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Highbush Blueberry Crops in a Trial in Norway, 1988-1998

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Abstract

Two *Vaccinium corymbosum* cultivars, 'Northland' and 'Patriot,' were evaluated at Ås (60 degree N) over the 11 years from 1988-98 after planting bushes spring 1983. All plants survived a minimum temperature of –30 C during winter per year 1984/85. On average, earliest fruit was harvested August 20 and the number of harvests averaged 3.0. Starting in 1993, biennial bearing was more pronounced for 'Northland' than for 'Patriot.' This trend for alternate bearing was broken in 1998 after an unusually warm July-September 1997. Based on one plant per square m, the total yield per year averaged about 0.9 kg fruit per square m during the first 10 years of the trial for both cultivars. However, in the eleventh year 'Northland' produced 3.4 kg per square m, exceeding 'Patriot' by almost 50% in total fruit yield. Fruit size varied from year to year in a similar manner for both cultivars with 'Patriot' having an average of 2.38 g per fruit, while 'Northland fruit averaged 1.19 g. Both cultivars were judged to produce fresh fruit of acceptable quality. These results are the first records of successful highbush blueberry culture in Norway.

Introduction

Although American highbush blueberries had been tried sporadically in Norway earlier, the trial conducted in 1970-74 at Ullensvang Research Station, experiment field SkÂnevik, was the first comprehensive blueberry cultivar trial in our country. This trial included 12 cultivars: 'Berkeley,' 'Bluecrop,' 'Blueray,' 'Collins,' 'Coville,' 'Darrow,' 'Goldtraube I,' 'Goldtraube II,' 'Heerma I,' 'Heerma II,' 'Herbert' and 'Ivanhoe' (1, not published). The first three cultivars were shown to be the earliest, with fruit ripening in early September; most cultivars ripened in Mid-September, while 'Darrow' was the latest cultivar and needed a warm autumn to ripen all fruits. Slow ripening was common for all cultivars, and they had to be harvested several times.

During the winter 1972/73 severe winterdamage occurred to'Collins' and 'Coville,' but the other cultivars were little damaged.

'Darrow' developed the largest fruits, 3.0-3.6 g/fruit; although the other cultivars had also good fruit sizes, 2.0-2.6 g.

Yield records are lacking for that trial. However, it was concluded that highbush blueberries were adapted to Western Norway. 'Berkeley,' 'Bluecrop' and 'Blueray' were recommended due to good winter survival, good fruit crops and big fruits. In 1978 (7) 'Blueray' and 'Bluecrop' were recommended as the earliest and 'Berkeley' as the latest for growing in home gardens in Southern Norway.

Materials and Methods

Rooted cuttings of 'Patriot' and 'Northland' were supplied in 1981 by Arlen Draper, U.S. Department of Agriculture, Agriculture Research Service, Beltsville, Maryland.

Due to their small size, the plants were grown in a unheated plastic house for two years, and 4 bushes of each cultivar were then randomly transplanted in two rows in spring 1983 at Ås.

Plant distances were 1.20 x 0.80 m; thus kg fruit crop/bush corresponds approximately to kg fruit crop/square meter. The soil was a rich clay, beforehand mixed with 30 liters acid peat per square meter. A Cl-free complete fertilizer consisting of 11% N, 5% P, 17% K, 2.5% Ca (apatites, Ca3(PO4)2 as main Ca resource), 1.8% Mg and 9% S (from

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kieserite, MgSo4) and 0.02% B was applied yearly at a rate of approximitely 10 g per square meter. Low levels of N were used to minimize excessive growth and subsequent winter damage. In July 1997, a 5 cm layer of peat with pH 5.5-6.5 was spread as a top dressing. The soil was kept clean by hand weeding. It has not been necessary to apply any kind of chemicals against pests or fungi. Pruning has been restricted in early spring to cutting back older branches to young shoots, and removing prostrate branches.

Temperatures and snow cover at Ås

As shown in Figure 1 the two mean temperature curves fit very well together during the growth months May-September reaching 16.2 degrees C in the warmest month July. During winter month the mean temperatures during the period of trial have been somewhat higher and the snow cover slightly less compared to the last 30 years period when the snow cover had a mean of 30 cm for February. Yearly minimum temperatures during the period of trial is shown in Figure 2 A.

Results and Discussion

Growth was slow in the first years, and the bushes remained small. At the end of this trial all bushes were about 1 m high. Since 'Northland' produces more shoots from its base than 'Patriot,' it is now more dense.

The winters 1984/85, 1985/86 and 1986/87 were among the coldest in Eastern Norway since WORLD WAR II, having minimum temperatures from –30.8 to –26.2 degrees C (Fig. 2 A). However, all bushes survived most likely due to a proper snow cover of 40-47 cm during the very cold part of these winters (3). The trial has now been grown for 16 years without loss of plants. Records of fruit yield have been taken for the last 11 years, 1988-98.

On average, the first fruit picking for the year was done August 20, and the last one September 24. The number of pickings per year varied between 2-5, in average 3.0.

Only small differences were recorded between these two cultivators in harvest season, except for one of the latest seasons, 1995. That year 'Patriot' was finished after 3 pickings, while 'Northland' produced a higher fruit crop and needed a 4th picking after the first frost.

The average fruit yield per square meter for the first 10 years was equal for the two cultivars: 0.93 and 0.92 kg/square meter for 'Patriot' and 'Northland,' respectively. Both cultivars produced the highest fruit yield in 1993, exceeding 2 kg/square meter (Fig. 2 B). From that year the trend has been that a good fruit crop has always been followed by a lower to small crop. This pattern of fluctuating crops from year to year seems to be most

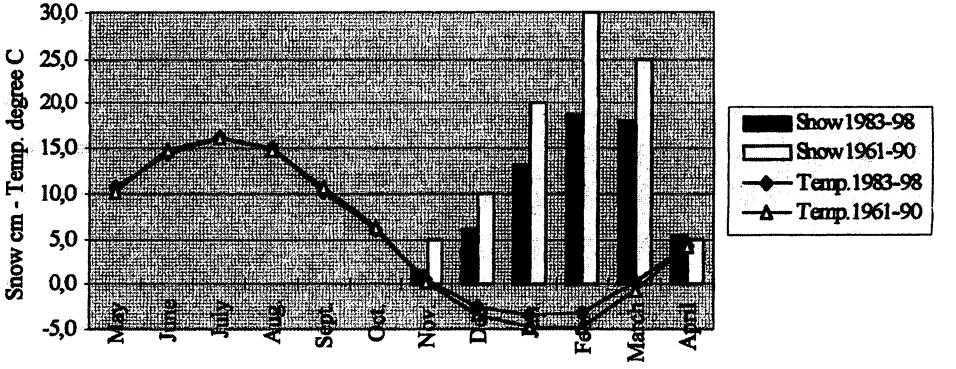

Figure 1. Monthly mean temperatures and snow cover at Ås for the period of trial, May 1983 to September 1998, and for the last 30 years period,1961-90 (3).

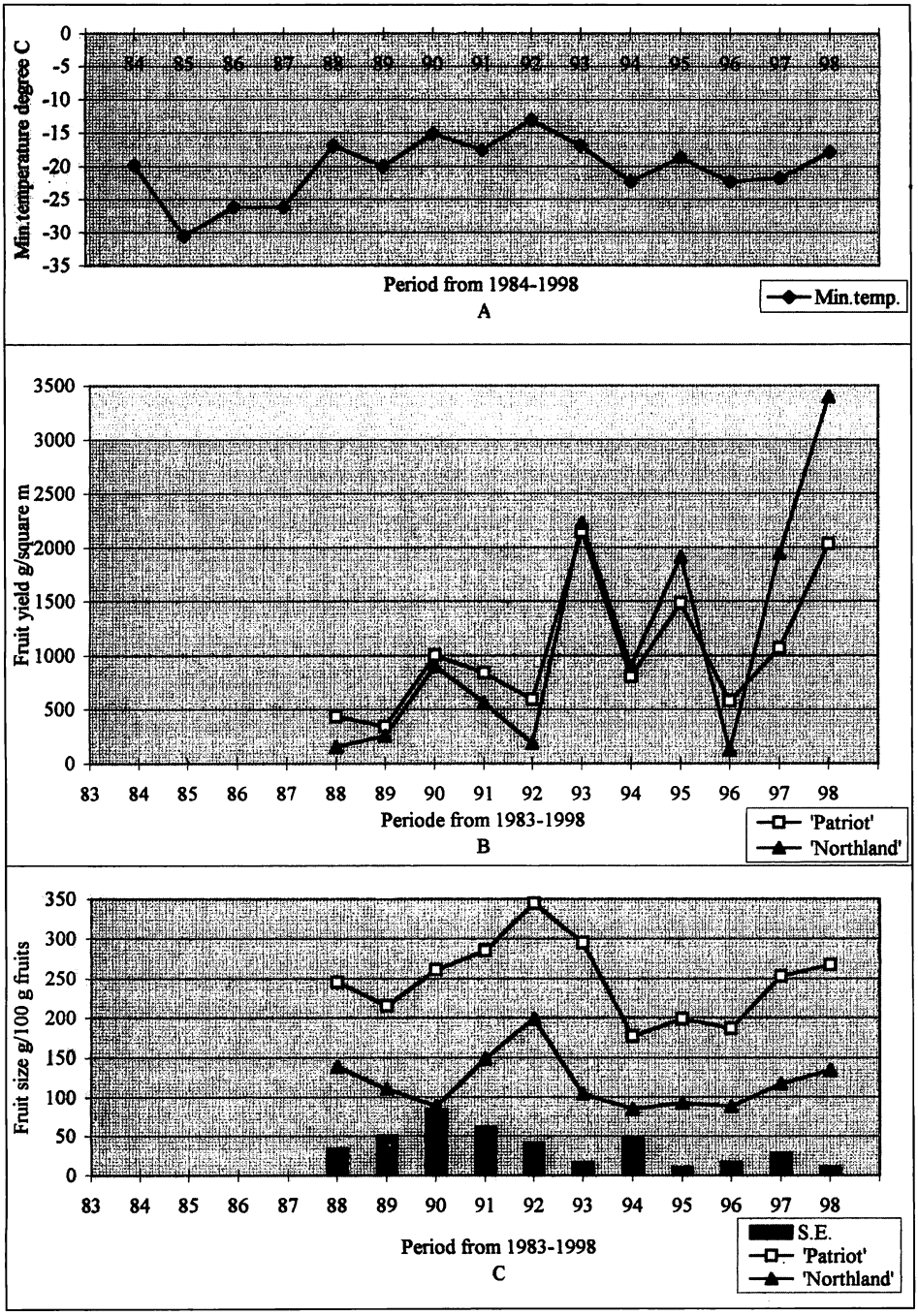

Fig. 2. Minimum temperatures (Des., Jan. or Feb.) preceding the actual fruiting season (A), fruit yield (B) and fruit size with standard error (S.E.) (C).

pronounced for the cultivar 'Northland.' However, in the 11th recording year this pattern of cropping was broken: 'Northland' gave a much higher crop in 1998 than any year before.

We can only speculate on why the cultivars were biannially bearing. It was not due to temperature as during the 11 years differences in the minimum winter temperature (3) was not associated with the fluctuating fruit yields common for both cultivars (Fig. 2 B), although winter survival certainly will be an important trait when a very cold winter again occurs.

In general as a species is moved closer to its temperature threshold growth, flowering and fruiting ability will be more unstable according to the effect of more dramatic yearly changes in the climate.

The higher fruit crop on 'Northland' in 1998 may be due to increasing in bush size as time has passed. In addition it may be a result of mulching in 1997 combined with the uncommonly warm late summer and autumn. With normal temperatures in parentheses, departures from means for July, August and September that year were +2.3 (16.1), +5.0 (14.9) and +1.5 (10.6). The average of these three month was almost 3 degrees C. above the normal temperatures at Ås (3). 'Patriot' did not respond as much to the warm summer as did 'Northland' possibly because of its lower capacity - less dense bushes and thus lower ability to utilize improved growth conditions.

Fruit size was only recorded for the first picking each year, but compared to our wild blueberries *Vaccinium myrtillus* L., the fruit size is impressive, particularly for 'Patriot.' On average 'Patriot' reached a size of 2.38 g per fruit, twice that of 'Northland' with an average of 1.19 g/fruit. The variation in fruit size from year to year during this period showed a similar pattern for both cultivars (Fig. 2 C). There does not seem to be an obvious connection between large fruit size and high yield, or vice versa, each year.

Both cultivars were judged to be acceptable for fruit quality. As fresh fruit, 'Northland' was ranked highest of these two when judged by common consumers. The taste and the value of the fruit was significantly lower, tasted more acid and less sweet, for the latest pickings in years with the latest ripening seasons and that was more pronounced for fruits of 'Patriot' than for 'Northland.' For possible commercial growing, 'Patriot' will most likely be preferred as the main cultivar of these two due to its impressive fruit size. 'Northland' may be too small as main cultivar, but can be planted with 'Patriot' as a mixture. Many studies in North America has shown that most blueberry cultivars give higher yields with cross-pollination (4).

These results are interesting as the first Norwegian records of weighed fruit yields of successful *Vaccinium corymbosum* culture at 60o northern latitude. The attained results demonstrate that yields are high enough to make highbush blueberries interesting for at least home gardens in Southern Norway as stated by Amland (1). In a blueberry trial at Ås 1993-98 reported by Vestrheim et al. (6) and Haffner et al. (2) 'Collins' and 'Blueray' suffered badly from winter damages; 'Hardyblue' and 'Patriot' produced the highest fruit yield, 'Bluecrop' and Patriot' had the lagest fruits. 'Patriot' got equally high sensory taste scores as the other cultivars involved in that trial. In collaboration with selected berry growers a larger scale project has now been started (5) to investigate the possibility of commercial growing of *Vaccinium corymbosum* in different parts of Southern Norway.

From 1995 'Northland,' 'Patriot,' 'Berkeley' and 'Bluecrop' have been the recommended highbush blueberry cultivars for growing in home gardens in Norway (8).

Acknowledgement

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Black Currant Cultivars Newly Released from the U. S. National Quarantine

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Abstract

Eighteen disease-tested, black currant cultivars (*Ribes nigrum* L.) and one jostaberry (*R.* x *nidigrolaria* Bauer) were released in December 1998 from the U. S. National Plant Germplasm Quarantine Office (NPGQO) in Beltsville, Maryland. These cultivars were received at the quarantine office between 1989 and 1993 from collaborators in Poland, Russian Federation, Switzerland, and the United Kingdom. Foreign *Ribes* from Europe are prohibited to enter the United States except when processed through this quarantine facility. These 19 cultivars passed the rigorous Animal and Plant Health Inspection Service (APHIS) testing protocol and were released to the U. S. Department of Agriculture, Agricultural Research Service, National Clonal Germplasm Repository (NCGR) in Corvallis, Oregon, for long term preservation in their *Ribes* collection. Plant material can be requested for research and evaluation by contacting the Curator at the Corvallis Repository.

Introduction

A number of exotic diseases and pests are present in foreign *Ribes* L, currants and gooseberries. Some diseases, such as reversion, which seems to be caused by blackcurrant reversion-associated virus BRAV (4) are present throughout the black currant production regions in Europe, New Zealand, and Australia, but are not found in North America. This disease is vectored by the black currant gall mite (*Cecidophyopsis ribis* Westw.) which is also not found in North America. Several European nepoviruses, which are spread by nematodes (*Xiphinema* spp. and *Longidorus* spp.), are also not known here (1). To keep economically significant pests and diseases from naturalizing in this country, APHIS (2) has issued foreign quarantine notices pursuant to federal law. These regulations prohibit the direct entry of *Ribes* plants or plant parts into the United States except via quarantine. *Ribes* can be admitted through the NPGQO in Beltsville, Md., where a rigorous set of virus testing procedures is conducted. Infected plants are destroyed, but disease free material can enter the country. The U. S. National Plant Germplasm System has assigned the preservation, distribution and

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