FINAL REPORT TO THE AGRICULTURAL RESEARCH FOUNDATION

TITLE: Leaf nutrient concentrations for blueberry cultivars grown in Oregon – development of standards for comparison

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PROJECT DATES: 2013 - 2015

Project overview:

Oregon blueberry production has grown to over 8,000 acres harvested and a farm gate value of over $117 million in 2011. Plant fertility is managed through applications of granular fertilizer products in spring or autumn or liquid products through a drip irrigation system or via foliar applications in the growing season. Growers develop fertilizer plans using published recommendations based on planting age (Hart et al., 2006), consulting advice from chemical company field reps and field Extension Faculty and based on their own experience. Soil analysis and tissue analysis are used to assess the field and plant nutrient status.

Tissue standards provide a "normal" range for expected nutrient concentration in leaves for each macro- and micro-nutrient as well as "above normal" and "deficient" levels. Standards have been developed for mid-season cultivars in all blueberry production regions (e.g. 'Bluecrop' in Oregon). Standards for "normal" leaf nutrient concentration are based on leaves collected in late July – at this time of the growing season, mid-season cultivars have just finished fruiting. 'Bluecrop' is no longer widely planted in Oregon relative to the early season cultivar (Duke), other mid-season cultivars (Bluegold, Draper) and mid- to late-season cultivars (Legacy, Liberty, Aurora, and Elliott) (Strik and Finn, 2014).

The lack of information on cultivar specific or fruiting season specific leaf nutrient standards in this important crop has limited growers' ability to develop efficient fertilizer programs that optimize plant health, yield, and fruit quality, and reduce risk of negative environmental impact that may be caused by fertilizing with an incorrect rate of product or fertilizing at the wrong time.

Our objectives were to determine the concentration of nutrients (C, N, P, K, S, Ca, B, Mg, Mn, Fe, Zn, Cu) in the leaves of blueberry cultivars at various times during two growing seasons and to correlate changes in nutrient concentration with stage of plant development (e.g. fruiting season) for each cultivar. Based on our findings we will provide guidance to growers as to optimal sample times and nutrient concentrations for various cultivars.

Procedures:

We conducted our study over two growing seasons (2013 and 2014) and at two sites (the North Willamette Research and Extension Center, a certified organic planting, and a grower-collaborator site, conventionally managed). We collected leaf tissue samples every two weeks from early bloom to autumn in each year (13 dates) for each of six cultivars (Duke; Liberty; Bluecrop; Legacy; Draper; and Aurora) that range in fruiting season.

Our results were quite conclusive and the study will not need to be extended or repeated.

Findings:

While the concentration of tissue nutrients varied with year, site, and cultivar, the pattern of changes over the season were very similar for each nutrient. Changes in macronutrients (nitrogen, phosphorus, potassium, magnesium, calcium, and sulfur are shown in Figure 1 (micro-nutrients not shown). Leaf nutrient concentration either decreased from spring to autumn (N, P, K, and S) or increased (Mg, Ca) making sampling time important to assess plant nutrient status over the life of a planting.

Cultivars differed in leaf nutrient concentration at almost every sampling time throughout the season, at both sites (e.g. Figure 2). However, differences in leaf nutrient concentration were not related to fruiting season.

Based on the range of leaf nutrient concentrations found, we have no reason to change our present recommendations of sampling ALL cultivars in late July to early August to assess plant nutrient status.

Our findings, however, do indicate that some recommendations for leaf sufficiency should be revised to avoid possible plant nutrient deficiencies (calcium) or a tendency to over-fertilize with other nutrients to reach levels that are likely too high for the current cultivars grown (P, K, and Cu). We are providing growers with the new, recommended sufficiency levels via presentations this winter and will incorporate our findings in an upcoming revision of the Blueberry Nutrient Management Guide (Hart et al., 2006) and our OSU Blueberry School (March 16-17, 2015).

Literature cited:

Hart, J., B. Strik, L. White, and W. Yang. 2006. Nutrient management for blueberries in Oregon. EM 8918, 14 pp.

Strik, B.C, C.E. Finn, and P. Moore. 2014. Blueberry Cultivars for the Pacific Northwest. PNW 656

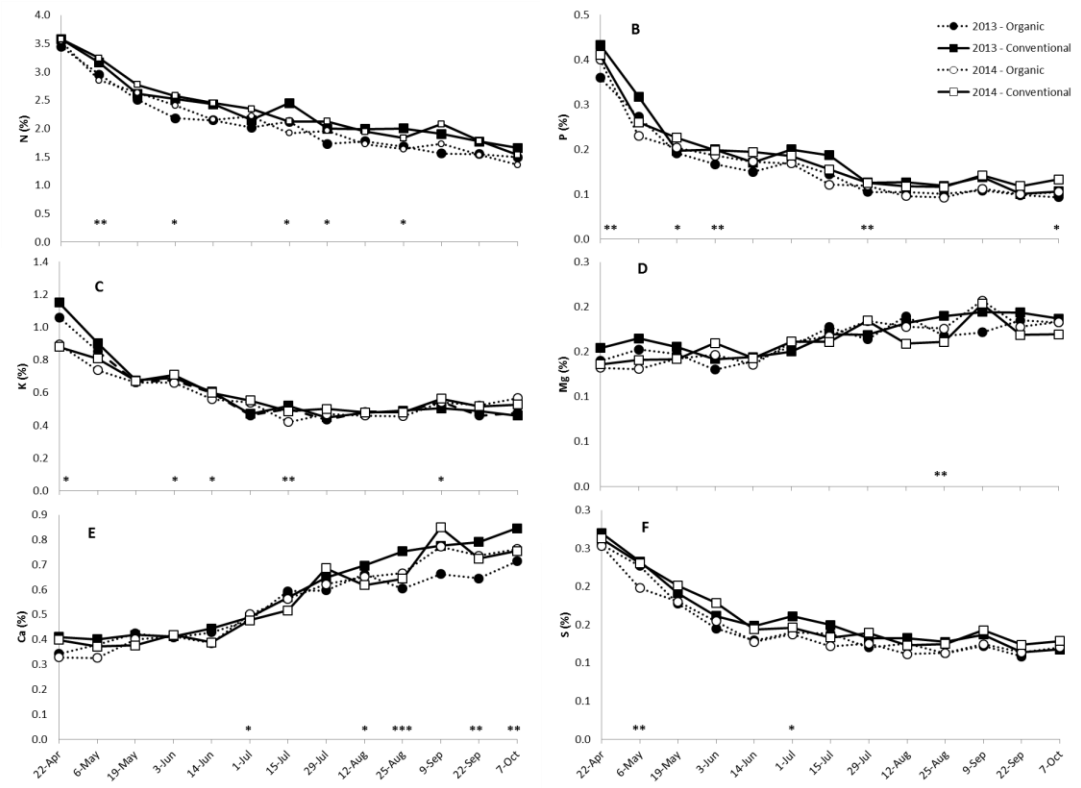

Figure 1. Changes in macronutrient concentration by year and site (averaged over 6 cultivars)

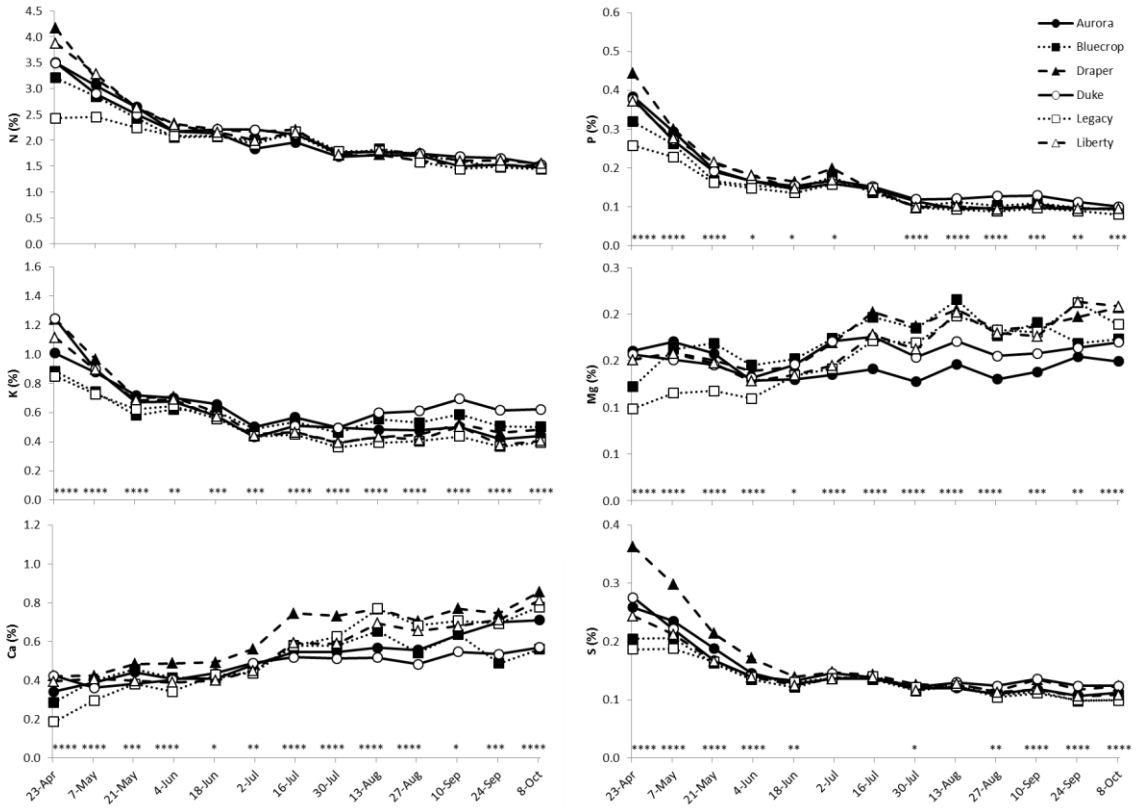

Figure 2. Changes in macronutrient concentration by cultivar in 2013 at the grower site