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THE INFLUENCE OF DIFFERENT ROOTSTOCKS ON THE GROWTH, YIELD AND FRUIT QUALITY OF PLUM TREE CV. 'DĄBROWICE PRUNE' PLANTED IN EXHAUSTED SOIL

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The growth and yield of plum tree cv. 'Dąbrowice Prune' grafted on two seedling rootstocks (*P. cerasifera var. divaricata* Borkh. and 'Wangenheim Prune') as well as on four clonal rootstocks (Jaspi, GF 655/2, Ishtara and St. Julien A) were investigated in the young orchard. Trees were planted at a spacing of 4.25 x 2.5 m in the soil used for fruit tree crops for at least 50 years. Cherry, apple and plum trees were cultivated previously on this field. Analysis of tree growth and cumulative yield revealed that plum trees on seedlings Wangenheim Prune grew less vigorously and had lower cumulative yield than the control ones grafted on *P. divaricata.* The growth and yield reductions in case of trees on seedlings 'Wangenheim Prune' were untypical in this experiment as a comparison to trees on the same rootstocks located in other places. Replant problems of plum trees grafted on four other investigated rootstocks were not observed in such big scale like on seedlings of 'Wangenheim Prune'

Key words: plum, *Prunus domestica* L., rootstock, cultivar, growth, yield, fruit weight, replant problems.

Introduction. Plum trees in Poland are grown mainly on *Prunus cerasifera* var. *divaricata* Led. (Grzyb and Rozpara, 1998). This rootstock is classified as vigorous (Grzyb et al., 1984; Ystaas and Froynes, 1993) and is unsuitable for intensive plum orchards. In this respect trees grafted on seedlings of Wangenheim Prune are more suitable for this type of orchards. According to the results obtained by several authors (Grzyb and Krzewińska, 1992; Grzyb et al., 1998a; Rozpara and Grzyb, 1994; Rozpara and Grzyb, 1998; Sitarek and Grzyb, 2002; Sitarek et al., 2004), this rootstock reduced significantly the growth of plum trees and improved their productivity in comparison to *P. divaricata* seedlings. However, some plum cultivars on seedlings of 'Wangenheim Prune' had the tendency to decrease mean fruit weight, particularly on sandy soils (Grzyb et al., 1998 b). Therefore, the search was undertaken to find out new dwarf or semi dwarf rootstocks for plums well adapted to Polish growing conditions. For experiments, for the evaluation of new rootstocks there were included

in West European countries well know vegetative propagated rootstocks commonly used in commercial orchards. Among them there are types of French, German and English selection.

Materials and methods. In field experiment plum trees of cv. 'Dąbrowice Prune' grafted on seedlings of 'Wangenheim Prune' and four vegetative propagated rootstocks (Jaspi, GF 655/2, Ishtara and St. Julien A) were compared with trees on *P. divaricata* seedlings. In the spring of 2000 one-year-old trees were planted at the "Pomological Orchard" in Skierniewice. Trees were planted in the soil used before for fruit tree crops for at least 50 years. Cherry, apple and plum trees were cultivated previously on this field. The trees were planted in light loamy soil at a spacing of 4.25 x 2.5 m. Experiment was established in the random blocks design with four replications, with three trees per plot. The total number of 12 trees in each rootstock/cultivar combination was investigated. Plum orchard was irrigated. During the first year after planting the soil was kept free from weeds by mechanical cultivation. In the following years soil management included frequent grass mowing in the alleyways in conjunction with the maintenance of less than 1-m wide herbicide strips along the tree rows. Herbicides and fertilizers were applied according to the standard recommendation for plum commercial orchards. Trees were trained as free spindles with a central leader. The following traits were evaluated: tree vigor, yield, fruit weight and the soluble solids. The results of obtained data were statistically analyzed and Duncan's multiple range t-tests at the probability level of 5% was used to separate statistically different means.

Results. The results revealed that only seedlings Wangenheim Prune reduced significantly the growth of plum trees 'Dąbrowice Prune' in comparison to *P. divaricata* (Table). The decrease of tree grow of this cultivar was influenced also by GF 655/2 and St.Julien A rootstocks. Trees grafted on Ishtara grew very vigorously.

Cumulative yield of 'Dąbrowice Prune' was not affected by the type of rootstocks, except of 'Wangenheim Prune' seedlings. The trees grafted on seedlings of Wangenheim Prune had significantly lower yield than on the other tested rootstocks grown in the same conditions.

Yield efficiency was similar for all these trees. Differences among rootstocks were not significant. Plum trees 'Dąbrowice Prune' grafted on Jaspi and Ishtara produced larger fruits than trees grafted on *P. cerasifera* var. *divaricata.* The highest content of soluble solids was established in the fruits collected from the trees grafted on St. Julien A.

Discussion. Seedlings of 'Wangenheim Prune' used as a rootstock in this trial significantly reduced the growth of fruit tree cv. 'Dąbrowice Prune'. This corresponds to results obtained by other authors (Grzyb et al., 1998b; Grzyb and Sitarek, 2004; Sitarek et al., 2004). However, the scale of growth reduction intensity was relatively too big and not corresponded to data obtained with this rootstock located in other places (Grzyb and Rozpara, 1998; Rozpara and Grzyb, 1998; Sitarek et al., 2001; Sitarek et al., 2004). It seemed to be as consecutive effect of exhausted soil, because cherry, apple and plum trees were cultivated previously on this field (Pacholak, 2003a; Pacholak, 2003 b; Grzyb and Sitarek, 2004). Such problem in this scale was not observed with trees grafted on other investigated rootstocks. In this location plum

trees on Ishtara rootstock grew as intensively as trees grafted on seedlings *P. cerasifera*. In comparison to control trees other investigated rootstocks (except of 'Wangenheim Prune' seedlings) only slightly limited the growth intensity of 'Dąbrowice Prune'.

T a b l e. **Growth and yield of plum trees cv. 'Dąbrowice Prune' grafted on different rootstocks and cultivated in replant conditions. Experimental Orchard at Skierniewice, Central Poland, 2000–2005**

L e n t e l ė. **Pakartotinai auginamų slyvų, įskiepytų į skirtingus poskiepius, augimas ir derlius. Bandymų sodas Skierniewice, centrinėje Lenkijoje, 2000–2005 m.**

Rootstock Poskiepis	Trunk cross sectional area (TCSA) in 2005 Kamieno skerspjūvio plotas (KSP) 2005 m.		Cumulative yield 2002–2005 Suminis derlius 2002–2005 m.	Yield efficacy 2002–2005 Produktyvumas 2002–2005 m.	Mean fruit weight Vidutinė vaisiaus masė	Soluble solids Tirpios sausosios medžiagos
	cm^2	%	kg tree^{-1} kg vaism.$^{-1}$	kg cm^{-2} of TCSA kg cm^{-2} KSP	g	%
P.divaricata	75.5 c*	100.0	29.0 b	0.39 a	32.7 a	18.1 ab
'Wangenheim Prune'	41.8 a	55.4	16.8 a	0.42 a	33.9 a	19.2 ab
Jaspi	67.7 bc	89.7	31.9 b	0.49 a	37.0 b	17.7 a
GF 655/2	60.9 b	80.7	23.4 ab	0.38 a	35.3 ab	18.4 ab
Ishtara	78.0 c	103.3	30.0 b	0.39 a	36.4 b	18.5 ab
St. Julien A	59.2 b	78.4	26.5 b	0.46 a	35.2 ab	19.8 b

***** Means followed by the same letter in the columns are not significantly different at P = 0.05 according to Duncan's test / Ta pačia raide pažymėtos reikšmės skiltyse pagal Dunkano kriterijų (p = 0,05) iš esmės nesiskiria.

Conclusions. The most vigorous growth of replanted plum trees cv. 'Dąbrowice Prune' was on rootstock Ishtara and Prunus divaricata seedlings. Trees on Jaspi and Ishtara produced the largest fruits. Cummulative yield was simmilar on all tested rootstocks except seedlings of 'Wangenheim Prune'.

In exhausted soil the most limited growth and productivity of plum trees was on seedlings of 'Wangenheim Prune'.

Gauta
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SKIRTINGŲ POSKIEPIŲ ĮTAKA ‘DĄBROWICE PRUNE’ VEISLĖS SLYVŲ AUGIMUI, DERLIUI IR VAISIŲ KOKYBEI NUALINTOJE DIRVOJE

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Santrauka

Jauname sode tirtas ‘Dąbrowice Prune’ veislės slyvų, įskiepytų į du sėklinius (*P. cerasifera var. divaricata* Borkh. ir ‘Wangenheimo vengrinė’) ir keturis vegetatyvinius poskiepius (Jaspi, GF 655/2, Ishtara ir St. Julien A), augimas ir derlius. Slyvos buvo pasodintos 4,25 x 2,5 m atstumais dirvožemyje, kuriame mažiausiai 50 metų buvo auginti vaismedžiai: vyšnios, obelys ir slyvos. Vaismedžių augimo ir suminio derliaus analizė parodė, kad slyvos su sėkliniais ‘Wangenheimo vengrinė’ poskiepiais augo prasčiau ir davė mažesnį suminį derlių negu įskiepytos į *P. divaricata* sėjinukus. Slyvų su sėkliniais ‘Wangenheimo vengrinė’ poskiepiais augimo ir derliaus suprastėjimas, atliekant šį bandymą, buvo netipiškas, palyginti su panašių tyrimų rezultatais kitose vietose. Slyvų su kitais tirtais poskiepiais pakartotinio auginimo problema nebuvo tokia didelė, kaip į ‘Wangenheimo vengrinė’ sėjinukus įskiepytų slyvų.

Reikšminiai žodžiai: slyvos, *Prunus domestica* L., poskiepiai, veislės, augimas, derlius, vaisių masė, persodinimo problemos.