CLIMATE CHANGE
ADAPTATION PROGRAM

Evaluating the Use of Organic Amendments to Maintain Soil Health and Cherry Production Under Climate Change in British Columbia

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Farm Adaptation Innovator Program- Research Factsheet

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MSc student Paige Munro applying compost to cherry trees.

Geographic Applicability	This study was conducted in the Okanagan Valley, BC and findings may be applied to other regions in BC that produce tree fruit crops
Commodity relevance	This study was conducted on Sweet Cherries but findings may also be applied to other tree fruit crops
Timeline	2015-2017

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The purpose of this project was to assess the potential of wood chip mulch and yard trimmings compost to 1) enhance cherry production and maintain soil health in new orchards at higher latitudes and elevations under climate change and 2) to improve soil health in established orchards where replant disease is problematic. Climate change has allowed expansion of sweet cherry to higher latitude and elevation sites in BC. Organic amendments can improve soil quality, stimulate microbial activity and repress harmful microorganisms that contribute to replant disease in established orchards.

Study Objectives

- Establish study sites at two new orchards and one established orchard with replicated treatments of compost, mulch or no amendment (control)
- Assess the impact of organic amendments on soil health, soil chemical properties, fruit yield and quality
- Assess the economic cost/benefit of the organic amendment treatments

Key Findings

- Compost increased soil organic matter, cation exchange capacity, total carbon and nitrogen, other mineral nutrients, and pH compared to other treatments.
- Compost tended to decrease the abundance of plant parasitic nematodes in plant roots and soil and increased total nematode abundance in soil. Compost and mulch decreased colonization of roots by arbuscular mycorrhizal fungi.
- Compost and mulch had no effect on tree growth, but increases in leaf % N, P and K were observed after two years.
- Compost increased fruit firmness and stem pull at two sites, and mulch increased fruit colour and soluble solids at two sites after three years, but had no effect on fruit yield.
- Economic analysis showed that, in the short term, compost amendment had a greater potential for benefit than mulch, with greater benefit expected in sandier soils, but costs may outweigh the benefits.

Definitions

Soil health: continued capacity of soil to function as a vital living ecosystem that sustains plants, animals, and humans. It is dependent on a diverse soil biota.

Replant Disease: decline in vigour and productivity of young fruit trees planted into soil previously planted to fruit trees, associated with buildup of plant parasitic nematodes and fungal pathogens in soil.

Design

This project was conducted at two new cherry orchards in the North Okanagan and one established orchard in the Central Okanagan with replant disease. There were three treatments at each site: annual surface application of bark and wood chip mulch or yard trimmings compost or no amendment and each treatment was replicated six times. Soils were sampled each fall and soil nutrient status, cherry tree growth, yield and fruit quality assessed in the final two years of the project.

Limitations

This study was conducted on commercial orchards over three seasons and there was significant variability between replicates and across sites. The time frame for observing treatment effects may have been too short as other studies have shown that the benefits of organic amendments can increase over a 10-15 year period.

Next steps

While the findings from this study provide useful information to fruit growers, longer-term studies are needed to fully assess the potential benefits of organic amendment application to maintain soil health and enhance sweet cherry production in new orchards and reduce/control replant disease in established orchards.

Climate Adaptation Implications

Surface application of organic amendments such as compost and mulch show the potential to enhance soil chemical and physical characteristics and maintain soil health by decreasing plant parasitic nematode populations in newly cultivated orchards and old orchard soils. They may prevent the onset of replant disease in new soils and decrease its negative effects in old orchard soils..

Table 1. Effect of organic amendments on soil chemical and biological characteristics. Values are means of three orchard sites over 2 years. Within each column, means followed by different letters are significantly different. CEC = cation exchange capacity, PPN = plant parasitic nematodes and AFM = arbuscular mycorrhizal fungi.

Amend-ment	CEC (meq/ 100 g soil)	P (mg/ kg)	Total N (%)	Total C (%)	Organic Matter (%)	pH	PPN (g/ root)	AMF (% colonized root)
Bare	19.9 b	150 b	0.3 b	3.9 b	7.0 b	6.3 b	133 a	27.9 a
Compost	22.4 a	203 a	0.4 a	4.8 a	8.4 a	6.7 a	103 b	21.3 b
Mulch	17.6 b	148 b	0.3 b	4.1 ab	7.2 b	6.4 b	161 a	22.6 b

For more information:

The complete article may be found on this link:

https://www.bcagclimateaction.ca/faip-project/fi12/

Follow these links for additional information on related topics:

Climate adaptation projects in the Okanagan/Thompson regions
https://www.bcagclimateaction.ca/regional/okanagan-thompson/

Sweet Cherry production
http://www.bctfpg.ca/

http://www.bctfpg.ca/horticulture/varieties-and-pollination/cherry-varieties/

Replant disease
http://tfrec.cahnrs.wsu.edu/organicag/tree-fruit/replant-disease/

Soil health
https://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/

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