Organic production systems in Northern highbush blueberries

S. Caspersen, B. Svensson, S. Khalil and H. Asp

Department of Biosystems and Technology, Box 103, SE-230 53 Alnarp, Sweden

Siri.Caspersen@slu.se

Implications

The production of highbush blueberries is increasing worldwide. Organic production of blueberries in Sweden is presently very limited but is expected to have a great potential to expand as the berries are popular and have a good shelf life. The fact that blueberries require acid soils raises several questions concerning suitable substrates in combination with mycorrhizal inoculation and fertilization in organic production systems. Field and pot experiments have been established during 2011 and 2012 with the aim of developing a sustainable production system for high quality organic blueberries. After the second experimental year, total fruit yields were similar for plants grown in a plastic tunnel and in the open field. Yields were not affected by the addition of 10% forest soil to the peat-based substrate. Inoculation with ericoid mycorrhizal fungi had little effect on shoot length in a greenhouse pot experiment. Blueberries may be particularly suitable for organic production as the need for fertilizers is low combined with a relatively low disease pressure on the blueberry crop in the Nordic countries. The Swedish blueberry production might be expected to expand in the near future. The development of a successful and resource-efficient growing system for organic blueberries may encourage new blueberry growers to chose organic production.

Background and objectives

Growing blueberries in high plastic tunnels may prolong the production period. However, since it is likely that cultivation in tunnels will increase the vegetative growth over the season, there is a risk for decreased and/or delayed frost resistance (Kosiba et al 2010). In Sweden, new blueberry cultures are often established on field soils with higher pH levels and lower contents of organic matter compared to the levels normally considered optimal for blueberries. To improve available soils for blueberry production, organic matter like peat, bark or sawdust can be mixed into the planting hole or used as a substrate. In nature, blueberries form mycorrhizal symbiosis with ericoid mycorrhizal fungi. The fungal hyphae contribute to plant nutrient uptake by releasing enzymes hydrolysing organically bound nitrogen and phosphorus. This project focuses on crop management in blueberries in high plastic tunnels and in the open field with emphasis on substrate, mycorrhizal inoculation and nutrient availability.

Key results and discussion

Field experiment

Flowering was delayed for two to three weeks in the field compared to the tunnels. The accumulated fruit yield per plant during July-August 2012 is shown in Figure 1. For all varieties, yield during the first part of the harvest period was higher for the tunnel-grown plants than for the field-grown plants. However, the difference in accumulated yield between field and tunnel was diminished towards the end of the harvest period and there was no significant difference in total fruit yield between plants in tunnel and in the field. Of the two highbush varieties, Duke showed the higher yield. As could be expected, yield was lowest for the halfhigh variety Northblue. No significant difference was observed between the two substrates (data not shown). Blasing (1998) observed that blueberries on agricultural soils grew poorly and were less readily colonized by mycorrhizal fungi than plants on virgin forest soils. However, earlier studies have shown varying effects of the addition of forest soil to soil or substrates for blueberries.

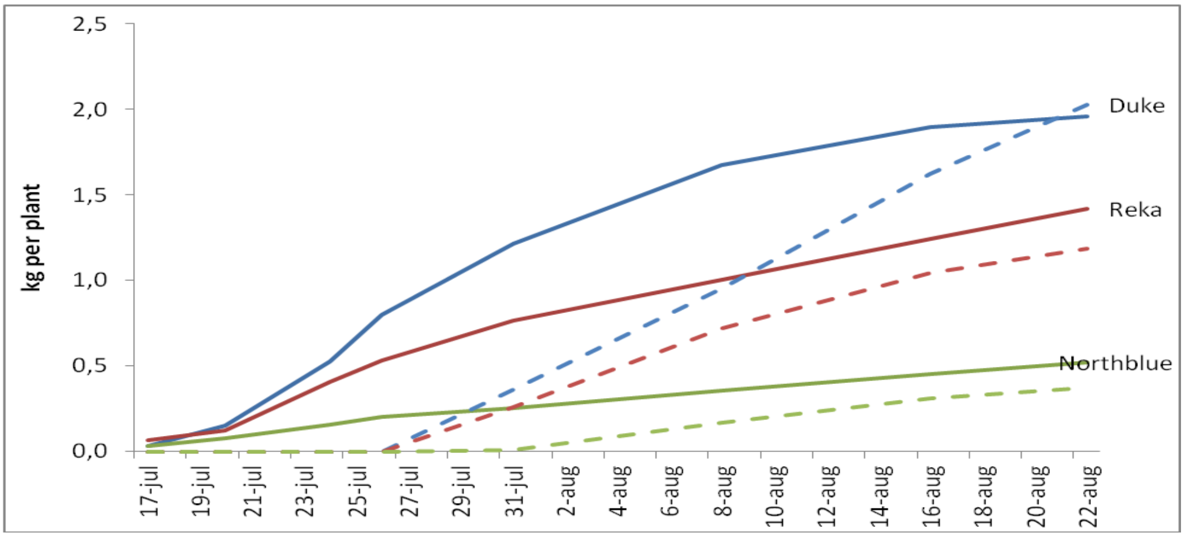

Figure 1. Accumulated yield (kg per plant) during 2012 for the varieties Reka, Duke and Northblue in tunnel (—) and in the field (---).

Pot experiment
There was no significant effect of mycorrhizal inoculation on plant height (data not shown). However, a tendency to increased growth of inoculated plants was observed for Duke and for one of the inoculated treatments for Reka. The influence of mycorrhizal inoculation on plant development and yield will be followed during 2013. Varying results have been observed after inoculation of blueberries with ericoid mycorrhizal fungi, depending on variety, fungal isolate and fertilizer treatment (Eccher et al 2002).

How work was carried out?

Field experiment
Three-year old plants of the three varieties Duke and Reka (*V. corymbosum*) and Northblue (*V. corymbosum* x V. *angustifolium*) were planted in 25 cm deep beds in a plastic tunnel and in the field at Rånna Experimental Station, Skövde, in late April 2011. Two types of substrates were tested in the beds; Substrate 1 contained peat:bark 9:1 and Substrate 2 contained Substrate 1:forest soil 9:1. Three blocks per treatment, each block consisting of three plants, were established in both the tunnel and in the field. The plants were fertilized with 7.1 g N as Biofer 6-3-12 and Biobact in 2011. In 2012, each plant was given a total of 13.5 g N applied as Biobact from May to August.

Pot experiment
One-year old plants of the varieties Duke and Reka (*V. corymbosum*) were potted in a peatbased substrate and fertilized with a total of 0.4 g N as Biobact. The plants were grown in the greenhouse from March to August. Plant height was measured at the 27th of August before the plants were transplanted to the field on the 29th of August.

References

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