Evaluation of Polish scab-resistant apple cultivars in organic orchard.

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Abstract

In the years 2005-2011 the quality and storability of three scab resistant apple cultivars of Polish origin 'Gold Milenium', 'Free Redstar' and 'Melfree' were investigated. The differences in tree growth were noticed. Tree size of 'Free Redstar', expressed as TCSA, was the highest compared to the others, and it gave the highest yield in the experiment. The fruit size varied between cultivars and depended on weather conditions in a season. The smallest fruits, in all seasons, born 'Free Redstar', and the biggest 'Gold Milenium'. During the first five years of observations the symptoms of apple scab did not occurred on the leaves or fruits of evaluated cultivars. No symptoms of sooty blotch and flyspeck of apples were found on any of the apple tree cultivars.

Quality of fruits at harvest and after storage depended on the growing season. Regardless of the season apples of 'Melfree' cultivar characterized the highest total soluble solids content (except 2008 season) and titratable acidity in comparison to the other tested cultivars. 'Duration of storage is limited by incidence of storage disorders and diseases. Superficial scald seems to be a problem for 'Melfree' and 'Free Redstar' cvs.

Keywords: organic production, diseases, fruit quality, storability

Introduction

The breeding of apple cultivars resistant to scab started in last century. However, the taste of many of them was not widely accepted by the consumers. Nowadays the taste of some scab resistant apple cultivars is comparable to highly accepted "standard" cultivars (Kuhn and Thybo, 2001). Weibel et al. (2000) concluded that apples from organic orchards had higher taste marks than conventional ones.

The aim of the study was to investigate the quality and storability of three scab resistant apple cultivars of Polish origin 'Gold Milenium', 'Free Redstar' and 'Melfree'.

Material and Methods

In the years 2005-2011fruits of three scab resistant apple cultivars of Polish origin 'Gold Milenium', 'Free Redstar' and 'Melfree' were harvested at the organic orchard belonging to Research Institute of Horticulture, Skierniewice, Poland. Trees on M.9 rootstock were planted in 2004, in a complete randomised design with four replications, consisting of five trees per plot.. Each year the crop protection programme involved 3 treatments with a copper preparation carried out before flowering and 2 treatments with a sulphur preparation carried out in May/June.

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Trunk diameter at 30 cm above the ground level was measured and fruit yield was recorded yearly. Trunk cross sectional area (TCSA) and cropping efficiency index (CEI) were calculated. Fruit size and percentage of blush were evaluated.

The scab and powdery mildew symptoms were observed on 400 leaves (for each cultivars). Leaves with symptoms of the diseases were counted and the surface of lesions was measured. The symptoms of sooty blotch and flyspeck of apples were investigated during harvest time.

Quality parameters of fruits (total soluble solids - TSS, titratable acidity –TA, and flesh firmness) were measured at harvest, after storage and after shelf life. Internal ethylene concentration in the core of fruits and starch index were measured at harvest as well.

Fruit firmness was measured on the opposite sides of fruit (blushed and unblushed) using the EPT-1R pressure tester (Lake City Technical Products, Canada), equipped with a 11.1 mm tip. TSS was measured in the juice collected from individual apples with the digital refractometer (ATAGO, PR-101, Japan). TA was measured using the automatic titrator (Mettler-Toledo, DL-21, Swiss), standard titration method, 0.1 N NaOH, pH=8.1 – end point.

Additionally, after storage and after shelf life the incidence of storage disorders and diseases were assessed.

The results were subjected to analysis of variance, and the differences between the means were estimated by LSD (α=0.05).

Results and Discussion

The differences in tree growth were noticed. Tree size of ‘Free Redstar’, expressed as TCSA, was the highest compared to the others, and it gave the highest yield in the experiment. The fruit size varied between cultivars and depended on weather conditions in a season. The smallest fruits, in all seasons, born ‘Free Redstar’, and the biggest ‘Gold Milenium’. Data presented by Czynczyk et al. (2004) suggested that ‘Gold Milenium’ (previous name ‘Early Freegold’) is the scab resistant apple cultivars most suitable for sustainable fruit production in modern orchard.

During the first five years of observations the symptoms of apple scab did not occurred on the leaves or fruits of evaluated cultivars. In 2010 the symptoms of apple scab were observed on the leaves of ‘Free Redstar’ cv. The severity of powdery mildew on the leaves of all cultivars was low. No symptoms of sooty blotch and flyspeck of apples were found on any of the apple tree cultivars.

Quality of fruits at harvest and after storage depended on the growing season. Regardless of the season apples of ‘Melfree’ cultivar characterized the highest total soluble solids content (except 2008 season) and titratable acidity in comparison to the other tested cultivars. ‘Melfree’ apples from organic orchard seems to be more acid than from integrated fruit production (Rutkowski et al., 2005). Percentage of blush varied from ca 20% on ‘Gold Milenium’ to 100% on ‘Free Redstar’ apples. Duration of storage is limited by incidence of storage disorders and diseases. Superficial scald seems to be a problem for ‘Melfree’ and ‘Free Redstar’ cvs.

‘Melfree’ and ‘Gold Milenium apples are not only suitable for fresh apples, but also for producing apple juices with a high health-giving value. Those cultivars provide high levels of phenolics in their juice (Markowski et al., 2009).

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