

GROWTH, YIELDING AND FRUIT QUALITY OF TWO APRICOT CULTIVARS UNDER ORGANIC ORCHARD CONDITIONS

Summary

The experiment evaluated the possibility of ecological fruit production of two apricot cultivars. Trees grafted on Myrobalan seedlings were planted in the spring of 2004 in the Experimental Ecological Orchard in Nowy Dwór-Parcela near Skierniewice (central Poland). The experiment was conducted in accordance with the principles of organic fruit-growing. Under organic orchard conditions, the trees of the cultivar 'Wczesna z Morden' grew more strongly than the trees of the cultivar 'Harcot'. Fruit yields varied over the research years; however, the total yields for the period 2008–2014 were low. The 'Wczesna z Morden' trees were more productive. Spring frosts and windy and rainy weather during flowering had an adverse effect on the setting of fruit and apricot yield. Fruits of the cultivar 'Harcot' had a larger mass; however, a higher proportion of fruit damaged by the brown (*Monilinia*) rot of stone-fruit trees was observed in the crop.

Keywords: apricot cultivars, ecological orchard, fruit yields

WZROST, OWOCOWANIE ORAZ JAKOŚĆ OWOCÓW DWÓCH ODMIAN MORELI W WARUNKACH SADU EKOLOGICZNEGO

Streszczenie

W doświadczeniu oceniano możliwość ekologicznej produkcji owoców dwóch odmian moreli. Drzewa szczepione na siewkach alyczy posadzono wiosną 2004 roku w Ekologicznym Sadzie Doświadczalnym w Nowym Dworze-Parceli k. Skierniewic. Doświadczenie prowadzono zgodnie z zasadami sadownictwa ekologicznego. W warunkach sadu ekologicznego drzewa odmiany 'Wczesna z Morden' rosły silniej niż drzewa odmiany 'Harcot'. Plonowanie zmieniało się w latach badań, jednak sumaryczne plony zebrane w latach 2008-2014 były niskie. Plenniejsze były drzewa odmiany 'Wczesna z Morden'. Niekorzystny wpływ na zawiązanie owoców i wielkość plonów moreli miały wiosenne przymrozki oraz wietrzna i deszczowa pogoda w czasie kwitnienia. Owoce odmiany 'Harcot' miały większą masę, jednak w plonie obserwowano większy udział owoców uszkodzonych przez brunatną zgniliznę drzew pestkowych.

Słowa kluczowe: odmiany moreli, sad ekologiczny, plonowanie

1. Introduction

The area under apricot cultivation in Poland is nearly 1700 ha, producing 3–5 thousand tonnes of apricots per year [2]. In terms of the volume of fruit production this species ranks seventh after apple, sour cherry, plum, pear, sweet cherry and peach. The apricot tree has high thermal requirements. The trees grow and bear fruit best in warmer years with a long and sunny autumn [3]. They can survive periodic drops in temperature even down to -30°C, but due to the fact that they have a shorter endodormancy period than the other fruit trees commonly cultivated in Poland, they bloom very early and are therefore more vulnerable to frost damage. Low temperature and rainfall during flowering is the most common cause of poor yielding of apricot trees. Such conditions hinder the pollination of the flowers and promote the development of certain diseases, e.g. the brown (*Monilinia*) rot of stone-fruit trees.

Apricot trees and fruits are not very susceptible to diseases and pests [8]. Bryk [1] reports that the dying of apricot trees that is quite often observed is caused by a disease complex, the so-called apoplexy, and in wet years, the brown rot of stone-fruit trees appears on apricot trees, affecting the flowers and fruits. For growing in organically managed orchards it is important to choose cultivars that are frost resistant and disease tolerant, with highly productive trees that bear good quality fruit. The apricot fruit has a

high dietary value, which results from a high vitamin A content. Maintaining the high nutritional value and health-enhancing qualities of apricot fruit is possible by means of organic production, without the use of pesticides and fertilizers produced by chemical synthesis.

Due to the growing interest in organic fruit production in Poland, the experiment attempted to grow apricots in an orchard managed by organic means. Under assessment were tree growth and fruit yield and quality.

2. Material and methods

The experiment was established in the spring of 2004 in the Experimental Ecological Orchard (ESD) in Nowy Dwór-Parcela near Skierniewice, on a sandy-loam podzolic soil with a loamy subsoil, of class IVb of rye-potato complex. The average organic matter content was 1.3–1.4%. Nursery stock of the cultivars 'Harcot' and 'Wczesna z Morden' was chosen for planting.

'Harcot' – a dessert variety with trees resistant to frost, but flower buds quite susceptible to frost damage. The tree grows strongly and is moderately productive. The fruits ripen in late July – early August. They are medium-sized to large, of a spherical, ovoid or oval shape narrowing at the stalk. The skin is orange with a bright red, blurred blush covering 30-60% of the fruit's surface. The flesh is dark orange, firm, juicy, slightly aromatic, tasty, easily separating from the stone.

‘Wczesna z Morden’ – a dessert and processing variety, with trees and flower buds resistant to frost. The tree grows strongly or very strongly, and is productive. The fruits ripen in the second half of July and fall off the tree readily. They are medium-sized to large, ovoid, with highly flattened sides, and a large tip. The skin is light orange, usually without a blush, or with a small dotted blush covering 10% of the fruit’s surface, very downy. The flesh is medium firm, medium juicy, slightly aromatic, not very sweet. The stone is large, easily separating from the flesh.

Trees of the cultivars ‘Wczesna z Morden’ and ‘Harcot’, grafted on Myrobalan seedlings, were planted 4.5×3.5 m apart, in four replications, with three trees per plot. For the first 2 years, the soil in the orchard was kept in mechanical fallow. From the third year, mechanical fallow was continued in the rows of trees, while self-seeding turf was introduced in the inter-rows. Light sanitary and rejuvenation pruning of the trees was carried out every year. The trees were irrigated with a drip system from 2007. From 2008, data on weather conditions were collected via a meteorological station located in the ESD in order to assess their impact on the health status and yielding of the trees, and on fruit quality (Tab. 1).

The trees were managed in accordance with the principles of organic fruit-growing. Every year, the disease protection programme included 1–3 treatments with a copper plant protection product (Miedzian 50 WG or Miedzian Extra 350 SC) at a dose of 1.5–3 kg/ha or 1.5–3 l/ha. Aphids were controlled by performing one to several treatments, depending on the severity of the pest, with a mixture of Bioczoz – an extract of garlic *Allium sativum* (L.) (15 l/ha) and potassium soap (15 l/ha), or potassium soap (15 l/ha) and denatured spirit (7.5–15 l/ha).

Tree health status and growth vigour, and later, after the trees had come into bearing fruit, also the size and quality of the fruit crop were assessed annually. To assess the susceptibility of the trees to frost and disease, a 9-point scale developed by COBORU in Słupia Wielka was adopted [4]. The thickness of the tree trunk was measured annually in the autumn, in a permanently marked place, 30 cm above the soil surface. In the first two years after planting, it was the diameter of the trunk that was measured, and from the third year onwards – its circumference. The measurements were used to

calculate the trunk cross-sectional area (TCSA). After the apricot trees had come into fruiting, fruit yields were assessed annually, separately for each tree. The time of fruit ripening was recorded. Fruit weight was estimated based on a sample of 400 fruits randomly taken from each replicate (4×100 fruits). Similar samples (4×100 fruits) were taken to assess the extent to which the fruits were affected by the brown rot of stone-fruit trees.

The obtained results were evaluated statistically using analysis of variance in the Statistica 10 program. Duncan’s test was used to assess the differences between means at the 0.05 level of significance.

3. Results

The trunk cross-sectional area (TCSA) of the two apricot cultivars is shown in Table 2. The trees of the cultivar ‘Wczesna z Morden’ grew more strongly than the ‘Harcot’ trees in the organically managed orchard. The health status of both apricot cultivars was quite good, although withering of some shoots was observed every year as a result of infection by the pathogen causing the brown rot of stone-fruit trees. Symptoms of *Monilinia* rot were observed on both the ‘Harcot’ and ‘Wczesna z Morden’ trees, but to a significantly lesser extent in the latter. After detailed observations, the infected shoots were removed from the orchard. In terms of pests, aphids were the biggest problem. In some years, aphid-infested areas were observed on all the trees of the cultivar ‘Harcot’ and on isolated trees of ‘Wczesna z Morden’. The yielding of the apricot trees varied over the research years; however, the total yields obtained in 2008–2014 were low. The first fruits from the ‘Harcot’ trees were harvested in the third year after planting, and from ‘Wczesna z Morden’ two years later. Spring frosts and windy and rainy weather during flowering had an adverse effect on fruit set and fruit yield. In 2011, the trees of the two apricot cultivars did not bear fruit at all because the flowering period was characterized by very frequent and abundant rainfall, which was not conducive to pollination. In the years 2012 and 2013, which were the most favourable to apricot cropping, from nearly 8 to over 23 kg, depending on the cultivar, was collected from 1 tree. Regardless of the year, the ‘Harcot’ trees yielded less well (Tab. 2).

Table 1. Atmospheric conditions in the Experimental Ecological Orchard in Nowy Dwór-Parcela, in the years 2008–2013
Tab. 1. Warunki atmosferyczne w Ekologicznym Sadzie Doświadczalnym w Nowym Dworze-Parceli, w latach 2008–2013

Year	Min. temperature [°C]	Max. temperature [°C]	Mean temperature [°C]	Precipitations [mm]
2008	-15.3	31.3	8.7	415.2
2009	-22.5	32.1	8.2	682.0
2010	-26.1	33.2	7.3	659.2
2011	-20.2	32.5	9.0	541.6
2012	-22.6	34.8	8.1	524.2
2013	-16.9	36.9	8.0	501.8

Source: own study / Źródło: opracowanie własne

Table 2. Growth and yielding of two apricot cultivars under organic growing conditions
Tab. 2. Wzrost i plonowanie 2 odmian moreli w warunkach uprawy ekologicznej

Cultivar	TCSA* [cm ²] 2014	Fruit yield** [kg/tree]						Total yield 2008-2014 [kg/tree]	Productivity index [kg/cm ²]
		2008	2009	2010	2012	2013	2014		
‘Harcot’	207.7 b	2.6 b	4.1 b	9.2 a	11.9 b	7.7 b	2.4 b	39.3 b	0.190 b
‘Wczesna z Morden’	251.4 a	11.0 a	7.0 a	7.8 a	21.1 a	23.4 a	4.1 a	72.7 a	0.288 a

* TCSA – trunk cross-sectional area

** no fruit crop in 2011 because of flower buds freezing

Source: own study / Źródło: opracowanie własne

Table 3. Ripening time and fruit weight of two apricot cultivars under organic growing conditions
 Tab. 3. Termin dojrzewania oraz masa pojedynczych owoców 2 odmian moreli w warunkach uprawy ekologicznej

Cultivar	Ripening time	Fruit weight [g]						
		2008	2009	2010	2012	2013	2014	Mean
'Harcot'	12–25 July	54.3 a	67.3 a	45.5 a	49.6 a	44.4 a	49.8 a	51.8 a
'Wczesna z Morden'	14–30 July	51.0 a	56.8 a	38.3 a	43.3 a	31.3 b	44.3 a	44.2 b

Source: own study / Źródło: opracowanie własne

The fruits of the two apricot cultivars ripened at different times in mid- or late July, so harvesting had to be carried out at least twice. 'Harcot' apricots achieved harvest maturity earlier (Tab. 3). They were also larger than the fruits of the cultivar 'Wczesna z Morden'; however, in the years 2008–2012 those differences were not statistically significant (Tab. 3). Significant differences in fruit weight were found in 2013 and 2014. The fruits collected were large and healthy. Conditions favourable to fruit infection with the brown rot of stone-fruit trees occurred in 2010. The extent of infection was nearly 17% in the 'Harcot' cultivar, whereas in 'Wczesna z Morden' it did not exceed 5%.

5. Discussion

The apricot is a fruit crop species of stone-fruit trees, which until recently was rarely cultivated in Poland. A major problem in apricot cultivation was the irregular yielding of trees caused by the freezing of flower buds during winter dormancy or during flowering in the spring [3, 5, 7]. The noticeable climate warming in Poland, however, has resulted in recent years in a growing interest in the cultivation of this species [6]. There is no information in the literature regarding the production of apricots by organic means. Therefore, in response to the growing interest in the organic cultivation of fruit plants, an experiment was established to assess the usefulness of apricot trees for cultivation in an organically managed orchard. Two apricot cultivars were selected from the Polish National List of Fruit Plant Varieties for the experiment. The chosen cultivars were 'Harcot' and 'Wczesna z Morden'. There is a lack of literature on the organic cultivation of apricots. The results of the research conducted in the Experimental Ecological Orchard in Nowy Dwór-Parcela showed, however, that the apricot is one of the easiest species of stone-fruit trees to grow organically. Fruit crops of the highest quality were obtained us-

ing authorized plant protection products. In 2008–2014, the experimental apricot trees yielded quite regularly under organic orchard conditions, although their fruit yields varied. The year 2011 was the only year in which no fruit was harvested. In terms of size, the harvested fruits were not inferior to those from integrated cultivation. In the study by Jakubowski [3], the mean fruit weight of a 'Harcot' apricot in integrated cultivation was 40–60 g and that of 'Wczesna z Morden' 35–50 g. Similar weights were achieved by the fruits of these cultivars in organic cultivation (Tab. 3).

The research presented here showed great usefulness of the assessed apricot cultivars for organic fruit-growing. The results so far indicate that cultivars and rootstocks can play an important role in this apricot production system, which is why new research will be conducted in this respect.

6. References

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