canola sprayed at early bolt.

6) Fertility

Nitrogen (N), sulphur (S) and boron (B) deficiencies can cause flower blast, pod abortion or poor pod filling. Of these, S deficiency is the most likely to cause flower blast under field conditions. With N and S, you would likely see other deficiency symptoms such as poor branching, short height, colour.

In some cases, lack of fertility during dry years can occur where roots are having trouble extracting sulphate from the soil profile. The result is typically aborted pods, even with adequate sulphate sulphur application. Once moisture is available and the roots can acquire adequate amounts of sulphur, flowering and pod formation often return to normal.

Pictures of missing pods as a result of nutrient deficiencies from the Canola Growers manual (pages 920, 935, 938).

Figure 51. Aborted Pods due to S Deficiency

Figure 54. Boron-deficient Podding (left) Compared to Boron-sufficient Podding Canola

Figure 19. N-sufficient Raceme (left) and Deficient Raceme

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