BLUEBERRY NUTRIENT MANAGEMENT

Does One Size Fit All?

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BACKGROUND

- There is a strong health message associated with blueberries and they are often described as a "nutrient rich super-fruit" with high anti-oxidant capacity. This messaging as well as the associated convenience and taste of the fruit is driving consumer demand.
- Meeting this consumer demand for blueberries has required an increase in production on a range of soil types and the introduction of new cultivars that comprise several different species and hybrids.
- Growers recognise the importance of nutrient balance for optimising growth, plant health and yield.
- Less well understood are the integrated roles of genotype, stage of plant development and impact of growing environment in determining crop performance and nutritional value of the crop.
- This paper summarises seasonal changes in blueberry leaf nutrient status with the aim of defining an optimal range for each nutrient. It poses the question: are rabbiteye and highbush types the same in terms of nutrient balance? The research is an initial step towards using isometric log ratios (ILR's) to interpret compositional data. The outcome will be a better understanding of the blueberry ionome. Comprehensive knowledge of nutrient balance at different growth stages will allow more specific crop management advice.

OBJECTIVES

- Measure seasonal changes in leaf nutrient levels
- Investigate the need for differentiation between rabbiteye and highbush types when determining optimum nutrient balance

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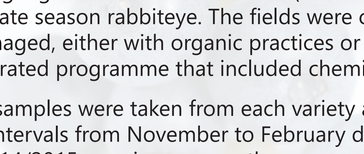
MATERIALS AND METHODS

Two blueberry varieties from the New Zealand Plant and Food Research Programme were selected for this study: 'Sunset Blue' *(Vaccinium corymbosum)* is an early fruiting highbush while 'Centra Blue' *(Vaccinium virgatum)* is a late season rabbiteye. The fields were commercially managed, either with organic practices or with a more integrated programme that included chemical fertilisers.

Leaf samples were taken from each variety at two weekly intervals from November to February during the 2014/2015 growing season; then measured for size and other physical features (specific leaf weight and water content). Chlorophyll content and mineral analyses were also carried out.



RESULTS

In this trial we found that 'Centra Blue' leaves were larger than those of 'Sunset Blue'. This trend was consistent under both organic and integrated management practices.

VARIETY	MEAN LEAF AREA *(cm^2)*	SPECIFIC LEAF WEIGHT *(mg/cm^2)*	WATER CONTENT *(%)*
'Centra Blue'	20.7	6.3	67.3
'Sunset Blue'	17.1	6.1	64.4
Difference between means	3.6	0.2	2.9
T value	3.54	0.25	1.63
Significance p≤0.01	0.002	0.807	0.121

Both varieties had higher chlorophyll content under an integrated management regime where most nutrients were supplied in a chemical form.

GROWING REGIME	CHLOROPHYLL METER	
	'Sunset Blue'	'Centra Blue'
Integrated	20.1	21.4
Organic	15.0	11.6
Difference between means	5.1	9.8
T value	4.18	4.75
Significance p≤0.01	0.002	0.002

DATA KEY

Significant Results

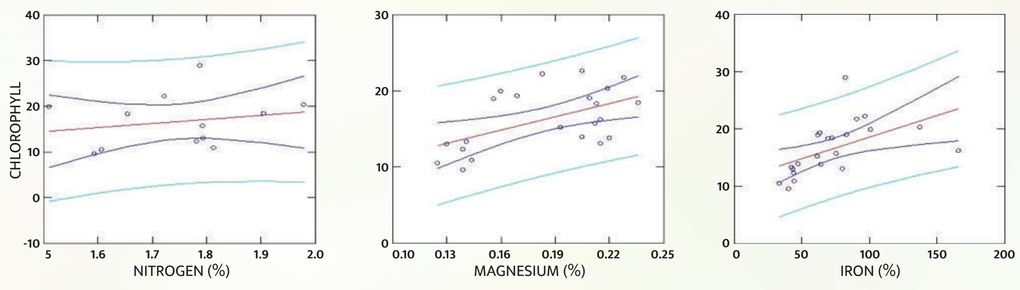
ORDINARY LEAST SQUARES (OLS) REGRESSION MODEL

Regression estimate (—)
Confidence intervals (—)

Nitrogen levels were sufficient for both varieties, irrespective of growing regime.

Iron and magnesium both had an apparent effect on chlorophyll, although iron was determined the most likely key driver for production.

Leaf nutrient effects on chlorophyll index (Opti-Sciences CCM 200)



	No <1.98% = 12	
R^2	0.208	
P Value	0.517	Not significant

	No. <0.24% =22	
R^2	0.531	
P Value	0.011	Significant

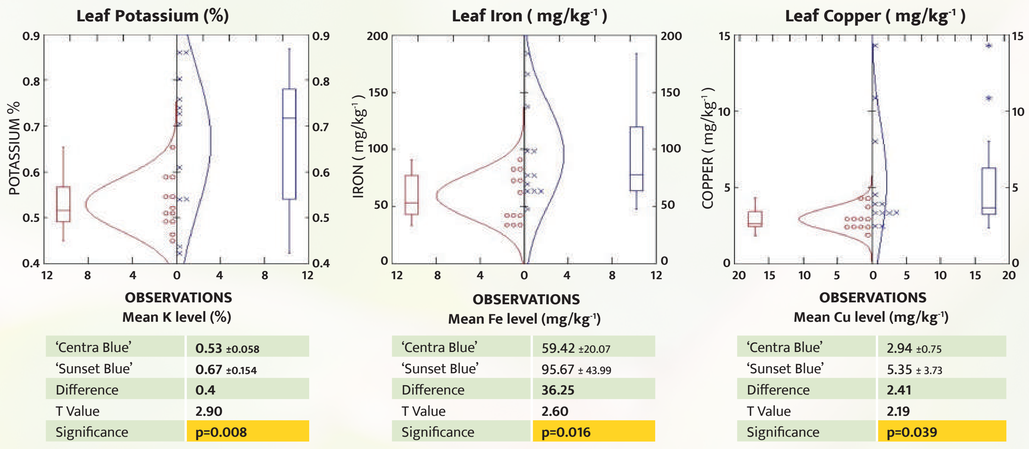
	N <168mg/kg^{-1}= 22	
R^2	0.524	
P Value	0.012	Significant

We found varietal differences in leaf concentrations of potassium, iron and copper.

The clustering and compact shape of the data spread for 'Centra Blue' may mean:

- Greater tolerance to disease.
- More consistent cropping under variable growing conditions, eg soil pH and available iron.

Differences in leaf levels (K, Fe & Cu) for two blueberry varieties 'Centra Blue' (o - o) and 'Sunset Blue (x – x)



'Centra Blue'	0.53 ±0.058
'Sunset Blue'	0.67 ±0.154
Difference	0.4
T Value	2.90
Significance	p=0.008

'Centra Blue'	59.42 ±20.07
'Sunset Blue'	95.67 ± 43.99
Difference	36.25
T Value	2.60
Significance	p=0.016

'Centra Blue'	2.94 ±0.75
'Sunset Blue'	5.35 ± 3.73
Difference	2.41
T Value	2.19
Significance	p=0.039

CONCLUSIONS

- Separation of rabbiteye and highbush types for determining leaf nutrient balance in blueberry seems warranted.
- The changing dynamics of nutrient concentrations through the growing season leads to potential for use of isometric Log Ratios to analyse the data. This information will be of particular value to growers wanting wto transition to pot culture and/or alternative growing media.
- Programmed fertigation systems allow fortification of plant mineral levels and enhanced bio-availability of all phyto-nutrients.

REFERENCES

Bryla, D.R; Strik, B.C. 2015. Nutrient Requirements, leaf tissue standards and new options for fertigation of Northern Highbush blueberry. Hort Technology. 25 (4) 464 - 470

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