JOURNAL OF FRUIT AND ORNAMENTAL PLANT RESEARCH

VOL. X
2002

SKIERNIEWICE, POLAND

Zdzisław Kawecki, Zofia Tomaszewska, Anna Bieniek
University of Warmia and Mazury
Department of Horticulture
Prawocheńskiego 21,10-957 Olsztyn, POLAND

YIELD AND CHEMICAL COMPOSITION OF FRUITS OF *Prunus tomentosa* THUNB.

ABSTRACT. In 1998-2000 at the experimental station in Olsztyn (N.E. Poland), the yield as well as the morphology of fruits and stones obtained from the selected bushes of *Prunus tomentosa*, were investigated. In 2000, chemical composition of fruits was also determined using gas chromatography. The yield in 2001 was higher than its mean value in the previous three years. The fruits of *Prunus tomentosa* significantly differed with regard to their weight, but the differences in their length and diameter were insignificant. In the fruits, following organic acids were found: malic, α-ketoglutaric, aspartic, pyruvic, oxalic, citric, folic and ascorbic. The last prevailed, followed by malic acid. Of sugars, glucose and fructose dominated.

Key words: *Prunus tomentosa* Thunb., yield, chemical composition of fruits, morphology of fruits

INTRODUCTION. *Prunus tomentosa* Thunb. or *Lithocerasus tomentosa* Thunb. belongs to the family *Rosaceae, subgenus* 'Lithocerasus'. Sękowski (1993) reports that it is a broadly growing bush up to 3 m high,

densely covered with massed young shoots. The leaves are reversely eggshaped or eliptic, unevenly serrated and from the bottom hairy rapped. Flowers are slightly pink and appear early – at the same time as the leaves. Fruits ripening in July are flat oval, 1 cm in diameter. They look like sour cherry but are sweeter (Kawecki and Tomaszewska, 1999). They can be consumed fresh or as preserved products: juices, jams, compote, syrup and dried whole. In therapeutics they are not popular, although show some strengthening properties. They also increase appetite, regulate alimentary canal, as well as make easier to digest fat, meat protein and milk (Kawecki, 1997).

This is a plant barely propagated in horticulture, mainly grown by amateurs. It grows in the wild in China, Japan, Tybet and Himalayas. Pietrowa (1987), Sękowski (1993) and Radiuk and Radiuk (1997) report that it is a very changeable species, frost resistant, of low soil requirement (it thrives even on dry sands) and very prolific.

The purpose of this study was to determine the chemical composition of fruits of *Prunus tomentosa* Thunb. obtained from generative propagation and grown in climatic conditions of Olsztyn (N.E. Poland).

MATERIAL AND METHODS. The seeds of *Prunus tomentosa* were brought in the autumn of 1994 from the Agricultural Academy in Gorki (Russia). They were stratified at 5 °C. After four month of the secondary physiological ripening they were sown into boxes with composted soil. Seedlings, after attaining 5-8 cm height, were planted into pots and in the autumn replanted into sandy soil of class 5. All the obtained plants (50) were planted in one row at a spacing of 1.5 m. The width of the inter-row to other fruit plants was 5 m. Before planting, the soil received 40-60 t manure x ha^{-1}, 100 kg K_2O x ha^{-1}, and 100 kg P_2O_5 x ha^{-1}. After planting no pruning was performed. During vegetation no plant protection means were applied.

The present study concerns the 3^{rd}, 4^{th}, 5^{th} and 6^{th} year after planting. Yield and morphology of both fruits and stones from the selected bushes of *Prunus tomentosa* were evaluated. The investigation was performed in 3 replications, each was an average for 100 fruits and stones from each bush. The results were

compared with those from the previous years of vegetation. Chemical composition of fruits was determined by the method of gas chromatography (Górecki et al., 1997). The data were statistically analysed using Duncan`s t - test at P=0.05.

RESULTS AND DISCUSSION. The fruit yield of *Prunus tomentosa* varied in the four consecutive years. In 2001, it was higher as compared to the three previous seasons. The highest fruit yield (Tab.1) was obtained from bush W-37 (1.80 kg·bush^{-1}, which corresponds to 2.39 t·ha^{-1}) and it was significantly greater than recorded earlier. The lowest fruit yield was obtained from bush W-32 both in 2001 (0.64 kg·bush^{-1}, i.e. 0.85 t·ha^{-1}) and in the previous seasons.

Table 1. Yield [kg·bush^{-1}] of *Prunus tomentosa* Thunb. bushes in 1998-2001

Bush number	1998	1999	2000	2001
W-11	1.85i	0.24abc	0.97f	1.43g
W-23	0.70e	0.37cd	0.16ab	0.98f
W-32	0.30bcd	0.43d	0.30bcd	0.64e
W-37	1.00f	0.20abc	0.11a	1.80h
LSD (5%) 0.154				

Pietrowa (1987) reports that 1 fruit can have the weight of 1.5 to 2 g. These are higher values than those obtained in the four consecutive years of the present research (Tab. 2).

Table 2. Fruit morphology of *Prunus tomentosa* Thunb. in 1998-2000 (means) and in 2001

Bush number	Weight [g]		Length [cm]		Diameter [cm]	
	1998-2000	2001	1998-2000	2001	1998-2000	2001
W-11	1.10ab	1.15a	1.17a	1.18a	1.10	1.06a
W-23	1.29a	1.22b	1.20a	1.21a	1.19	1.18b
W-32	1.01b	1.03c	1.08b	1.10b	1.12	1.10ab
W-37	1.13ab	1.12a	1.19a	1.20a	1.19	1.20b
LSD (5%)	0.214	0.069	0.078	0.041	n.s.	0.098

According to Czachowskij et al. (1986) the fruit diameter amounts to about 1 cm and that approximately corresponds with this study. In 2001 the fruit diameter averaged from 1.06 cm for bush W-11 to 1.19 cm for W-23 and W-37. The length of fruits was from 1.10 to 1.21 cm. The statistical analysis showed no significant differences both in the diameter and length of fruits (Tab. 2).

The fruit stones differed significantly with regard to the diameter only. In 2001 it ranged from 0.62 to 0.64 cm, and was similar to the mean values for 1998-2000, with the exception of bush W-37 (0.60 cm). The weight of stones in 2001 was between 0.14 and 0.16 g (Tab. 3). Kawecki and Tomaszewska (1999) report that due to the production of bushes from seeds, the planting material is genetically differentiated, which is associated with securing the uniform fruit yield with regard to the weight and size of drupes from particular bushes.

T a b l e 3 . Stone morphology of *Prunus tomentosa* Thunb. in 1998-2000 (means) and in 2001

Bush number	Weight [g]		Length [cm]		Diameter [cm]	
	1998-2000	2001	1998-2000	2001	1998-2000	2001
W-11	0.14ab	0.14	0.86	0.86a	0.62	0.63
W-23	0.17c	0.16	0.84	0.84ab	0.64	0.64
W-32	0.15b	0.15	0.82	0.82b	0.64	0.64
W-37	0.13a	0.14	0.82	0.82b	0.60	0.62
LSD (5%)	0.019	n.s.	n.s.	0.030	n.s.	n.s.

Chemical composition showed that the fruits contained the following organic acids: malic, α-ketoglutaric, aspartic, pyruvic, oxalic, citric, folic and ascorbic (Tab. 4). The last (vitamin C) prevailed, the content of which amounted to 16.06 $\mu g \cdot mg^{-1}$ of dry weight. Also malic acid occurred in a high quantity (13.34 $\mu g \cdot mg^{-1}$ d.w.) Dry weight of the fruits constituted 16.07%. Pietrowa (1987) reports that they contain 12-16.6% of dry weight, from 0.6 to 1.3% organic acids and from 4.7 to 9.7% sugars. In the present study (Tab. 4) the content of glucose amounted to 65.54 $\mu g \cdot mg^{-1}$ d.w. and there was also a small quantity of saccharose (3.45 $\mu g \cdot mg^{-1}$d.w.). Also, small amounts of alcoholic sugar derivatives were found: d-pinitol (1.69 $\mu g \cdot mg^{-1}$ d.w.), d-chiro-

inositol (0.31 μg·mg^{-1}d.w.) and myo-inositol (0.62 μg·mg^{-1}d.w.). The results obtained in this study approximately correspond with the data given by Pietrowa (1987) and Kawecki et al. (1999).

T a b l e 4. Content of dry matter and chemical composition of fruits of *Prunus tomentosa* Thunb. (2000)

Constituent	Content [μg·mg^{-1} d.w.]
Organic acids:	
malic	13.34
α-ketoglutaric	1.12
aspartic	0.08
pyruvic	0.03
oxalic	0.44
citric	0.64
folic	0.59
ascorbic	16.06
Alcoholic sugar derivatives:	
d-pinitol	1.69
d-chiro-inositol	0.31
myo-inositol	0.62
Sugars:	
saccharose	3.45
glucose	65.54
fructose	62.76
Dry matter 16.07%	

CONCLUSIONS

1. The yield of *Prunus tomentosa* obtained in 2001 (0.64 to 1.80 kg per bush) was higher than its mean values in 1998-2000. Fruits of particular bushes differed significantly with regard to their weight and stone diameter.
2. Uneven yield and fruit weight in consecutive years probably resulted from the genetic differentiation caused by the production of planting material from seeds.
3. Fruits of the studied bushes contained the following organic acids: malic, α-ketoglutaric, aspartic, pyruvic, oxalic, citric, folic and

ascorbic. The latter prevailed (16.06 $\mu g \cdot mg^{-1}$ d.w.), followed by malic acid (13.34 $\mu g \cdot mg^{-1}$ d.w.).

4. In *Prunus tomentosa* fruits, the presence of glucose (65.54 $\mu g \cdot mg^{-1}$ d.w.), fructose (62.76 $\mu g \cdot mg^{-1}$ d.w.), saccharose (3.45 $\mu g \cdot mg^{-1}$ d.w.) as well as d-pinitol, d-chiro- and myo-inositol was found.
5. Climatic conditions of north-eastern Poland favour the planting of *Prunus tomentosa*.

REFERENCES

Czachowskij A.A., Szapiro D.K., Czekalskaja I.I., Boboreko E.Z., Pańko N.A. 1986. Perspktiwnyje płodowo-jagodnyje rastienija Bełorusi. Urodżaj, Mińsk, p. 200.

Górecki R., Piotrowicz-Cieślak A.I., Obendorf R.L. 1997. Soluble sugars and flatulence-producing oligosaccharides in maturing yellow lupin (*Lupinus luteus L.*) seeds. SEED SCI. RES. 7: 107-115.

Kawecki Z. 1997. Mniej znane perspektywiczne rośliny sadownicze i ich znaczenie. Zarządzanie Gospodarstwem Towarowym. CROW, Olsztyn, pp. 76-99.

Kawecki Z., Tomaszewska Z. 1999. Wstępna ocena krzewów i owoców wisienki kosmatej (*Prunus tomentosa Thunb.*) z rozmnażania generatywnego. ZESZ. PROB. POST. NAUK ROLN. 468: 329-334.

Pietrowa W.P. 1987. Diko rastuszczije płody i jagody. Lesn. Prom. Moskwa, pp. 277.

Radiuk A.F., Radiuk W.A. 1997. Wisznia wojłocznaja. In: Płodowo-jagodnyj sad. Urodżaj, Mińsk, pp. 129-134.

Sękowski B. 1993. Wisienki i czeremchy. In: Pomologia systematyczna. Cz. 1. PWN, Warszawa, pp. 248-252.