Blueberry Leaf Tissue Nutrient Concentration as Influenced by Canopy and Branch Position

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Introduction

In Washington state, blueberry is grown in two very climatologically different regions. East of the Cascade Mountains, in Central Washington, there is low precipitation (ca. 150 mm/year) and cold winters with warm to hot summers whereas western Washington is characterized by high precipitation (ca. 830 mm/year) and mild temperatures. Our ongoing research is evaluating differences in leaf tissue nutrient concentrations in these two regions to establish guidelines for growers to use for nutrient management, including the best location in the canopy is to collect tissue samples for nutrient analyses.

The objective of our present study is to compare the location in the canopy as well as on the branch for tissue nutrient concentrations to develop guidelines for sampling.

Methodology

- Leaf samples between 28 July – 4 August in 2016 and 2017 and analyzed for nutrients
- Midseason blueberry cultivar Draper used for all sampling
- Three sites in western and two in eastern Washington
- Three canopy positions/"regions" (Fig. 1)
- Three leaf positions in each canopy position (Fig. 2)
- Samples collected from 5 plants per plot, replicated 3 times in each field
- Data analyzed using ANOVA on SAS v. (.4 (Cary, N.C)

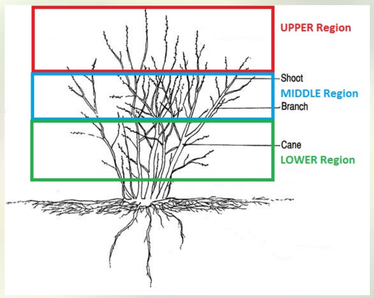

Figure 1. Three sampling positions/regions in blueberry canopy.

Figure 2. Three branch sampling positions in blueberry, used in each canopy position.

Results

- The data being reported is from one growing season (2016) only as the 2017 sample analysis is only partially complete.
- With the exception of iron, all nutrient concentrations differed by location (eastern and western Washington) and canopy position (Table 1)
- Nutrient concentration did not vary with branch position or the interaction of canopy by branch position (Table 1).
- When the data was analyzed by location, calcium and boron concentration in leaves did not differ by canopy position (data not presented).
- Figure 2 shows the average leaf tissue nutrient concentration by location and canopy position when significantly different ($P < 0.05$).

Table 1. Level of significance for differences in blueberry leaf tissue nutrient concentrations by location (eastern or western Washington) and canopy and branch positions.

Nutrient	Location	Canopy Position	Branch Position	Canopy*Branch
Nitrogen	0.0001	0.0001	0.1826	0.8927
Phosphorus	0.0001	0.0040	0.9125	0.4119
Potassium	0.0001	0.0001	0.9604	0.9991
Calcium	0.0012	0.0001	0.1159	0.4780
Magnesium	0.0001	0.0001	0.3652	0.9922
Sulfur	0.0412	0.0001	0.5207	0.8991
Boron	0.0001	0.0001	0.5795	0.8566
Copper	0.0001	0.0067	0.8448	0.7694
Iron	0.5733	0.1819	0.5121	0.5722
Manganese	0.0001	0.0001	0.4921	0.9724
Zinc	0.0082	0.0001	0.3204	0.9190

Results (con't)

The differences in nutrient concentrations found between eastern and western Washington are consistent with other sampling in this study. Overall, nitrogen (N), phosphorus (P), potassium (K), and zinc (Zn) were lower in eastern Washington. Sulfur was only slightly lower by region. However, magnesium (Mg), copper (Cu) and manganese (Mn) were higher in eastern than western Washington.

For all of the nutrients, the pattern showed the highest tissue nutrient concentration in the lowest part of the canopy and the lower concentrations in the upper canopy, with the mid canopy region being intermediate (data not presented). In most cases the mid canopy position average nutrient values were not significantly different from the lower and upper canopy values.

Conclusions and Recommendations

- Leaf sampling position on the branch does not affect tissue nutrient concentration, thus sample randomly along the branch.
- Focus sampling on the mid-canopy section since lower canopy positions will give results that are higher, indicating less nutrient need, and upper canopy positions will show greater need, resulting in potential over use of fertilizers.

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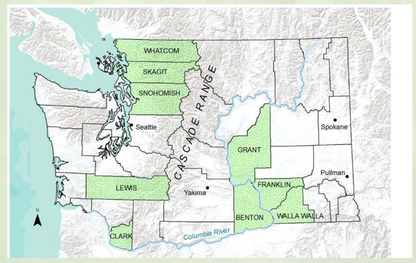
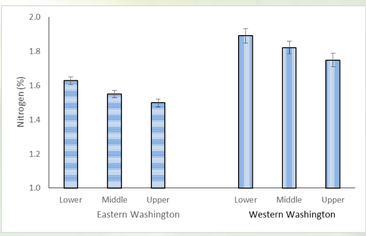
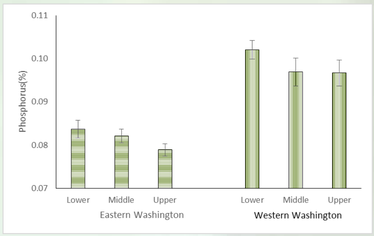
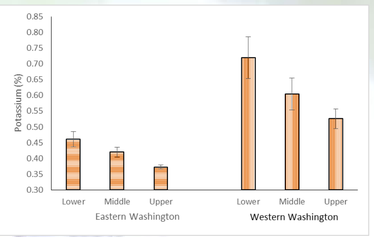
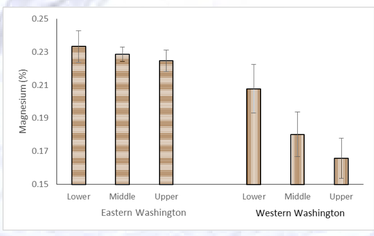


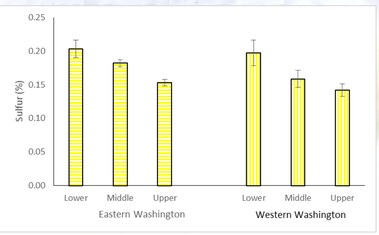
Washington blueberry production counties. Map by Richard Rupp and Helen Vogel, Washington State University

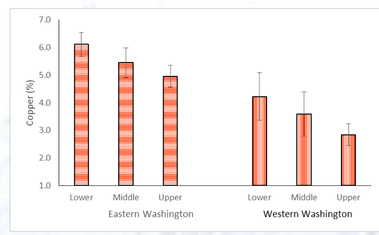


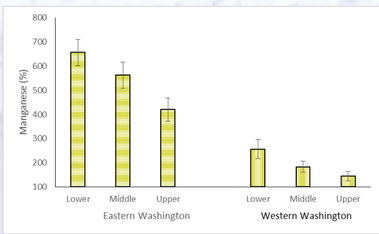












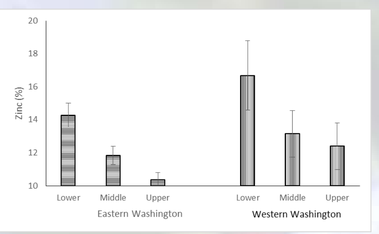


Figure 2. Leaf tissue nutrient concentrations by location (eastern vs western Washington) and canopy position.