Using the relationship between fertilization practices, soil and plant nutrient status, and yield in caneberry grower fields to inform research and extension programs

P.A. Jones, A. J. Vance, and B.C. Strik

Faculty Research Assistant, Senior Faculty Research Assistant I, and Professor, Department of Horticulture and North Willamette Research and Extension Center, Oregon State University, Corvallis, OR, 97331

Abstract

Raspberries and blackberries (caneberries) are in the top 20 commodities produced in Oregon, USA with approximately 40 million lb of blackberries harvested in 2017. Oregon leads the USA in black raspberry production (2.2 million lb in 2017) and while our red raspberry production is small compared to that in Washington (3.1 million lb and 77 million lb, respectively), they are an important crop for many fresh-market growers. To better inform new research and extension programs on nutrient management, a survey of growers in the Willamette Valley was conducted. Our goal was to evaluate any relationship between grower fertilizer practices and plant (leaf tissue and fruit) and soil nutrient levels and yield. Data were collected from 33 farms or fields for the following cultivars: Red raspberry ('Meeker'); black raspberry ('Munger'); trailing blackberry ('Marion', 'Columbia Star', 'Black Diamond', 'Obsidian'); and semi-erect blackberry ('Triple Crown'). Historical data on fertilizer programs, average yield and other management practices were collected. Fields differed in soil type, irrigation method (overhead, drip, or unirrigated), fertilizer source (e.g. nitrate-N vs. ammonium-N), fertilizer rate (e.g. 51–221 lb N/acre; 0–192 lb P_2O_5 and K_2O/acre), and method (e.g. granular vs. fertigation) and timing of fertilizer application (e.g single granular vs. split granular). The survey illustrated that there were some key challenges that may limit field or plant performance for some sites. For example, 28% and 16% of fields had a low pH (some as low as 4.6 when the recommended range is 5.6 to 6.8) and low soil Ca level, respectively. In contrast, soil N, P, K, and Mg were considered higher than normal (in 31%, 72%, 25%, and 47% of fields, respectively) for autumn. Despite high soil levels of P, Mg, and K, leaf tissue levels were below sufficiency levels in 10%, 23%, and 91% of the fields. Leaf nutrient levels, even in high yielding fields, were lower than sufficiency standards for N, P, and K confirming our recent research that these currently published sufficiency levels require revision. Leaf N levels were low in some fields because less expensive ammonium sources of N were being applied at low soil pH, leading to insufficient nitrate-N available in spring. In contrast, some fields applying high rates of fertilizer N had higher than typical fruit %N. High K application, when soil had sufficient K led to high fruit %K and lower leaf and fruit %Ca. Survey results highlighted further educational and research opportunities.