INVESTIGATION OF APPLE CV. ‘JONAGOLD’ CLONES IN THE YOUNG ORCHARD

Darius KVIKLYS\textsuperscript{1}, Nomeda KVIKLIENĖ\textsuperscript{1}, Henk KEMP\textsuperscript{2}

\textsuperscript{1}Lithuanian Institute of Horticulture, LT–54333, Babtai, Kaunas distr.
E. mail: d.kviklys@lsdi.lt Henk KEMP

\textsuperscript{2}Applied Plant Research, Research Unit Fruit Lingewal 1, 6668 LA Randwijk, The Netherlands

Abstract. Seven clones of cv. ‘Jonagold’: ‘Red Jonaprince Red Prince’, ‘Jonagold Boerekamp Early Queen’, ‘Jonagored Supra’, ‘Jonaveld First Red’, ‘Decosta Jonagold DeCoster’, ‘Jonagold Novajo’ and ‘Jonabel’ were tested at the Lithuanian Institute of Horticulture in Babtai in 2003–2006. In the young orchard significant differences among cv. ‘Jonagold’ clones were recorded in vegetative growth, yield and fruit weight. Cvs. ‘Red Prince’ and ‘Novajo’ had smaller stem diameter, comparing with other tested clones. The highest total yield in the young orchard was recorded for cvs. ‘Early Queen’, ‘Red Prince’ and ‘Supra’, the lowest – for cv. ‘Novajo’. Average fruit weight of cv. ‘Novajo’ was significantly lower too.

Key words: Malus sp., vegetative growth, yield, fruit quality.

Introduction. Lithuanian climatic conditions determine introduction possibilities of apple cultivars. Shorter vegetation period and growing hours, winter cold are the limiting factors for the cultivars originated from the west and south of Europe. In earlier performed rootstock trial with standard cv. ‘Jonagold’ fruits lacked colour, especially on more vigorous rootstocks (Kvikliene, Kviklys, 2001). At the same time, other fruit quality parameters and taste were not sufficient every year (Kviklys, Kvikliene, 2002). The same colouring problems were noticed in other countries (Vercammen et al., 2007a; Vercammen et al., 2007b). To overcome this shorting, during the last decades, in commercial growing several colour mutations of cv. ‘Jonagold’ have been introduced. These ‘Jonagold’ clones differ in colour and colour pattern, being bright red, dark red, striped or solid blushed (Hampson, Kemp, 2003; Kemp et al., 1995). There were also declared differences among clones for their suitability to grow in cooler climate conditions (Czynczyk, pers. comm., 2005). No significant differences in earlier internal ripening could be determined between clones with the same crop load and the same virus status. Earlier picking is possible only due to better colouring (Hampson, Kemp, 2003; Jager, Kemp, 2000).

Until recent years, ‘Jonagold’ is one of the main varieties in the Netherlands, Belgium, Germany and Poland. Main clones grown and currently planted in these countries are ‘Jonagored Supra’, ‘Decosta Jonagold DeCoster’, and ‘Red Jonaprince Red Prince’ (Anonymous, 1999; Jager, Kemp, 2000). After discovering the Russian market, a new wave of establishing commercial orchards with the well-coloured
clones of cv. ‘Jonagold’ is taking place in Belgium and the Netherlands (Deckers, pers. comm., 2007).

The aim of the trial is to evaluate suitability of cv. ‘Jonagold’ clones for growing under the Lithuanian climatic conditions.

**Material and methods.** Seven clones of cv. ‘Jonagold’: ‘Red Jonaprince Red Prince’ (further ‘Red Prince’), ‘Jonagold Boerekamp Early Queen’ (further ‘Early Queen’), ‘Jonagored Supra’ (further ‘Supra’), ‘Jonaveld First Red’ (later ‘First Red’), ‘Decosta Jonagold DeCoster’ (further ‘Decosta’), ‘Jonagold Novajo’ (further ‘Novajo’) and ‘Jonabel’ were tested at the Lithuanian Institute of Horticulture in Babtai (Central Lithuania 55° 60’ N, 23° 48’ E) in 2003–2006. The orchard was planted in spring of 2003. Planting distances were 3 × 1 m. The orchard was established without irrigation. The soil was epicalcari-endohypogleyic cambisol (RDg4-K1) with following agrochemical properties: pH$_{KCl}$ - 7.3, humus – 2.8%, P$_2$O$_5$ – 255 mg/kg, K$_2$O – 230 mg/kg. Planting material was propagated in the Netherlands as knip – trees and delivered by Vermeerderingstuinen Nederland (Propagation Gardens Netherlands).

Fertilization mainly with nitrogen was applied according to soil analysis before flowering and during intensive fruitlet growth.

Tree growth was evaluated by total shoot length (cm), tree height (cm) and stem diameter (mm), 30 cm above soil surface. Fruit average weight was counted of a sample of 100 fruits.

The trial consisted of four replicates with 5 trees each. Replicates were randomised. Results were statistically elaborated by the analysis of variance using Duncan’s multiple range test.

**Results.** The strongest shoot growth during the year of planting was recorded of cvs. ‘Red Prince’ and ‘Early Queen’ (Table 1).

<table>
<thead>
<tr>
<th>Table 1. Vegetative growth of ‘Jonagold’ clones</th>
<th>Lentelė. ‘Jonagold’ klonų vegetatyvinis vystymasis</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Clone</strong></td>
<td><strong>Total shoot length in 2003</strong></td>
</tr>
<tr>
<td><strong>Klonas</strong></td>
<td><strong>Bendrais ugūti ilgis 2003 m., cm</strong></td>
</tr>
<tr>
<td>‘Red Prince’</td>
<td>225 a</td>
</tr>
<tr>
<td>‘Early Queen’</td>
<td>211 ab</td>
</tr>
<tr>
<td>‘Supra’</td>
<td>159 cd</td>
</tr>
<tr>
<td>‘First Red’</td>
<td>135 d</td>
</tr>
<tr>
<td>‘Decosta’</td>
<td>133 d</td>
</tr>
<tr>
<td>‘Novajo’</td>
<td>100 e</td>
</tr>
<tr>
<td>‘Jonabel’</td>
<td>183 bc</td>
</tr>
</tbody>
</table>

Values followed by the same letters within the columns are not statistically different at P ≤ 0.05.

Their total shoot length differed significantly from other tested clones with the exception of cv. ‘Jonabel’. Significantly weakest shoot growth was observed for cv. ‘Novajo’. Its total shoot length was by 100% less than one of strong growing cultivars. Vegetative growth of cv. ‘Novajo’ expressed as stem diameter was suppressed during all years of investigations too. Two other clones, ‘Red Prince’
and ‘First Red’, had also smaller stem diameter. Cv. ‘Decosta’ exhibited strongest growth in the young orchard among the tested clones, although there were no significant differences comparing with cvs. ‘Early Queen’, ‘Supra’ and ‘Jonabel’.

Significant differences among clones in yield capacity were recorded starting from the first year of cropping. The highest yield was from cvs. ‘Red Prince’, ‘Early Queen’ and ‘Jonabel’ (1.50–1.83 kg/tree) (Table 2). ‘Early Queen’ remained on the top positions every year and had highest total yield in the young age (18.3 kg/tree). Only the total yield of two other cvs. ‘Red Prince’ and ‘Supra’ was significantly not different. Cv. ‘Supra’ was the least productive during first two years, but the most in 2006.

**Table 2. Yield of ‘Jonagold’ clones (kg/tree)**

<table>
<thead>
<tr>
<th>Clone Klonas</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>Total Bendras</th>
</tr>
</thead>
<tbody>
<tr>
<td>‘Red Prince’</td>
<td>1.50 ab</td>
<td>6.68 ab</td>
<td>8.47 bc</td>
<td>16.7 ab</td>
</tr>
<tr>
<td>‘Early Queen’</td>
<td>1.83 a</td>
<td>6.49 ab</td>
<td>9.99 ab</td>
<td>18.3 a</td>
</tr>
<tr>
<td>‘Supra’</td>
<td>0.27 c</td>
<td>4.23 c</td>
<td>11.8 a</td>
<td>16.3 a</td>
</tr>
<tr>
<td>‘First Red’</td>
<td>1.13 b</td>
<td>5.54 bc</td>
<td>8.72 ab</td>
<td>15.4 bc</td>
</tr>
<tr>
<td>‘Decosta’</td>
<td>1.05 b</td>
<td>4.58 bc</td>
<td>9.63 ab</td>
<td>15.3 bc</td>
</tr>
<tr>
<td>‘Novajo’</td>
<td>1.06 b</td>
<td>4.16 c</td>
<td>8.96 ab</td>
<td>14.2 c</td>
</tr>
<tr>
<td>‘Jonabel’</td>
<td>1.50 ab</td>
<td>7.24 a</td>
<td>6.02 c</td>
<td>14.8 bc</td>
</tr>
</tbody>
</table>

Values followed by the same letters within the columns are not statistically different at P ≤ 0.05.

| Tomis pažiūrės raidėse pažymėtos reikšmės iš esmės nesiskiria (P ≤ 0.05). |

On the average during three years the biggest fruits were of cv. ‘Decosta’, though significant differences were recorded only with cv. ‘Novajo’ (Table 3).

**Table 3. Average fruit weight of ‘Jonagold’ clones (g)**

<table>
<thead>
<tr>
<th>Clone Klonas</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>Average Vidutinis</th>
</tr>
</thead>
<tbody>
<tr>
<td>‘Red Prince’</td>
<td>149 a</td>
<td>126 bc</td>
<td>152 a</td>
<td>142ab</td>
</tr>
<tr>
<td>‘Early Queen’</td>
<td>145 a</td>
<td>128 bc</td>
<td>151 a</td>
<td>141ab</td>
</tr>
<tr>
<td>‘Supra’</td>
<td>140 a</td>
<td>137 ab</td>
<td>159 a</td>
<td>145 ab</td>
</tr>
<tr>
<td>‘First Red’</td>
<td>148 a</td>
<td>126 bc</td>
<td>153 a</td>
<td>142 ab</td>
</tr>
<tr>
<td>‘Decosta’</td>
<td>146 a</td>
<td>147 a</td>
<td>162 a</td>
<td>152 a</td>
</tr>
<tr>
<td>‘Novajo’</td>
<td>154 a</td>
<td>116 c</td>
<td>131 b</td>
<td>134 b</td>
</tr>
<tr>
<td>‘Jonabel’</td>
<td>145 a</td>
<td>118 c</td>
<td>165 a</td>
<td>143 ab</td>
</tr>
</tbody>
</table>

Values followed by the same letters within the columns are not statistically different at P ≤ 0.05.

| Tomis pažiūrės raidėse pažymėtos reikšmės iš esmės nesiskiria (P ≤ 0.05). |

The average fruit weight was different during the trial time. The dry summer of 2005 resulted in much smaller fruits compared to fruit size in 2004 and 2006. The biggest changes of average fruit weight during the trial were recorded for cvs. ‘Novajo’ (38 g) and ‘Jonabel’ (47 g). The most stable fruit weight was of cvs. ‘Decosta’ (16 g) and ‘Supra’ (22 g).
**Discussion.** During first two years in the orchard, vegetative growth of trees depended on the development of planting material. Though all trees were formed in the nurseries as two-year-old trees with one-year-old branches, the number of branches, stem diameter and tree height were not the same. It explains the strongly expressed significant differences among clones in total shoot length in the orchard. Influence of quality of planting material was noticed in stem diameter too. Later differences in stem diameter among clones decreased; nevertheless even in the fourth year after planting they still were significant. Considering growth peculiarities in the young orchard, it could be stated that ‘Jonagold’ clones will remain differences in vegetative development. Such tendency was mentioned by H.Kemp and Van Dieren (1996), but it was connected with virus status of planting material.

Three cultivars that had the highest total shoot growth during planting year were the most precocious in the second year. ‘Red Prince’, ‘Early Queen’ and ‘Jonabel’ yielded more than 1.5 kg/tree or more than 5 t/ha. Such yield is normal for cv. ‘Jonagold’ in the second leaf (Czynczyk et al., 2006; Vercammen et al., 2006). Yield of all tested clones increased during the first 4 years in the orchard, except cv. ‘Jonabel’. Higher total yield in the young orchard was recorded for cvs. ‘Early Queen’, ‘Red Prince’ and ‘Supra’, the lowest – for ‘Novajo’. Differences among yield of ‘Jonagold’ clones were recorded in the trials performed in Belgium too (Vercammen et al., 2006).

Average fruit weight of cv. ‘Jonagold’ varies from 170 g to more than 250 g in Poland (Czynczyk et al., 2006; Skrzynski, Gastol, 2006), which has comparable but more favourable growing conditions than in Lithuania. Under Lithuanian climatic conditions, the biggest fruits were in 2006 reaching more than 150 g. Of course the combination of dwarfing rootstock and an orchard without irrigation should be taken into account, meaning that average fruit weight could be increased if drought stress factor will be eliminated.

Significant differences of fruit weight among different selections of cv. ‘Jonagold’ usually are not strongly expressed if virus free plant material is used (Kemp, Van Dieren, 1996). However, ‘Novajo’ is known for its smaller fruit and different (more flat) fruit shape (Anonymous, 1999; Kemp, Van Dieren, 2003). In our trial, the smaller fruits of cv. ‘Novajo’ could be attributed to lower growth, but at the same time the yield was also relatively low. In comparison, fruit weight of weak growing and high yielding cv. ‘Red Prince’ was higher by 10 g. In other countries average fruit weight of cv. ‘Novajo’ on M.9 rootstock reaches 240-255 g (Vercammen et al., 2006).

**Conclusions.** 1. In the young orchard significant differences among cv. ‘Jonagold’ clones were recorded in vegetative growth, yield and fruit weight.

2. Cvs. ‘Red Prince’ and ‘Novajo’ had smaller stem diameter, comparing with other tested clones.

3. The highest total yield in the young orchard was recorded for cvs. ‘Early Queen’, ‘Red Prince’ and ‘Supra’, the lowest – for cv. ‘Novajo’.

4. Average fruit weight of cv. ‘Novajo’ was significantly lower in the tested group.
Acknowledgement. Authors acknowledge Vermeerderingstuinen Nederland (Propagation Gardens Netherlands) for a kind delivery of planting material.

Gauta 2007 06
Parenęga spausdinti 2007 06

References


SODININKYSTĖ IR DARŽININKYSTĖ. MOKSLO DARBAI. 2007. 26(3).
‘JONAGOLD’ OBELŲ VEISLĖS Kلونų tyrimai jauname sode

D. Kviklys, N. Kviklienė, H. Kemp

Santrauka


Reikšminiai žodžiai: derlius, Malus sp., vaisių kokybė, vegetatyvinis augimas.