Interseeding Cover Crops in Broccoli to Improve Soil Health

RESEARCH SUMMARY | ON-FARM DEMONSTRATION RESEARCH & MONITORING | 2024

RESEARCH LOCATION

- Pemberton, BC

FARMER COLLABORATORS

- Kerry McCann and Andrew Budgell; Laughing Crow Organics

AUTHORS

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HIGHLIGHTS

- This project evaluated the outcomes of interseeding of a cover crop with broccoli in terms of soil health, post-harvest nitrate, and crop yield.
- The cover crop seemed to uptake post-harvest (leftover) soil nitrate resulting in lower soil post-harvest nitrate levels. This nitrate, because it is now part of the cover crop, will be available to the plants next year once the cover crop is terminated and incorporated.
- The establishment of the cover crop while the broccoli crop was in production (interseeded) did not seem to affect the broccoli yield in this study.

MOTIVATION

- Interseeding cover crops among cash crops has the potential to provide weed suppression, repulsion of pests, and improved soil quality without reducing yield.
- There are different cover crop/cash crop combinations that could be interseeded, with a variety of benefits and challenges.
- On-farm demonstration research is a way to evaluate which approach will work best for individual farmers.

RESEARCH OBJECTIVE

The objective of this research is to evaluate interseeding of a cover crop with broccoli. The research questions that this project will be addressing are:

1. Does a cover crop mix composed of fall rye, peas and vetch successfully establish when interseeded in a broccoli bed?
2. Does a cover crop mix composed of fall rye, peas and vetch improve soil health parameters such as organic matter?
3. Does a cover crop mix composed of fall rye, peas and vetch interseeded in a broccoli bed reduce post-harvest nitrate levels and increase nitrogen availability the following cropping season?
4. Does a cover crop mix composed of fall rye, peas and vetch interseeded with broccoli affect crop yield?

METHODS

BED PREPARATION

- One 345 ft x 5 ft broccoli bed was planted June 26, 2023, and split in half to establish two treatment areas each 172.5 feet long. The two treatments were 1- broccoli undersown with cover crop (Cover Crop) and 2- broccoli without a cover crop (Control).
- The cover crop mix was composed of 70% fall rye, 20% winter peas and 10% winter vetch, a mix produced by Richardson Seed and supplied by Terralink Horticulture Inc., Abbotsford, BC.
- 4 lbs of the cover crop mix was broadcasted by hand in the cover crop bed on August 10, 2023 (Fig. 1ab). Both treatment areas received a light cultivation that day.
- The broccoli was harvested over two days, on Aug. 28 and Sept 1. The crop was destroyed using a flail mower within a week of harvest.

WHAT IS ON-FARM DEMONSTRATION RESEARCH?

- Demonstration research is small-scale testing of an innovative practice on a working farm.
- Guided by producers' goals, demonstration research provides the farming community with experience and information about a new practice, product or technology.
- This research summary is intended to share information and is not official guidance.

SOIL TESTING

- Soil was sampled twice; end of June (baseline) and early October (post-harvest). Baseline sampling consisted of one composite sample of 15 cores in each bed. Post-harvest, two composite samples of 15 cores in each bed were taken (one in the west half and one in the east half of each treatment) to capture potential soil variabilities within treatment.
- Soil was sampled to 30 cm with the 0-15 cm and the 15-30 cm layers submitted separately to the Terralink Plant Science Lab in Abbotsford, BC, for a complete soil analysis.

YIELD ASSESSMENT

- Total weight and the number of heads harvested was recorded by the grower during both harvest events.

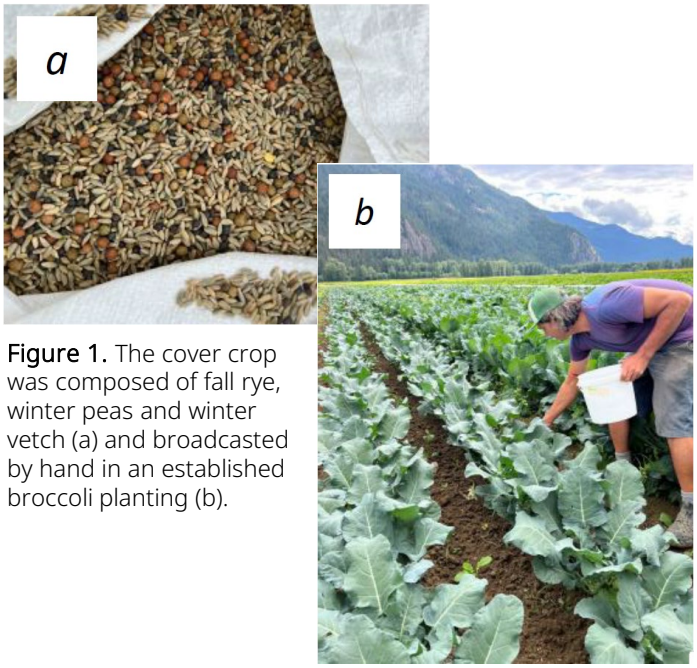

Figure 1. The cover crop was composed of fall rye, winter peas and winter vetch (a) and broadcasted by hand in an established broccoli planting (b).

COVER CROP ASSESSMENT

- Plant coverage was measured twice, Sept 5 (after harvest but prior to mowing) and Oct 2, 2023.
- Four sub-samples per treatment were taken each time. One sub-sample consisted of assessing plant coverage in a 0.5 sq ft quadrant on a scale of 0-4 (Table 1), and noting absence/presence of the rye, peas, and vetch.
- The plant coverage assessment included weeds.

Table 1. Cover crop assessment scale.

Score	Percentage Coverage
0	No plants
1	1-25%
2	26-50%
3	51-75%
4	76-100%

RESULTS

SOIL TESTING

- Soil organic matter (SOM) started at similar levels prior to bed establishment and showed increased levels in both treatments post-harvest. Because the cover crop will be incorporated in spring 2024, analysis of the effect of the cover on SOM will be evaluated then.
- Post-harvest nitrate levels left in the soil were higher in the Control treatment compared to the Cover Crop treatment (Table 2).

Table 2. Summary of nitrate content (kg N/ha) in the Control and Cover Crop treatments post-harvest in the 0-30 cm soil layer. Results are based on averages of two samples.

	Post-Harvest Nitrate (kg N/ha)
Control	51.7
Cover Crop	33.2

YIELD ASSESSMENT

- Yield was similar in both treatments (Table 3).
- Yield was lower than a typical broccoli crop for the farm as plants needed to be harvested earlier due to a bacterial disease outbreak.

COVER CROP ASSESSMENT

- On Sept 5, the average score for the Control was 0-1, representing low weed pressure overall (Table 4; Fig. 2). That day, the average score in the Cover Crop bed was 2 (26-50% plant coverage), with all three plant species present in the mix found growing in the field.
- On Oct. 2, the average score had not changed for the Control bed, and the Cover Crop score was 2-3 (26-75% plant coverage), indicating that further cover crop growth had occurred.

Table 3. Summary of yield per head (lbs/head) in the Control and Cover Crop treatments.

	Yield (lbs/head)
Control	0.49
Cover Crop	0.50

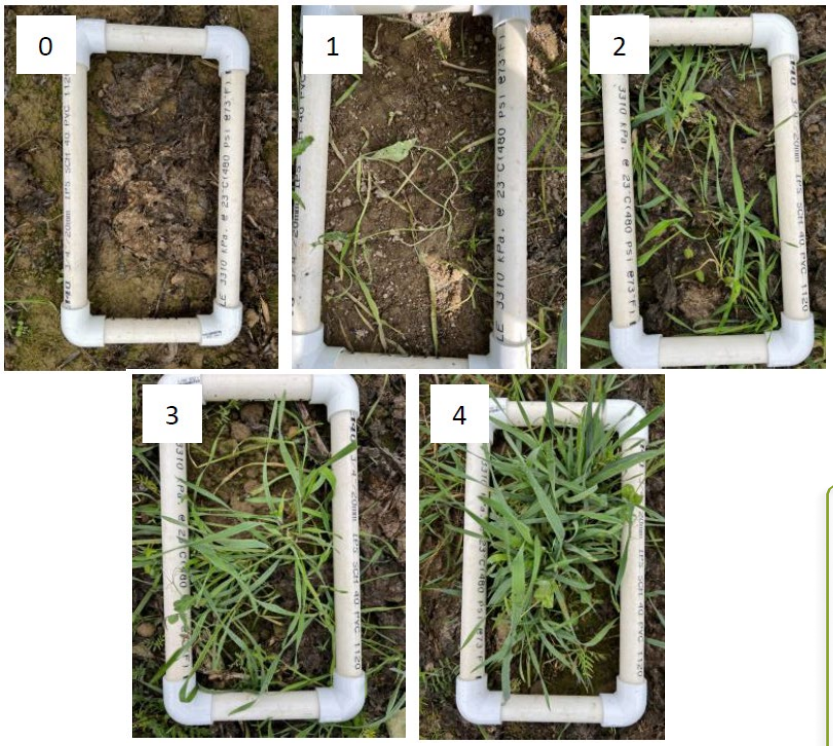

Figure 2. Visual representation of percentage coverage scores 0-4 where 0 = no plants, 1 = 1-25%, 2 = 26-50%, 3 = 51-75%, and 4 = 76-100% coverage.

CONCLUSIONS & NEXT STEPS

- The cover crop composed of fall rye, peas and vetch successfully established under the broccoli plants.
- The cover crop seems to successfully uptake nitrate leftover in the ground resulting in lower soil post-harvest nitrate levels. This nitrate, because it is now part of the cover crop, will be available to the plants next year once the cover crop is terminated and incorporated, while left over nitrate in the soil is typically leached through the soil in the fall and winter with precipitations.
- The establishment of the cover crop while the broccoli crop was in production (interseeded) did not seem to affect the broccoli yield in this study.
- Soil organic matter and nitrate levels will be evaluated in spring 2024, once the cover crop has been incorporated.
- This was an observation trial (side by side) with no replication of treatments. Data collection over multiple years is recommended to gain confidence in the results.

Table 4. Summary of average plant coverage score based on four sub-plots in each of the Control and Cover Crop treatments. Score 0-4 as described in Table 1.

	Sept 5 Av. Score	Oct 2 Av. Score
Control	0-1	0-1
Cover Crop	2	2-3

FIND MORE INFORMATION:

Read the research manual:
https://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/agriculture-and-seafood/programs/regional-extension/interseeding_cover_crops_in_broccoli_to_improve_soil_health.pdf

Find more demonstration research:
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