Australian Blueberry Grower

AUTUMN 2008 Journal No. 20

THIS ISSUE

Australian Blueberry Growers' Association

They Raise Them Differently Up North

Different production practices in Australian growing areas affect mycorrhizae

Edward Waters, Cassandra McLean & Carolyn Scagel

Edward Waters outlines the results of his recent survey investigating the different production practices in Australia and how they might affect mycorrhizal infection.

Mycorrhizal fungi (good fungi) are an important area of research as they have been found to potentially reduce fertiliser use by blueberries (Scagel 2005) and to increase yields dramatically (Powell & Bates 1981).

Some readers may have received my survey in the post in the middle of 2007. The survey was part of an undergraduate project for the University of Melbourne, supervised by Doctor's Cassandra (Cas) McLean and Carolyn Scagel, that investigated the practices Australian blueberry growers use in production. I received an overwhelming response with approximately a quarter of surveys returned. The survey's findings support many of the previous observations made by blueberry growers and researchers in Australia; however, until now there has been little hard data supporting observations regarding Australian production practices, so the findings are of interest to readers of this publication and the blueberry industry in general. I also appreciated the time put in by growers in filling out the survey, and wanted to report our findings in this publication for all those growers who responded.

The idea for the survey came from previous work by Cassandra McLean from the University of Melbourne and Carolyn Scagel of the US Department of Agriculture. These two researchers gathered root samples from Australian blueberry farms to look for traces of mycorrhizae, which they wrote about in this Journal (Scagel & McLean 2005). They thought it would be nice to have data on what Australian growers were doing in areas of production that might affect the growth of mycorrhizae. This data could go with the data on roots they collected and be used in the future to try and understand whether the different things growers did affected the numbers of mycorrhizae in the plant roots.

So the purpose of the survey was to collect information on a number of production practices that had been shown in the past to affect mycorrhizal infection and that might have the same effects in Australian blueberry farms.

The survey was sent to 171 growers in northern NSW, Queensland, Victoria and Tasmania. 22% of surveys were returned. The survey asked 14 questions, many of which were "standard" questions that were also asked by the recent Department of Primary Industries Survey into the blueberry industry (Field 2006). These questions surrounded mulching, pruning frequency and technique, "crop rotation" and cultivar selection, all of which had been shown to affect mycorrhizae. What was not a common question was that I asked about crop rotation. In retrospect I wondered if it should have been called crop scheduling or any number of other things, but this was without doubt one of the most interesting questions in the entire survey.

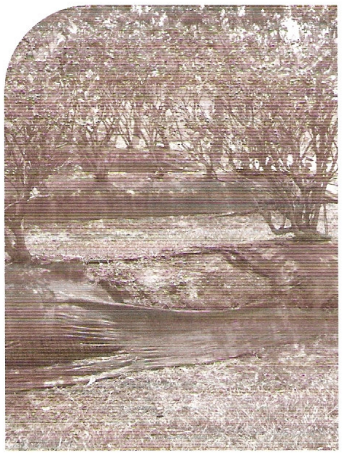
It would not be surprising to many observers of the blueberry industry to find that growers in northern NSW and Queensland grew plants for shorter periods and using different techniques than growers

Until now there has been little hard data supporting observations regarding Australian production practices.

Blueberry plantings in New South Wales. *Pic: Carolyn Scagel*

in Victoria and Tasmania. This was documented for instance by Trehane (2006). However these observations were just that; observations in the field by and large not backed up by experimental data.

The survey confirmed these observations, with analysis of the survey results showing that the productive life of crops was statistically related to location. A number of growers in northern NSW and Queensland reported growing plants for 6 – 8 years and then removing them. Trehane (2006) reported that growers using high density production systems with warm season cultivars typically grow plants from cuttings and arrive at a productive crop in perhaps four years, then remove plants anywhere from 8 – 12 years of age. With the close plant spacings often utilised in these production systems it is thought that declining light availability to canopies may be responsible for the premature decline in productivity in these plants (Eck & Stretch 1986).



Pic: Carolyn Scagel

In contrast Victorian growers typically reported the productive life of plants to be >25 years and to remove plants only at death. Growers in both Victoria and Tasmania cited the availability of replacement plants and propagule material as an obstacle to production, but significantly, a nurseryman from NSW responded to the survey. This may provide a clue to why the NSW growers adopt more intensive management systems, given that none of them reported plant availability as a problem and more growers reported no major production problems.

Given the intensity of production and plant turnover it was interesting and possibly significant that growers in northern NSW reported statistically much higher rates of disease and insect predation. Whether this was impacted on by the earlier cropping of low chill cultivars and/or potential stress due to low light in close spaced plantings in northern Australia is hard to know, but given clear relationships between northern states and pest problems in my report, it would be interesting to examine it further.

So what does all of this mean for mycorrhizae? A number of factors come to mind from the differences identified in Australian production practices which might impact on mycorrhizal infection in northern NSW and Queensland. Plant age has been shown to be related to mycorrhizal infection in blueberries (Scagel & Yang 2005). While pruning practices did not differ around Australia it is interesting to speculate on how insect or fungal disease in northern Australia could impact on mycorrhizal infection given emerging evidence that defoliation (ie biomass loss by pruning, predation or otherwise) may be related to mycorrhizal distribution in plant roots (Gange *et al*. 2002). Such evidence is particularly poor regarding blueberry type mycorrhizae but may become important in the future.

Researchers might find these results useful in directing their activities and experimental work; for example, assessing whether modifications in plant density and cropping period in experimental

Blueberry plantings in New South Wales. *Pic: Carolyn Scagel*

plantations in NSW would have any impact on the amount of mycorrhizal fungi in plant roots. Such research could in the future establish whether altering production systems can have implications for increasing mycorrhizal infection in production settings.

Whilst shorter productive crop lives was the chief difference between northern and southern production regions in cultural practices, another difference that was as dramatic was that the incorporation of organic substances, particularly peat and kelp based amendments to planting holes was restricted to Victoria and Tasmania. In general soil amendment and fertiliser use were not different between states so it is uncertain why this difference existed. Peat is often added to improve the water holding capacity of soil around the rootball (Spiers 1986), thus one possible explanation for peat amendment differences is that soils is NSW contained more clay than those in southern states, but this was not the case; no differences were seen in reported soil textures between states. Peat might also be added to lower the pH of the root environment as peat is generally acid in pH. Once again, however, in percentage terms the soil pH levels reported by respondents in northern states were higher than those of southern states, which would suggest that northern states might favour amending with peat rather than not doing so. Whether this is important to mycorrhizal infection in the field is a moot point; whilst in theory the acid pH and high organic matter content in peat should assist in forming conditions receptive to mycorrhizal infection, this has not yet been supported by field evidence (Goulart *et al.* 1995).

In general the most important difference identified between states was the shorter growing periods of crops in northern states, presumably by growers using high density production for low chill cultivars. The survey has directed the goals of researchers of blueberry mycorrhizae towards examining the effects of northern Australian production differences on mycorrhizae in these states.

For those readers who are interested in more detailed results from the survey, an abstract will shortly be available from www.horticulture.unimelb.edu.au, or contact Edward Waters at ekwaters@unimelb.edu.au. The authors will endeavor to include the survey results in the *International Journal of Fruit Science* in the future.

REFERENCES

Eck, P. & Stretch, A.W. 1986, 'Nitrogen and plant spacing effects on growth and fruiting of potted highbush blueberry', *HortScience*, vol. 21, pp. 249 – 250.

Field, H. 2006, *Industry survey report: December 2006*, Department of Primary Industries (Vic.), for the Australian Blueberry Growers Association, Box Hill, Vic.

Gange, A.C., Bower, E. & Brown, V.K. 2002, 'Differential effects of insect herbivory on arbuscular mycorrhizal colonization', *Oecologia*, vol. 131, pp. 102 – 112.

Goulart, B.L., Demchak, K. & Yang, W.Q. 1995, 'Organic matter and nitrogen level effects on mycorrhizal infection in 'Bluecrop' highbush blueberry plants', *Journal of Small Fruit & Viticulture*, vol. 3 (4), pp. 151 – 164.

Powell, C.L. & Bates, P.M. 1981, 'Ericoid mycorrhiza stimulate fruit yield of blueberry', *HortScience*, vol. 16(5), pp. 655 – 656.

Scagel, C.F. 2005, 'Inoculation with Ericoid mycorrhizal fungi alters fertiliser use of highbush blueberry cultivars', *HortScience*, vol. 40(3), pp. 786 – 794.

Scagel, C.F. & McLean, C. 2005, 'Who is in your roots?', *The Australian Blueberry Grower*, vol. 14, pp. 18 – 21.

Scagel, C.F. & Yang, W.Q. 2005, 'Cultural variation and mycorrhizal status of blueberry plants in NW Oregon commercial production fields', *International Journal of Fruit Science*, vol. 5(2), pp. 85 – 111.

Spiers, J.M. 1986, 'Root distribution of 'Tifblue' Rabbiteye blueberry as influenced by irrigation, incorporated peatmoss and mulch', *Journal of the American Society for Horticultural Science*, vol. 111(6), pp. 877 – 880.

Trehane, J. 2006, *Blueberries, cranberries and other Vaccinium*s, Timber Press, Portland, OR, for the Royal Horticultural Society.