

PRELIMINARY ASSESSMENT OF PRODUCTIVITY AND FRUIT QUALITY OF LITHUANIAN AND UKRAINIAN CULTIVARS OF BLACKCURRANT UNDER THE CLIMATIC CONDITIONS OF OLSZTYN

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A B S T R A C T

This work presents the results of research on productivity and morphological traits of Lithuanian and Ukrainian blackcurrant cultivars grown under the climatic conditions of Olsztyn. One year old plants of blackcurrant cultivars: 'Alta', 'Sofijewska', 'Jubilejnaja', Kopania', 'Czernecza', 'Czereszniowa', 'Ametyst', 'Wernisaż', 'Dainiai', 'Blizgiai', 'Tauriai', 'Imaliai', 'Titania', 'Viciai', and 'Almin' and 'Titania' were planted on 14 November 2002 in the University of Warmia and Masury Experimental Garden in Olsztyn. The experiment was designed in a set of random blocks with four repetitions, each having four plants in a plot positioned at 3.5 x 0.60 metres. In 2004 and 2005, crop yield was determined as was the weight of 30 clusters; the number of fruit in the 30 clusters; the weight of 100 fruits and the diameter of fruit. The crop yield from the tested cultivars varied. The largest average yield from one bush in 2004 was obtained from the cultivars: 'Tauriai', at 1.51 kg, 'Almin', at 1.45 kg, and 'Viciai', at 1.3 kg. In 2005, the highest crop yield was obtained from the cultivars: 'Ametyst', at 3.22 kg, 'Tauriai', at 2.75 kg and 'Sofijewskaja', at 2.57 kg. The smallest yield was recorded from the cultivar 'Czereszniowa', at 0.29 kg per bush in 2004 and 1.09 kg per bush in 2005. The cultivar 'Viciai' proved to have the largest mean weight of 100 fruit, at between 180 and 210.6 g, whereas the smallest fruit were recorded from the 'Dainiai' cultivar, at between 83.6 and 85.7 g. The clusters with the largest number of fruit were from the cultivars 'Jubilejnaja Kopania' and 'Tauriai'.

Key words: blackcurrant, *Ribes nigrum* L., cultivars, yield

INTRODUCTION

The currant cultivation area in Poland over the last five years has ranged from about 33 to 42 thousand hectares. The cultivation areas in the provinces of Warmia and Mazuria, in northern Poland, were the largest in the years 2000 and 2001, with just over 900 ha. Over the following three years from 2001, the area diminished to between 300 and 100 ha (GUS, 2000-2004). The production of blackcurrant in Warmia and Mazuria is not sizeable and should be enhanced, particularly in areas with favourable habitat conditions (Kawecki, 2001). The soil and atmosphere in the region are free from industrial pollution, which is why the quality of fruit obtained from plantations in these areas should be expected to be very high, especially where fruit production is fully integrated. The region of Olsztyn is less rich in fruit farming than other regions in Poland. This results from the fact that ground frost frequently occurs until late spring, on average until 15 May, or even as late as June in certain areas (Grabowski and Grabowska, 1983). For this reason, cultivars which are tolerant to low temperatures are appropriate for the region. In 2004 and 2005 low fruit prices and a drop in profitability resulted in a decreased interest in blackcurrant production. These factors have made it necessary to explore new cultivars of blackcurrant for cultivation in Poland (Pluta and Żurawicz, 2005). The purpose of the study presented was to assess the crop yields of 'Titania' and

Lithuanian and Ukrainian blackcurrant cultivars under the climatic conditions of Olsztyn.

MATERIAL AND METHODS

One year old plants of 'Titania' and Lithuanian and Ukrainian cultivars of blackcurrant: 'Alta', 'Sofijewska', 'Jubilejnaja Kopania', 'Czernecza', 'Czereszniowa', 'Ametyst', 'Wernisaż', 'Dainiai', 'Blizgiai', 'Tauriai', 'Imaliai', 'Viciai', and 'Almin' were planted on 14 November 2002 in the UWM Experimental Garden in Olsztyn on "class *a* IV" brown soil. The plants were spaced at 3.5 x 0.60 metres apart. The soil between rows was maintained weed-free with the aid of aerating and weeding tools. The weeds emerging among the rows were removed by hand. In 2004 and 2005, the crop yield and fruit quality were assessed. The amount of crop per plant was recorded. The weight of 30 clusters, the number of fruit per 30 clusters, the weight of 100 fruit and the diameter of fruit were also measured. The experiment was designed as randomized blocks in four repetitions with four plants on a plot. The data were interpreted using analysis of variance and means were separated by Duncan's multiple range test at 5% significance level. All calculations were performed using Statistica 6.0 software.

RESULTS AND DISCUSSION

The highest average yield from one bush was obtained in 2004 from the cultivars: 'Tauriai', at 1.51 kg,

'Almin', at 1.45 kg and 'Viciai', at 1.3 kg. In 2005, the highest crop yield was noted in the cultivars: 'Ametyst', at 3.22 kg, 'Tauriai', at 2.75 kg and 'Sofijewska', at 2.57 kg. The lowest yield was recorded in the cultivar 'Czereszniowa' at 0.29 kg per bush in 2004 and 1.09 kg per bush in 2005. Comparatively low yields were also recorded in the cultivars 'Alta', at between 0.47 and 1.55 kg, 'Wernisaiž', at between 0.37 and 1.87 kg and 'Dainiai', at between 0.51 and 1.78 kg.

The average yield for the cultivars in 2004 amounted to 0.845 kg per bush and in 2005 this increased to a level of 2.123 kg per bush. Between the years 2000 and 2004 the average yield in the provinces of Warmia and Mazuria amounted to 3.30 t/ha (GUS 2000-2004). The cultivars used in the experiment were planted in close proximity to each other (equivalent to planting density of 4762 bushes per ha), which is why the yield obtained from one bush was quite high. The average yield of currants from the cultivars in the provinces of Warmia and Mazuria in 2004 reached 4.1 t/ha, according to GUS (2000-2004) and was higher than those obtained in Podlasie Region (eastern Poland) and Wielkopolska (central Poland). Šikšnianas (2001) reports that the crop of fruit depends on the number of fruit in a cluster, the size of individual currants and the number of shoots in a bush. Other factors that affect crop productivity include insufficient tolerance to cold and damage to flowers caused by

slight frost. The expression of all these factors depends very much on the agricultural, climatic and meteorological conditions prevailing in each specific year. In 2005, these conditions were not favourable for good production, since drought and low temperatures prevailed throughout the vegetation period.

Makosz (1986) reported that fully cost effective production is possible with a yield of over 3 kg of currants per bush, and with a significant concentration of bushes per area unit. In the experiment described, such a yield was only obtained from the cultivar 'Ametyst' in 2005. Under the conditions in Olecko, in the province of Mazuria, Korsak (1990) obtained an average of between 2 to 3 kg of fruit per bush, which, using the traditional planting distances for hand harvesting, was equivalent to 3-4 t/ha. The crop per bush and of each cultivar was relatively low, particularly in 2004, which is probably because the bushes had not achieved their full production age. Studies into crop productivity under the climatic conditions in Olsztyn are in progress. The fruit chemical composition of the cultivars is also being assessed, but is not presented in this paper.

'Viciai' achieved the highest weight per 100 fruit at between 180 and 210.6 g. However, its clusters had the fewest fruit yield and the greatest diameter of a single fruit was 1.4 cm (Tab. 1). In the studies conducted by Kawecki et al. (2000), the weight of one fruit in the 'Viciai' cultivar exceeded 3 g. The smallest fruit were

Table 1. Crop productivity and fruit characteristics of Lithuanian and Ukrainian cultivars of blackcurrant in Olsztyn, north-eastern Poland, for the years 2004 and 2005

| Cultivar | Harvest time | | Yield bush [kg·bush ⁻¹] | | Weight of 30 clusters [g] | | The number of fruits per 30 clusters | | Weight of 100 fruits [g] | | Fruit diameter [cm] | |
|---------------------|--------------|-------|-------------------------------------|-------|---------------------------|--------|--------------------------------------|--------|--------------------------|---------|---------------------|------|
| | 2004 | 2005 | 2004 | 2005 | 2004 | 2005 | 2004 | 2005 | 2004 | 2005 | 2004 | 2005 |
| Titania – standard | 12.07 | 14.07 | 0.86d* | 2.02g | 159.3j | 192.6i | 291.0i | 243.0d | 151.4b | 112.5gh | 1.2cde | 1.2c |
| Alta | 6.07 | 9.07 | 0.47ghi | 1.55j | 182.8g | 201.4h | 257.1e | 232.5h | 134.7d | 120.0f | 1.2d | 1.1d |
| Sofijewska | 6.07 | 9.07 | 0.70def | 2.57c | 153.0k | 250.2c | 219.0g | 234.0h | 121.9f | 131.0e | 1.1e | 1.1e |
| Czernecza | 6.07 | 9.07 | 0.67defg | 1.28k | 230.0c | 285.0b | 288.0b | 284.5d | 99.1g | 109.0h | 1.0f | 1.1d |
| Czerezniowa | 6.07 | 9.07 | 0.29i | 1.09l | 333.0a | 335.6c | 297.3c | 298.0c | 119.4f | 115.5g | 1.2d | 1.2c |
| Ametyst | 6.07 | 9.07 | 0.60efg | 3.22a | 166.3i | 243.5d | 180.0i | 232.0h | 128.0e | 120.5f | 1.1e | 1.1d |
| Wernisaż | 6.07 | 9.07 | 0.37hi | 1.87h | 158.7j | 225.0e | 252.0f | 265.5e | 93.7h | 98.0i | 1.0f | 1.0e |
| Blizgiai | 6.07 | 9.07 | 1.22c | 2.12f | 173.0h | 220.3f | 249.0f | 251.0f | 128.8a | 135.8de | 1.2d | 1.1d |
| Tauriai | 12.07 | 14.07 | 1.51a | 2.75b | 152.2k | 182.5j | 324.0b | 322.0a | 126.2e | 134.2de | 1.3b | 1.3b |
| Imaliai | 12.07 | 14.07 | 1.10c | 2.49d | 204.2f | 282.3b | 288.0d | 301.0c | 133.9d | 155.0c | 1.2cde | 1.2c |
| Viciai | 12.07 | 14.07 | 1.30bc | 2.24e | 321.6b | 332.5b | 210.0h | 215.0i | 210.0a | 180.0a | 1.4a | 1.5a |
| Almin | 12.07 | 14.07 | 1.45ab | 2.24e | 225.4d | 253.3c | 288.0d | 282.0d | 154.0b | 165.0b | 1.2cde | 1.2c |
| Jubilejnaja Kopania | 12.07 | 14.07 | 0.79de | 2.51d | 216.1b | 283.0b | 351.0a | 307.0b | 145.9c | 138.5d | 1.2d | 1.2c |
| Dainiai | 12.07 | 14.07 | 0.51fgh | 1.78i | 155.3jk | 210.2g | 222.0g | 230.0h | 83.6i | 85.7j | 1.0f | 1.0e |

*The values denoted with the same letters are not significantly different within the column, at $P \leq 0.05$

recorded from 'Dainiai' clusters at 83.6 and 85.7 g. The diameter of one fruit in this cultivar was 1 cm. The greatest number of fruit in a batch of 30 clusters was found in the cultivars of 'Jubilejnaja Kopania' and 'Tauriai'. The diameter of one fruit from 'Jubilejnaja Kopania' was 1.2 cm and 1.3 cm from 'Tauriai'.

The cultivar 'Czereszniewa' proved to have the largest weight per 30 clusters. Gwozdecki et al. (2004) reported that the 'Czereszniewa' and 'Sofijewska' cultivars had spectacular and full clusters with large fruit and for this reason may be valuable for the retail market.

CONCLUSIONS

1. The yield of blackcurrant cultivars under the climatic conditions of Olsztyn was variable, averaging 0.845 kg per bush in 2004 and rising to 2.123 kg per bush in 2005. Most of the Lithuanian and Ukrainian cultivars of blackcurrant, as opposed to 'Titania', produced good crops in the north-eastern Poland. The 'Viciai' cultivar had the highest fruit weight at between 180 and 210.6 g per 100 fruit but the bushes produced less yield. The greatest diameter of a single fruit was 1,4 cm. Large attractive fruit were also found in the cultivar 'Almin'.
2. The highest cluster weight was recorded for the 'Czereszniewa' cultivar. However, its fruit weight was not among the largest.

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WSTĘPNA OCENA PLONOWANIA I JEGO JAKOŚCI LITEWSKICH I UKRAIŃSKICH ODMIAN PORZECZKI CZARNEJ W WARUNKACH OLSZTYNA

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S T R E S Z C Z E N I E

W pracy przedstawiono wyniki badań plonowania litewskich i ukraińskich odmian porzeczki czarnej uprawianej w warunkach Olsztyna. Sadzonki tych odmian oraz odmiany 'Titania' posadzono 14 listopada 2002 roku w Ogrodzie Doświadczalnym UWM w Olsztynie – północna Polska. Doświadczenie założono w układzie bloków losowych w 4 powtórzeniach, z czterema roślinami na poletku w rozstawie 3,5 x 0,60 m. W latach 2004 i 2005 dokonano oceny plonowania odmian: 'Titania', 'Alta', 'Sofijewska', 'Jubilejnaja Kopania', 'Czerneczka', 'Czereszniawa', 'Ametyst', 'Wernisaż', 'Dainiai', 'Blizgiai', 'Tauriai', 'Imaliai', 'Viciai' i 'Almin'. Określono wielkość plonu z rośliny oraz masę 30 gron, liczbę owoców w 30 gronach, masę 100 owoców i średnicę owoców.

Plon owoców badanych odmian był zróżnicowany. Największe średnie plony z 1 krzewu w 2004 roku uzyskano z odmian 'Tauriai' – 1,51 kg i 'Almin' – 1,45 kg, a także 'Viciai' – 1,30 kg. W 2005 roku najwyższe plony miały odmiany 'Ametyst' – 3,22 kg, 'Tauriai' – 2,75 kg oraz 'Sofijewskaja' – 2,57 kg. Najmniejsze plony zanotowano u odmiany 'Czereszniawa' – 0,29 kg z krzewu w 2004 roku i 1,09 kg z krzewu w 2005 roku. Odmiana 'Viciai' charakteryzowała się największą masą 100 owoców – 210,6 i 180 g, najdrobniejsze owoce zanotowano zaś na gronach odmiany 'Dainiai' – 83,6 i 85,7 g. Gronami o największej liczbie owoców wyróżniały się odmiany 'Jubilejnaja Kopania' i 'Tauriai'.

Słowa kluczowe: porzeczka czarna, *Ribes nigrum* L., odmiany, plon