



Evaluating the Use of Postharvest Deficit Irrigation for Cherry Production Under Climate Change in British Columbia

Farm Adaptation Innovator Program- Research Factsheet

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MSc student Tirhas Gebretsadikan measuring plant water stress of cherry subjected to postharvest deficit irrigation.

The purpose of this project was to assess the effect of postharvest deficit irrigation on cherry production and soil chemical and biological characteristics in a new and an established orchard. Climate change has allowed expansion of sweet cherry production to more northern sites in BC. With longer growing seasons and warmer temperatures the future availability of an adequate water supply is a concern in the semi-arid Okanagan Valley. Practices that conserve water and increase water use efficiency without affecting fruit yield and quality will help sustain production for the future.

Geographic Applicability

This study was conducted in the Okanagan Valley and findings may be applied to other regions in BC which 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

Study Objectives

- Establish study sites at one new orchard and one established orchard with replicated treatments of full irrigation and postharvest deficit irrigation (25-27% reduction in water application)
- Assess the impact of postharvest deficit irrigation on plant growth, plant water stress, fruit yield and quality, soil chemical and biological properties.
- Assess the economic cost/benefit of postharvest deficit irrigation

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Key Findings

- Postharvest deficit irrigation (25-27% reduction) had no effect on soil chemical or biotic properties compared to full irrigation treatments. Soil volumetric water content, measured in mid-August did not differ between treatments.
- Tree growth, leaf area and leaf mineral content did not differ between the two irrigation treatments.
- Stem water potential, a measure of plant water stress, did not differ between the two irrigation treatments.
- Postharvest deficit irrigation had no effect on fruit yield and quality, indicating that water use efficiency increased under this irrigation treatment.
- Economic analysis showed that postharvest deficit irrigation has the potential to be beneficial for growers in reducing the cost of water usage and having little implementation cost. However, there is little incentive for adoption at present as annual water allocation to Okanagan orchards exceeds current water usage.

Definitions

Postharvest deficit irrigation: reduced application of water following fruit harvest is used to reduce irrigation water allocations to fruit orchards and yet maintain yields.

Stem water potential: is the potential energy of water per unit volume in the stem relative to pure water in reference conditions. It is a sensitive physiological indicator of the water status of the plant.

Soil volumetric water content: is a numerical measure of soil moisture. It is the ratio of water volume to soil volume.

Leaf mineral content: In this study, % nitrogen, % phosphorus, % potassium and % magnesium content of dried leaf tissue.

Design

This project was conducted at one new cherry orchard in the North Okanagan and one established orchard in the Central Okanagan. There were two treatments at each site: 1) full irrigation supplied by microsprinkler and driplines, and 2) postharvest deficit irrigation in which irrigation water supplied postharvest was reduced by 25-27%. Each treatment was replicated six times. Stem water potential was measured on four replicates every 2 weeks following harvest. Soils were sampled each fall for two years and soil nutrient status, cherry tree growth, yield and fruit quality assessed for two years following initial application of the irrigation treatments.

Limitations

This study was conducted on commercial orchards over two seasons following initial application of the treatments. There was variability between replicates and between sites.

Next steps

While the findings from this study provide useful information to fruit growers, longer-term studies are needed to fully assess the potential effects of postharvest deficit irrigation on cherry yield and fruit quality in the following years. Greater reductions in postharvest irrigation should be tested.

Climate Adaptation Implications

With climate change it is anticipated that water supply during the growing season may be reduced in the interior of British Columbia and may limit crop production. It is likely that water pricing based on actual water usage will be implemented in the region and postharvest deficit irrigation would therefore benefit growers by reducing water usage costs and increasing water availability as cherry acreage continues to expand.

Table 1. Effect of postharvest deficit irrigation on sweet cherry yield and fruit quality characteristics one year following initiation of a 25% reduction in irrigation water applied following harvest in a newly established orchard in the north Okanagan. NS = no significant difference between full and deficit treatment means

Irrigation Treatments	Yield (kg/plot)	Firmness (g/mm)	Stem pull force (kg)	Color	Soluble solids (%)	Titrateable acidity¹
Full	27.48	483.77	0.835	3.827	21.78	5.809
Deficit	25.15	470.21	0.836	3.888	22.45	5.964
<i>Significance</i>	NS	NS	NS	NS	NS	NS

¹(mL NaOH/5 mL of juice)

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 project 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/>

Wine grape and tree fruit production Okanagan region- climate change adaptation

<https://www.bcagclimateaction.ca/wp/wp-content/media/AdaptROseries-Okanagan.pdf>

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