Weedy beets and bolters in fodder beet

Introduction
Weedy beets and bolters are an unavoidable aspect of growing fodder beet. The reasons they occur are complex and can be a mix of genetic, environmental, and agronomic factors. However, better understanding some of these factors can help to make decisions that can minimise the number of weed beets and bolters in the paddock. If left uncontrolled, these plants pose a risk of leaving viable seed in the paddock for up to 10 years and of cross-pollinating other beet varieties being grown for seed, such as red beet and silver beet, within a large radius. For these reasons, bolted plants must be physically or chemically removed from the paddock before seed has set. A 4 year minimum rotation between beet crops will minimise potential yield losses and break disease cycles.

What are bolters and why do they occur?

Weedy bolters
Weedy beets are off-type plants that bolt in a single season. They have a genetic trait that causes them to set seed in the first season. They will set seed regardless of the environmental factors that are required for typical vernalisation. The reason they occur is most likely due to cross-pollination from off-types during beet seed production. Because the annual trait is dominant, the seed produced from the cross-pollination will bolt in the first season as a weed beet. Cross-pollination can occur from over 20 km away, so it is difficult to avoid some impacted seed, but the use of certified seed can help reduce the occurrence.

Bolters
Bolters can happen for a variety of reasons including genetic, environmental, and agronomic factors. Some varieties are more likely to contain bolters than others.

Environmental factors include time of sowing and weather conditions. For example, sowing too early increases the risk of having cold weather which could initiate vernalisation and result in seedlings that bolt. Vernalisation requirements are temperatures 3-12°C for 2-3 weeks prior to the 8 leaf stage. Bolting can also result from stress factors such as frosts, dry or wet conditions.

Agronomic factors can also play a part. Stress factors such as damage from high herbicide rates, and over or under application of nutrients or water can cause seedlings to bolt. Repeated beet crops where bolters have not been removed in previous years can result in the presence of bolting seedlings.

Key points

• Removal and control of beet bolters should be part of the crop management for fodder beet crops.
• Sowing too early or adding unnecessary plant stress increases the risk of bolting seedlings.
• Viable seed from bolted plants can remain in the seed bed for up to 10 years.
• In Mid-Canterbury especially, another major concern of bolters is the potential for cross-pollination with other beet varieties/species, with pollen capable of travelling up to 20 km.
• Bolted plants should be pulled no later than when the seed is soft and green.
• Back-to-back fodder beet crops should be avoided, as bolters from the first crop can reduce beet yield in the following crop as well as transfer diseases and pests. For these reasons, wait at least four years before bringing beet back into the rotation.
How to tell weedy bolters and bolters apart

Weedy beets have multiple flowering stems and a white branching root that looks similar to a parsnip, while bolters have fewer branches on the seed head and can have a bulb similar in colour to the cultivar (Figures 1 and 2).

Why are bolters a problem?

Bolters pose a number of risks to fodder beet growers. Seed from plants that have bolted can remain viable in the soil for up to 10 years, although the number of viable seeds decreases after the first year. A large infestation can compromise the ability to grow beet in the same paddock for many years due to competition with non-weed beet as well as the potential for them to act as hosts for beet-specific pests and diseases. In seed production areas, particularly in Mid-Canterbury, plants that make it to flowering can cross-pollinate with other beet varieties such as red beet, posing a great risk to vegetable seed growers.

Removal of bolters

Plants should be pulled and left to dry in the field as soon as their stems have elongated, ideally this should be done before flowering to reduce the risk of cross-pollination. Plants can be pulled and left to dry while seed is still green and soft, but once the seed has set and appears dark and hard the job of removing the plants becomes much more time consuming. At this point, the whole stem and seed head should be removed from the field and destroyed, to prevent seed from entering the soil.

Other methods to deal with bolted stems include weed wiping the heads during flowering in both directions and following with a second wipe 10-14 days later. Multiple passes of mechanical mowing may be an option where there are large areas or with very high populations of bolters (>10,000/ha).

In paddocks where weed beet volunteers are present, inter-row cultivation can be used to remove seedlings, preferably before the 4 true leaf stage. Volunteer plants from viable seed in subsequent crops can be controlled with the standard herbicides being used in the rotation over a four or five year period before returning to beet in the rotation. Grazing can help control weed beet populations in following grazed crops.

Acknowledgements

Reference material for the information provided comes from Seed Force and DLF Seeds publications based on New Zealand and international studies. As more information becomes available from New Zealand research, further updates will be provided.