

Evaluation of blackberry and hybrid berry cultivars new to Polish climate – Short communication

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Abstract

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There were 13 blackberry cultivars new in Poland tested, including: Black Butte, Boysenberry, Chester Thornless, Helen, Karaka Black, Kotata, Loch Ness, Loch Tay, Loganberry, and Oregon Thornless. The experiment was conducted between 2005 and 2010 in central Poland with the main focus on resistance of the cultivars to adverse local environmental conditions, as well as to assess the yield and fruit quality. Analysis of data on fruit yield and fruit weight indicated significant differences between cultivars and years. There were slight differences in harvest date from year to year. Cv. Chester Thornless had the greatest yield – avg. 12.9 kg/plant (2007–2008). All of the hybrid berries and the trailing blackberries had yields that were not different – below 3.5 kg/plant. Cvs Black Butte and Karaka Black had the heaviest fruit, above 6.0 g (2006) and up to 10 g per fruit (2007 and 2008). Cv. Oregon Thornless had the smallest fruits – 2.1 g per fruit (2006) and up to 3 g (2007, 2008). The experiment showed that plants were influenced by the Polish weather conditions.

Keywords: *Rubus*; fruit yield; fruit quality; harvest season; winter tolerance

The main goal of conducting experiments on blackberries (*Rubus* subgenus *Rubus* Watson) in Poland was to test the performance of foreign cultivars that appear to be very attractive to farmers due to their taste and appearance. Another important factor was to evaluate the cultivars for their tolerance to low winter temperatures. The Research Institute of Horticulture in Poland (Skierniewice) started their blackberry breeding program in 1979. The main goal of these types of experiments was to identify cultivars that are less prone to freeze injury. The scale of blackberry cultivation in Poland is not large; however, the popularity of these fruits has been steadily growing in the recent years. The main obstacle for routine farming is adverse weather, especially during winters, when the temperature can drop below –30°C. These conditions are too harsh for many of very interesting and attrac-

tive foreign cultivars. Therefore, the main motivation for the tests conducted in the Research Institute of Horticulture in Skierniewice was to examine new cultivars of blackberry and hybrid berry while they remained covered with straw during winter.

Besides a nice appearance and delicious taste, blackberry fruits are good for human health (AMES et al. 1993; HEINONEN et al. 1998; DING et al. 2006; LEWERS et al. 2010). A survey conducted in 2005 showed that there was 45% increase in comparison to 1995 in the area of worldwide blackberry plantations and commercial cultivations estimated at 20,035 ha (STRIK et al. 2007). According to the authors, Poland was the fifth biggest producer in Europe and 13th worldwide with the production of 551 t. Blackberry cvs like Thornfree and Black Satin from the USA, and the Polish cv. Orkan are the most

popular so far but new genotypes become more attractive for their taste and fruits appearance.

A major problem in Poland is a poor selection of cultivars for growers to choose from. Polish blackberry growers focus mainly on cultivars that are tolerant to low winter temperatures and then on fruit quality. There are not many winter tolerant cultivars available. In the past, several experiments were conducted in the Research Institute of Horticulture regarding fruiting of blackberries with origins in regions with different climatic and soil conditions. Similar research was previously done in other parts of Poland (DANEK, KOŁODZIEJCZAK 1993) as well as in e.g. Spain (FUERTES et al. 1993). The latter experiments provided European growers with attractive cultivars.

The cultivars tested in the current trial in Skierniewice came from different breeding programs – mostly from the United States, especially from the USDA-ARS in Oregon and from the Scottish Crop Research Institute.

MATERIAL AND METHODS

To assess several blackberries and hybrid berries that are new or new to Poland, a field experiment

was set in the Pomological Orchard in Skierniewice. The experiment started in the spring of 2005. The trial included blackberries as well as hybrid berries. While the hybrid berries are also botanically blackberries they have red raspberry in their pedigree. The cultivars represented semi-erect blackberries developed in the eastern USA (cv. Chester Thornless) and Scotland (cvs Loch Ness and Loch Tay); trailing blackberries developed in the western USA (cvs Black Butte, Kotata, Silvan and Oregon Thornless sometimes known as Thornless Evergreen) and England (cv. Helen); and hybrid berries discovered in the USA (cvs Boysenberry and Loganberry) or bred in Scotland (cvs Tummelberry and Tayberry). The hybrid berries genetic background is very similar to the trailing blackberries predominantly developed in the western USA. They were compared with standard semi-erect cultivars grown in Poland: cvs Black Satin and Orkan. In the years 2005–2010 yield and fruit quality were evaluated. It was also very important to check the tolerance to adverse weather especially the frost that is typical during Polish winters.

The blackberries were planted in a randomized block design. There were six, two plant plots per replication and each plot was 2.5 × 2.5 m. The plants were drip irrigated. There were no pesti-

Table 1. First and last picking, yield and berry weight (for 2006, data not shown) for 13 blackberry cultivars grown in Skierniewice, Poland and harvested in 2006–2008

Cultivar	Mean of first and last picking in 2006–2008	Fruit yield (kg/plant)			Weight of 100 fruits (g)		
		2007	2008	mean 2007–2008	2007	2008	mean 2007–2008
Black Butte	27.06–03.08	2.5	3.8	3.2 ^g	768	998	883 ^a
Black Satin	30.07–05.10	8.2	12.5	10.4 ^b	444	601	523 ^d
Boysenberry	28.06–24.07	2.1	3.1	2.6 ^g	424	587	506 ^{de}
Chester Thornless	26.07–03.10	10.1	15.7	12.9 ^a	434	616	525 ^d
Helen	02.07–07.08	3	3.2	3.1 ^{fg}	546	649	598 ^{bc}
Karaka Black	25.06–04.08	2.4	4.6	3.5 ^{fg}	636	698	667 ^b
Kotata	05.07–03.08	3.3	5.1	4.2 ^{ef}	431	646	539 ^d
Loch Ness	13.07–21.09	5.2	8.1	6.7 ^c	471	698	585 ^c
Loch Tay	02.07–25.08	5.7	6.6	6.2 ^{cd}	413	537	475 ^e
Loganberry	25.06–31.07	1.8	3.4	2.6 ^g	462	526	494 ^{de}
Oregon Thornless	29.07–22.09	4.3	6.2	5.3 ^{de}	284	297	291 ^f
Orkan	22.07–19.09	5.6	7.4	6.5 ^c	479	562	521 ^d
Silvan	27.06–12.08	2	3.6	2.8 ^{fg}	447	587	517 ^{de}
Tayberry	25.06–31.07	2.9	3.3	3.1 ^{fg}	431	514	473 ^e
Tummelberry	26.06–20.07	2.3	2.4	2.4 ^g	568	680	624 ^{bc}

values marked by the same letter are not significantly different (at the 95% confidence level) according to the Duncan's *t*-test

cides used. Before the plants were planted manure was applied on the field. In the early spring of 2006 nitrous and in the early summer mixed fertilizers were applied between the rows. Mixed fertilizers were applied in the early spring of each of the following years. Every year primocanes were limited to 4–5 the most dominant ones. In summer, primocanes were tipped to about 2 m in length to promote branching. After the harvest all fruiting canes were cut down to ground level. In the late fall of 2005–2008 the primocanes were laid down and covered with straw to reduce winter injury. In the last two years of the experiment (2009 and 2010), there was no winter protection applied. This provided information on whether these cultivars could be planted without tunnels that are being used to protect against adverse weather.

Fruit yield and weight of 100 fruits were recorded in the years 2006–2008. The plants bore a “baby” crop in 2006 that was not included in the statistical analysis. Fruits were picked almost every other day not including weekends and all fruits from each plant were weighed and counted. The data on 100 berries were collected based on yield in 3rd, 5th, 7th etc. harvest which is at least once a week. First and last harvest dates were determined based on 5 and 95% harvest. The yield data were analysed with R environment (R Development Core Team, available at <http://www.r-project.org>). The results are presented in Table 1.

RESULTS AND DISCUSSION

The results of statistical analyses indicated that there were significant differences ($\alpha = 0.001$) in yield and fruit weight due to cultivar and year, and there were significant cultivar \times year interactions.

While there were slight differences from year to year with harvest date, on average the cultivars fell into groups with cvs Tayberry, Loganberry, Karaka Black, Tummelberry, Black Butte, Silvan and Boysenberry being the ones with the earliest first ripe fruits and cvs Chester Thornless, Oregon Thornless and Black Satin having the latest ripening of first fruits. The last harvest date was much more spread out with cvs Tummelberry and Boysenberry being the earliest to finish harvest, cvs Loganberry and Tayberry were about a week later, cvs Black Butte, Kotata, Karaka Black and Helen about two weeks later, cv. Loch Tay three weeks later, and the rest of the cultivars last ripening date stretched out over

many weeks with cvs Chester Thornless and Black Satin finishing up in October over 10 weeks after the first cultivar finished. The fruit of the late cultivars were picked up until the first frost. The range in fruit harvesting interval was quite variable with some like cvs Tummelberry, Boysenberry and Kotata ripening all of their fruit in only 24–29 days while others like cvs Black Satin, Chester Thornless and Loch Ness taking 66–70 days to ripen their crop.

While the crop a year after planting is not representative of crops' long term productivity, cvs Black Satin, Loch Ness and Oregon Thornless were precocious with over 4 kg/plant in the first year (data not shown).

Cv. Chester Thornless had the greatest yield in 2007–2008, 24% higher than the standard cv. Black Satin. All of the hybrid berries and the trailing blackberries had yields that were not different and were below 3.5 kg/plant. Cv. Kotata produced over 4 kg/plant; this was still much less than any of the higher yielding semi-erect blackberries. Their yields, even with winter protection were disappointing, yet, these cultivars can be very attractive for the appearance of their fruits. From 2007–2008, the cultivars averaged a 46% increase in yield with cv. Karaka Black having an increase over 90% and cvs Loch Tay, Tummelberry, Helen and Tayberry having less than a 16% increase.

Cultivars Black Butte and Karaka Black had the heaviest fruit, above 6.0 g, in 2006. Their fruits are cylindrical, elongated and glossy with very attractive appearance. Cv. Oregon Thornless had the smallest fruits – 2.1 g per fruit. In 2007 and 2008, the heaviest fruits were reported at cv. Black Butte with up to 10 g per fruit and the fruits were much bigger than fruits of the standard cultivars. The smallest fruits in these years were observed at cv. Oregon Thornless – 2.9 g. This cultivar can be recognized as small-fruited, which is quite typical for this cultivar in other parts of the world.

According to 20 volunteers invited to sample the fruit, cvs Chester Thornless, Loch Ness and Loch Tay were very tasty and of very good quality. Cv. Oregon Thornless had firm but small fruits. The rest of the cultivars had soft fruits that can especially be a disadvantage during rainy harvest seasons. For that reason it is suggested that these cultivars should be grown under covers.

The last two years of the experiment showed that among all cultivars only cv. Chester Thornless was highly tolerant to low winter temperatures. The lowest temperatures during the experiment was in win-

ter 2008/2009 with -23°C in January and during the 2009/2010 it was -20.4°C also in January. Therefore, tunnel production is advised in most cases as it will also protect against rain that is common during the harvest and can lower the market quality of the fruits.

Until now blackberries were planted in Poland mainly in small gardens. Commercial plantations, producing fruit for fresh markets has just started to develop. Producers are looking for big-fruited cultivars of good taste and appearance and with a long shelf life. Producers should be able to deliver fruit to the market for as long as possible. Cultivars evaluated in this experiment produced fresh fruit from an open field for about 90 days of a year, from the end of June until the middle of September. Additional extension of harvest period is possible by production under covers like plastic tunnels and greenhouses. Early cultivars are preferable for such production. This is the first time when the cultivars have been tested in climatic conditions of central Poland. They are quite new and in most cases they were evaluated only in the countries of origin before.

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