Case study:
IPM and biodiversity in broccoli, early spring 2024

August 2026 / version 1

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Summary:

This case study shares the integrated pest management (IPM) approach, combined with on-farm biodiversity used to produce a broccoli crop during early spring 2024, with reduced chemical inputs.

Introduction

This report outlines the early spring 2024 broccoli crop, implementing an Integrated Pest Management (IPM) framework focused on biodiversity enhancement.

Our key aim was to control pest populations through natural means by increasing on-farm biodiversity, reducing dependence on chemical treatments, and leveraging the effectiveness of natural enemies. This strategy serves as a sustainable model that helps optimise crop health and yield.

Crop overview

This section outlines the growth and environmental challenges of the early spring broccoli crop. The crop experienced generally favourable spring conditions, with minimal pest insect pressure and low disease incidence under cooler season conditions. While it was difficult to assess the impact of biodiversity plantings on crop insect dynamics during this early period, the crop was successfully harvested, achieving the expected quality and yield targets.

Crop details

The broccoli variety *'Nobel'* was transplanted on 29 August 2024, with two further sowings made over the following two weeks.

This case study covers all three plantings. Conditions at planting were poor due to persistent rainfall, but this was the only available window to establish the crop. Harvest of the first sowing commenced on 4 November 2024.

Broccoli crop with a mobile insectary providing natural enemy support, showing *Muehlenbeckia axillaris* in flower (4 November 2024).

Challenging ground preparation and planting conditions for the transplants (29 August 2024).

Monitoring details

Crop monitoring was conducted on a seven-day cycle, with adjustments made in response to pest pressure. During each session, six plants were systematically scouted in a diagonal pattern across the cultivation block, following standard industry guidelines. Spray thresholds were set based on these guidelines and further refined using field experience to inform and improve decision-making processes.

Broccoli harvest in progress (11 November 2024).

Pest overview

Overall pest pressure for this early spring slot crop was low. A small presence of aphids and leaf miner was observed toward the end of the crop cycle, but these did not reach significant levels. Diamondback moth (DBM) was not a major concern during this period, contributing to the relatively light pest load across the crop cycle.

Natural enemies overview

As would be expected coming out of the cooler winter months, beneficial insect activity within the crop was almost entirely absent. The only natural enemy observed was a parasitised aphid, indicating very limited observable biological control during this period.

Disease update

The main disease observed was downy mildew, which remained confined to the older leaves. It stayed under control throughout the life of the crop and did not affect harvest quality or yield.

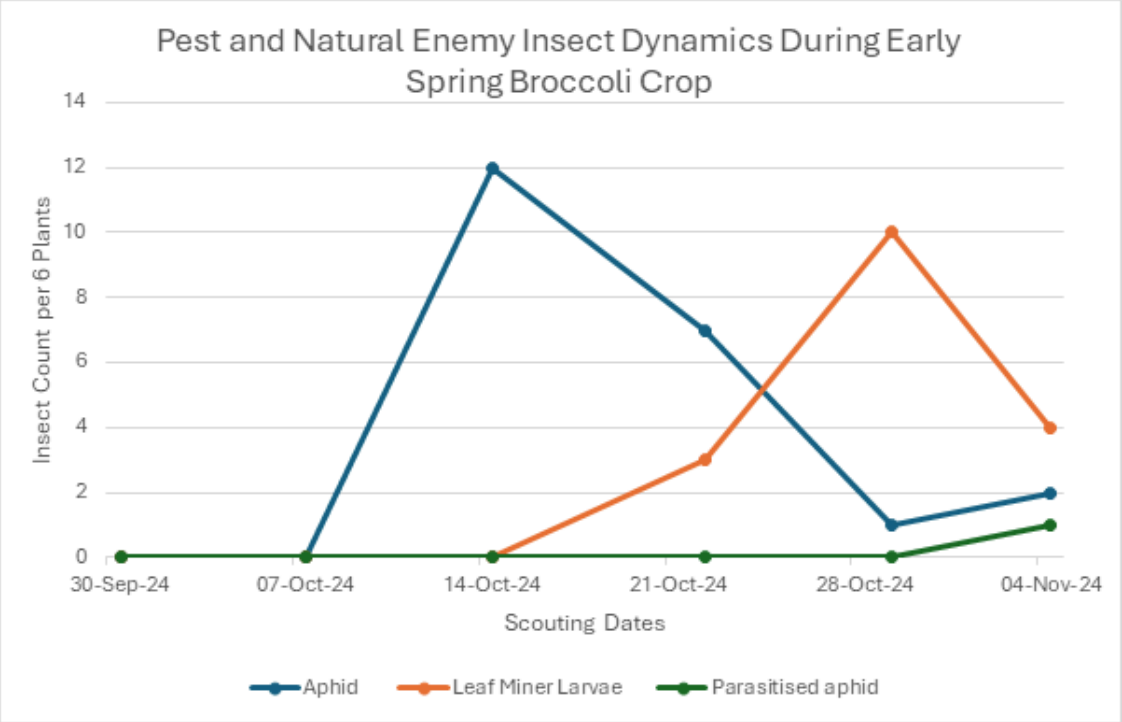
Thresholds

During this crop cycle, monitoring followed the threshold guidelines outlined in the Information Guide for IPM in Outdoor Lettuce (August 2007), with a focus on insect thresholds. The thresholds applied were:

- Aphids: Action threshold set at 10% of plants infested with colonies.
- Lepidoptera: Action thresholds set at:
  - 30% of plants infested at the 6–8 true leaf stage,
  - 20% of plants infested at the 6–8 true leaf stage - floret initiation (heart leaves only)
  - 10% of plants infested at the floret initiation - floret development stage.

In practice, no insecticide sprays were applied. Aphid colonies stayed at low, stable levels even when spray thresholds were reached, while lepidoptera pressure was negligible and did not trigger any action thresholds.

Monitoring results
Throughout the growing season, pest and natural enemy populations were monitored weekly to evaluate the effectiveness of IPM strategies and biodiversity enhancements. The graph below illustrates the main pest populations, with aphid life stages combined, alongside the most commonly observed natural enemy during the crop.



Additionally, the accompanying table provides details on the diversity of species encountered in the crop. This includes both pests and natural enemies that were not routinely monitored but were observed sporadically, offering valuable insight into the broader ecological impact of our biodiversity efforts. The table categorises these sightings into two groups: those systematically recorded during monitoring and those noted incidentally, providing an overview of the pest and beneficial insect dynamics within the lettuce crop.

Diversity of insect species observed in the broccoli crop

	Pest		**Beneficial**
Monitoring	Aphid	Monitoring	Parasitised aphids
	DBM - caterpillar		
	Leafminer - larvae		
Observed	DBM - adult		

Biodiversity planting impacts

During this crop cycle, biodiversity plantings did not appear to contribute directly to pest management, as very few natural enemies were found within the broccoli crop.

The biodiversity plantings in closest proximity to the crop was an annual floral strip established on the south side of the block, sown on 17 October 2024, with a mix of alyssum, buckwheat, calendula, cornflower, marigolds, and crimson clover. These strips provided no pollen or nectar resources during the broccoli crop cycle, as the first flowers only began opening around 26 November 2024, after harvest had already started.

Permanent native plantings along the north and east and sides of the block offered some SNAP resources, with species such as *Disphyma australe, Lobelia angulata, Metrosideros carminea* 'Red Carpet', *Muehlenbeckia axillaris, Pratia puberula, Pimelea* 'Blue Peter', *Pimelea prostrata* 'Silver Ghost', *Olearia chesmannii, Ozothamnus leptophyllus, Pittosporum anomalum,* and *Pomaderris kumeraho.*

In early October 2024, six movable insectaries were also placed within the crop, containing native plants of which those flowering included *Leptospermum nanum* 'Kiwi', *Leptospermum* 'Kea', *Muehlenbeckia axillaris, Pimelea prostrata* 'Silver Ghost', and *Pomaderris edgerleyi*. Combined, these native plantings provided habitats and resources for beneficial insects such as Tasmanian brown lacewings, parasitoids, and spiders, which are important contributors to pest control.

A spider was observed on a *Carpodetus serratus prostrata* plant within the native permanent plantings (4 November 2024).

Permanent native plantings along the sides of the block offered some SNAP resources.

To quantify the impact of these plantings, total insect counts and species diversity observed within the broccoli crop were recorded as follows:

Pests	Natural enemies
40 individuals across 3 species	1 individual across 1 species

This data highlights the ongoing pest pressure in Pukekohe during the transition out of winter, and the difficulty in establishing natural enemy populations at levels required for effective biological control during this period.

Harvest

The crop was successfully harvested. Despite the seasonal challenges, it met quality expectations and was well-received at market, with no issues reported.

Reducing insecticides

We successfully produced an early-spring broccoli crop by combining drenching, IPM, and biodiversity plantings.

Pest pressure remained low throughout the season, and the combination of control measures allowed the crop to reach harvest clean.

The table below outlines the schedule of fungicide and insecticide applications made during the crop cycle, comparing our biodiverse crop with a nearby conventional crop.

This comparison highlights how IPM and biodiversity strategies reduced chemical reliance while maintaining effective pest control.

Our crop treatment			**Nearby crop treatment**		
Date	Fungicide	Insecticide	Date	Fungicide	Insecticide
		Durivo drench @ transplant			Durivo drench @ transplant
21/10/2024	Bravo Weather Stik		10/09/2024	Thiram	
			17/09/2024	Thiram	
			25/09/2024	Promanz	
			01/10/2024	Promanz	
			14/10/2024	Bravo Weather Stik	
			21/10/2024	Bravo Weather Stik	Aphidex
			29/10/2024	+Integralis +Incursus Field	Uphold + Aphidex

Conclusion

This early spring broccoli crop was planted under tough, wet conditions, yet still showed that pest insects remain present even in cooler periods. Despite the pressure, the crop was successfully managed, highlighting the importance of strategies that support natural enemies when conditions are less favourable.

While it was difficult to observe the direct impact of biodiversity plantings on pest control during this cycle, their role is expected to increase as they mature.

The annual floral strip had not yet begun providing full SNAP resources for natural enemies during the crop, but the developing native plantings are anticipated to enhance ecological balance, support stronger natural enemy populations, and build resilience within the farming system over time.

Acknowledgements:

We extend our thanks to South Pacific Seeds for their generous seed contributions to the project. Special appreciation goes to Scott and Dennis Fong from Desloe Produce for their invaluable contributions to the growing of the crop. Additionally, we are grateful to Howe Young for his pivotal role in ensuring the smooth operation of all project activities and to Olivia Prouse from Cropping Services Ltd for technical oversight and reporting. Thank you to Balle Brothers for providing the land for this project.

Other related resources

Biodiverse planting on vegetables farms project - here

This project is designed to show how manipulation of plant diversity on a farm can increase beneficial insect numbers and reduce the pests in a crop, meaning less use of insecticides is required. Linked on this page are many grower resources relating to this biodiversity project, including how to guides, monitoring sheet templates and crop case studies.