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Well-established and uniform seedling improves broccoli uniformity at harvest maturity, reducing labour and handling costs. Image source: Shutterstock.



MAXIMISING UNIFORMITY AT HARVEST MATURITY IN PROCESSING BROCCOLI

THE IMPORTANCE OF CROP UNIFORMITY

A high level of variability in broccoli plants at harvest maturity, means multiple cuts are required to harvest the crop, adding to labour and handling costs. Most crops can be harvested in two cuts, but when variability levels are high this can extend to five hand-cut harvests spread over a 7-day period¹. Variation in harvest maturity is also one of the most significant barriers to the adoption of mechanical harvesting².

Once broccoli has entered its reproductive phase (i.e. heads begin to form) there are limited management options available to improve crop uniformity. It is therefore critical to make decisions in the pre-plant and early crop establishment phases that will result in a crop that matures evenly across the block. Good agronomic management, from pre-planting to 28 days post-plant, can significantly reduce crop variability and decrease the number of harvest cuts required¹.

The following information is intended to highlight the

key principles for maximising crop uniformity, however some recommended practices may vary depending on location and broccoli variety.

MANAGEMENT STRATEGIES TO IMPROVE CROP UNIFORMITY

Pre-plant

Paddock selection

Ideally, select blocks that are relatively uniform in soil type and gradient. Variations in soil moisture, soil tilth and temperature will all influence the uniformity of seedling establishment and early growth².

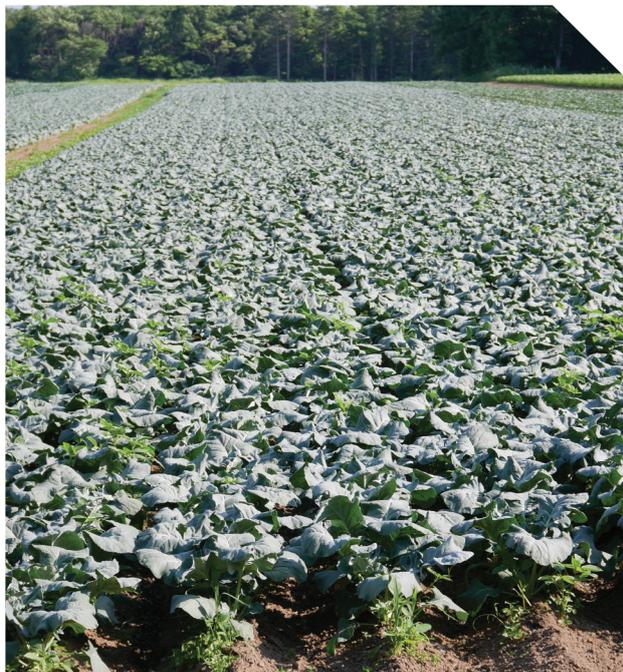
Cultivar choice

Genetic differences among broccoli cultivars can influence uniformity in their development. For example, an open-pollinated variety may have more variability than a hybrid.

Broccoli varieties are highly dependent on climate and season. It is important to select a variety that has been proven to perform well in your location and in the production slot you are targeting².

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Selecting an even block improves the uniformity of crop establishment and rate of maturity. Source: Shutterstock

PLANTING TO HARVEST

Crop establishment

Row configuration

Ensure that the slope, aspect and relative orientation of rows across the block are even, because this will significantly influence the rate of maturity. The difference between temperature and light interception means that north-facing rows will typically mature faster than south-facing rows. North-facing rows can also have significantly greater head weight of harvested broccoli, compared to south-facing rows². This however will vary based on location and planting time.

Direct seeding vs. transplants

Transplanted crops are less variable than direct-seeded crops, while they also have better tolerance to early high insect pressure compared to emerging seedlings in a direct seeded crop.

Seedlings

The quality of the seedlings is very important. Either purchase seedlings from a reputable seedling nursery or if you are producing your own seedlings, follow a reliable production guide, such as the *Seedling production using cell trays* produced by Agriculture Victoria.

Soil preparation and transplanting

The soil should be prepared so that any previous crop residues are incorporated and have broken down sufficiently before transplanting.

The cultivation required to produce a tilth suitable for transplanting seedlings will depend on the soil condition, the level of crop residue and the machinery you have available. The goal should be a seedling bed with a fine enough tilth to ensure good contact between the soil and the seedling plug.



Poor placement of the broccoli plug into the soil can lead to moisture stress and seedling death. Photo M. Boersma, UTAS.

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Careful placement of seedling plugs into the soil is critical as incorrect insertion that exposes the roots or the upper surface of the plug can lead to moisture stress. This can significantly increase seedling mortality and levels of variation at maturity³.

Planting density

High planting density has been shown to improve crop uniformity. Research on direct seeding showed that an increase in plants per hectare from 60,000 to 90,000 significantly reduced head size but also improved crop uniformity². This research also showed that single-row planting produced a more uniform stand than double-row planting. For transplants, current industry standard for optimum yield and uniformity is 45,000 transplants/ha.

Water and nutrient management

Irrigation timing and the moisture levels of the broccoli plugs at planting are significant determinants of crop evenness³.

Water the seedlings just before planting. Pre-water the beds so that the soil profile is full before transplanting, and allow the soil surface to dry out sufficiently to allow the transplanting operation to occur without clogging. Do not plant into dry soil, as fully wetting up the profile after planting is difficult and dry soil will draw water from the plug.

If possible, apply water directly to the seedlings at transplanting (e.g. with a water wheel). Adding potassium nitrate to the seedlings at a rate of 80g per 1,000 seedlings (in 5 litres of water) to reduce the incidence of transplant shock⁵ may also be of benefit.

Moisture stress caused by dry, exposed plugs or delayed irrigation post-transplanting, can cause significant crop stress and increase harvest variability³.

Even application of fertiliser, especially nitrogen, is also important for even crop development².

Pest and disease control

Most broccoli seedlings are pre-drenched with treatments to provide early control of pests and diseases. However, vigilant crop scouting is recommended to enable early identification of pest or disease infestations.

White blister (*Albugo candida*) is one of the most significant diseases of broccoli that requires early control (i.e. protective fungicide applications) to prevent damage during head development.

Caterpillar stages of diamond-back moth (*Plutella xylostella*), cabbage white butterfly (*Pieris rapae*) and heliothis (*Helicoverpa armigera*) are the most potentially devastating insect pests. Integrated pest management strategies should be used where possible and if chemical control is required softer options should be considered (e.g. *Bacillus thuringiensis* or spinetoram (Success™ Neo).

REFERENCES

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