

# Early and late blueberry production

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## Introduction

European blueberry acreage is mainly located in central Europe in countries like Germany and Poland. Blueberry prices are high in early and late season, especially during February/March and September/October due to the lack of European fruit production during these months. Southern European regions with mild winter climate can profit from their mild Spring and Autumn temperatures to try to fill this gap. Blueberry early production is based on southern highbush blueberry (SHB) cultivars and the late production supported by northern highbush (NHB) and rabbiteye cultivars. With the aim of testing the possibility of harvest high quality fruit in these periods a trial was setup with six cultivars grown in substrate under protected cultivation.



## Results

## Material and Methods

Three SHB cultivars; Star, Paloma (Haven) and O'Neil and three NHB; Duke, Elizabeth and Legacy were planted inside a greenhouse in 12 liter pots in substrate (Siro® Ácido) in 2012. For the early production trial only the three SHB cultivars were used. Four treatments were imposed on the plants: open field ( $T_{of}$ ), greenhouse ( $T_g$ ), and greenhouse with two cold treatments ( $\pm 2^\circ\text{C}$ ), 696 ( $C_1$ ) and 480 chilling hours ( $C_2$ ). Plants of  $C_1$  were in cold storage from 13 December to 9 January and plants from  $C_2$  were placed from 10 January to 30 January. In the late production trial three NHB cultivars were used. Six treatments were forced, two standards equal to the previous trial; open field ( $T_{of}$ ), greenhouse ( $T_g$ ), and greenhouse with four cold treatments with plants going into cold storage at 14 January and pull out every two weeks starting at 15 May (2904, 3288, 3648 and 4008 chilling hours, respectively).

## Early production (SHB)

### The crop in March



A - 'Star' at bloom in open field ( $T_{of}$ ), B and C - Plants at beginning of harvest in the greenhouse ( $T_g$ ).

Table 1. Total yield per plant (g) and berry weight (g) for the three southern highbush cultivars. Open field standard ( $T_{of}$ ); greenhouse standard ( $T_g$ ); cold storage (E1) with natural cold + 696 chilling hours; cold storage (E2) with natural cold + 480 chilling hours.

Treatment	Cultivar	Yield (g/plant)	Berry weight (g/berry)
T open field	Star	2853 A	1.35 ABCD
	Paloma	1151 CD	1.24 ABCD
	O'Neal	288 D	1.38 ABC
T greenhouse	Star	2302 A	1.49 AB
	Paloma	2289 AB	1.36 ABC
	O'Neal	787 D	1.03 CD
E1	Star	1835 ABC	1.61 A
	Paloma	2194 AB	1.58 A
	O'Neal	936 CD	1.08 BCD
E2	Star	2274 AB	1.23 ABCD
	Paloma	2381 A	1.08 BCD
	O'Neal	1257 BCD	0.93 D
Prob(F)		P<0.001	P<0.016
SEM		215.3	0.126

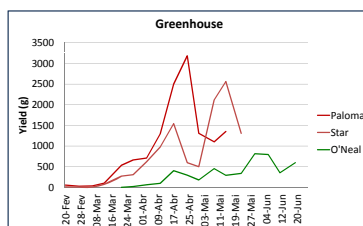
Means in the same column followed by different letters differ according to the Tukey's test ( $\alpha=0.05$ ); SEM – standard error of the mean.



General view of the cold chamber used for all treatments.



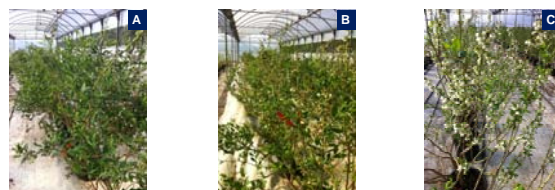
General view of plant vigor after two years grown in substrate. Cultivar Paloma in full bloom.



Fruit harvest per week for the three SHB cultivars grown in the greenhouse without any cold treatment ( $T_g$ ).

## Late production (NHB)

### The different treatments at the same moment



Treatments for cultivar Duke. A - 15 May (2904 chilling hours), B - 1 June (3288 chilling hours), and C - 15 June (3648 chilling hours) in the greenhouse. Pictures taken in the same day for all treatments.

Table 2. Total yield per plant (g) for the three northern highbush cultivars. Open field standard ( $T_{of}$ ); greenhouse standard ( $T_g$ ); cold storage (15 May) with natural cold + 2904 chilling hours; cold storage (1 June) with natural cold + 3288 chilling hours; cold storage (15 June) - with natural cold + 3648 chilling hours.

Treatment	Cultivar	Yield (g/plant)
T open field	Legacy	2167 AB
	Elizabeth	1324 BCD
	Duke	704 D
T greenhouse	Legacy	1840 ABC
	Elizabeth	987 CD
	Duke	789 CD
15 May	Legacy	2593 A
	Elizabeth	1438 BCD
	Duke	2586 A
1 June	Legacy	933 CD
	Elizabeth	1122 BCD
	Duke	1283 BCD
15 June	Legacy	419 D
	Elizabeth	399 D
	Duke	610 D
Prob (F)		P<0.001
SEM		302.0

Means in the same column followed by different letters differ according to the Tukey's test ( $\alpha=0.05$ ); SEM – standard error of the mean.

## Discussion and conclusions

### - Southern Highbush trial:

'Paloma' showed low yields in open field but high yields in all greenhouse treatments, even with no chill applied to the plants. This behavior suggest that this cultivar benefits from the closed environment of the greenhouse; - 'Star' showed the same yield in open field and greenhouse with no benefit from the cold treatments which suggests that natural chilling hours were sufficient for 'Star' and 'Paloma'; - All cultivars started harvest one month earlier when we compare open field with protected cultivation. O'Neal increased yield with cold treatments suggesting a higher need for chill.

### - Northern Highbush trial:

'Duke' gave low yields in both open field and greenhouse treatments showing the lack of chill of the region. 15 May was the best treatment with a negative effect of high chilling for all cultivars; - 'Legacy' showed a typical SHB behavior. Also for the NHB cultivars greenhouse production was effective for early production with harvest starting one month earlier than open field.

## Acknowledgments

Authors fully acknowledge the financial support for this study by European Framework Program 7, Project EUBerry, Grant Agreement n° 265942.