

EVALUATION OF THREE ASIAN PEAR CULTIVARS FOR CULTIVATION IN COMMERCIAL ORCHARDS

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A B S T R A C T

From 1999 to 2003, a trial was conducted of three Japanese cultivars of Asian pear (*Pyrus serotina* Rehder) in terms of growth, yield and fruit quality. The cultivars evaluated were 'Shinseiki', 'Chojuro', and 'Hosui'. 'Conference' (*P. communis* L.) was used as a reference cultivar. All cultivars were grafted on *Pyrus communis* var. *caucasica* Fed. seedling rootstock. In the spring of 1999, one-year-old trees were planted 4.0 x 2.5 meters apart in sandy, grey-brown, podsolic loam. 'Hosui' and 'Conference' were more vigorous than 'Chojuro' and 'Shinseiki' in terms of trunk cross-sectional area. The trees started bearing in 2000, the year after planting. In 2001, all of the Japanese cultivars had high yields, from 13.5 to 15.6 kg per tree, whereas 'Conference' yielded on 2.0 kg per tree. 'Chojuro' had the highest three-year cumulative yield, and 'Hosui' had the lowest, although 'Hosui' yielded far better than 'Conference'. The productivity index was calculated as the ratio of the three-year cumulative yield to the trunk cross-sectional area in 2003. 'Chojuro' and 'Shinseiki' had much higher productivity index than 'Hosui', although 'Hosui' had a much higher productivity index than 'Conference'. Only one or two pesticide treatments a year were needed to control aphids. 'Shinseiki', 'Chojuro', 'Hosui' seem to be promising cultivars for commercial cultivation in Poland.

Key words: *Pyrus serotina*, Nashi pears, cultivars, productivity, fruit quality, *Pyrus communis* var. *caucasica* rootstock

INTRODUCTION

Asian pears (*Pyrus bretschneideri* Redh., *P. serotina* Redh., *P. ussuriensis* Maxim) are grown mainly in China, Japan and Korea. Asian pears are the third most impor-

tant fruit crop in China, surpassed only by apples and oranges. Asian pears are also commercially grown in New Zealand, Chile and the United States, especially in California, Oregon and Washington. Asian pears are a profitable crop because of their

high-quality fruit (Larsen and Higgins, 1999; Li, 2002). In Canada, the demand for and the price of Asian pears have been rapidly increasing since the early 1980's because of the increasing Asian population. Asian pears have recently begun to be marketed to consumers who are not of Asian origin (Li, 2002). Europeans have little experience with the production of Asian pears. The European market for Asian pears is still in its infancy, though interest is growing (Kemp, 1994; Rusterholz and Husstein, 1988; Pitera and Odziemkowski, 2003).

In 1990, Japanese cultivars (*P. pyrifolia*) were evaluated in three regions of Hungary (Honty et al., 2003). The production of Japanese pears outside of Japan has been increasing (Kajiura, 1994). Japanese pears are cultivars of *Pyrus serotina* Rehder (*P. pyrifolia* Nakai). The chief cultivars of Japanese pear are: 'Kosui', 'Hosui', 'Nijisseiki' ('Twentieth Century'), 'Shinseiki', 'Chojuro', 'Shinsui', 'Shinko' and 'Nitaka' (Kajiura, 1994; Joublan et al., 1998; Larsen and Higgins, 1999). Unlike European pears like 'Bartlett' and 'Conference', Japanese pears are round and ripen on the tree. Japanese pears are firm, crisp, very juicy, and tend to have a russet skin (Kajiura, 1994).

MATERIAL AND METHODS

The trial was carried out from 1999 to 2003 at the experimental orchard of Warsaw Agricultural University in Warsaw-Ursynów. Three cultivars of Japanese pear were

evaluated: 'Shinseiki', 'Chojuro', and 'Hosui'. 'Conference' (*P. communis* L.) was used as a reference cultivar. All cultivars were grafted on *Pyrus communis* var. *caucasica* Fed. seedling rootstock. In the spring of 1999, one-year-old trees were planted 4.0 x 2.5 m apart in sandy, grey-brown, podsolic loam where pears had not been previously grown. The trees were planted in four replicates of three trees each. A .8 m wide strip along the rows was kept weed-free using unwoven fabric mulch, with mown sward in alleyways. Trees were trained with a central leader. Starting in 2001, fruits were thinned by hand, leaving only one or two fruits per spur. Trunk diameter was measured 30 cm above ground level and was used to calculate the trunk cross-sectional area. Data on blooming time were recorded every day. The yield per tree was recorded. The productivity index was calculated as the ratio of the three-year cumulative yield to the trunk cross-sectional area in 2003. Fruit quality was estimated by mean fruit weight, fruit diameter and skin color.

Results were elaborated by analysis of variance. The significance of differences between means was evaluated using the Newman-Keuls test.

RESULTS

'Hosui' and 'Conference' were more vigorous than 'Chojuro' and 'Shinseiki' in terms of trunk cross-sectional area. This difference could already be seen in 2001. By 2003,

the trunk cross-sectional areas of 'Hosui' and 'Conference' were about 30% more than the trunk cross-sectional areas of 'Chojuro' and 'Shinseiki' (Tab. 1).

The trees started bearing in 2000, the year after planting. In 2001, all of the Japanese cultivars had high yields, from 13.5 to 15.6 kg per tree, whereas 'Conference' yielded only 2.0 kg per tree. In 2002, 'Hosui' and 'Shinseiki' had lower yields than in 2001. 'Shinseiki' was ready for harvest about one week earlier than 'Chojuro' and 'Hosui' (Tab. 1).

'Chojuro' had the highest three-year cumulative yield, and 'Hosui' had the lowest, although 'Hosui' yielded far better than 'Conference'. The productivity index was calculated as the ratio of the three-year cumulative yield to the trunk cross-sectional area in 2003. 'Chojuro' and 'Shinseiki' had much higher productivity index than 'Hosui', although 'Hosui' had a much higher productivity index than 'Conference' (Tab. 2).

Fruit thinning increased fruit size. All three cultivars tested had more than 84% of their fruits larger than seven centimeters in diameter. In 2002 and 2003, fruit weight was more uniform in 'Chojuro' than in 'Hosui' and 'Shinseiki' (Tab. 3).

Only one or two pesticide treatments a year were needed to control aphids. No fungicides were applied at any time during the five-year trial period. No symptoms of scab were ever observed. Young shoots of 'Shinseiki' were only slightly infected with apple powdery mildew (*Podos-*

phaera leucotricha (Ell. & Evherh.) Salm.).

DISCUSSION

On *P. communis* var. *caucasica* rootstock, 'Hosui' was much more vigorous than 'Shinseiki' and 'Chojuro'. This agrees with the findings reported by Olcott (1991), who ranked 'Hosui' as large, and 'Shinseiki' and 'Chojuro' as medium. Most Japanese pear cultivars are dwarfed about 50% on *P. communis* rootstock, so California growers and nurseries prefer *P. betulifolia* for its vigor, large fruit and tolerance to wet soils (Beutel, 1990).

The three cultivars evaluated bloomed either at the same time as 'Conference', or at most a day or two earlier (Tab. 1). This means that the risk of spring frost damage is not very high. The Japanese cultivars which bloom the latest are 'Shinko', 'Kosui' and 'Ishiiwase'. Chinese cultivars, such as 'Ya Li', 'Tsu Li', 'Seuri' and 'Ar-ri-rang', bloom very early, and cannot be safely grown where spring frost is a problem (Olcott, 1991).

In our trial, the Japanese cultivars on *P. communis* var. *caucasica* rootstock consistently yielded better than in other trials reported in the literature, such as a Swiss trial using Quince MA rootstock (Rusterholz and Husistein, 1988), and a Dutch trial using *P. betulifolia* rootstock (Kemp, 1994). Quince MA is not a good rootstock for Asian pears (Rusterholz and Husistein, 1988).

Table 1. Growth, blossom time, and harvest time of Japanese pear cultivars

Cultivar	Trunk cross-sectional area [cm ²]				Blossom time			Harvest time
	2000	2001	2002	2003	2001	2002	2003	2001-2003
'Shinseiki'	7.0 a	10.6 a	17.8 a	23.0 a	April 29 to May 7	April 18 to April 28	April 25 to May 3	Aug. 26 to Sept. 19
'Chojuro'	6.2 a	11.1 a	17.4 a	23.8 a	May 1 to May 7	April 19 to April 29	April 25 to May 3	Sept. 3 to Sept. 26
'Hosui'	9.1 a	16.3 b	26.9 b	34.7 b	April 30 to May 6	April 19 to April 28	April 26 to May 3	Sept. 3 to Sept. 26
'Conference'	6.8 a	15.5 b	26.1 b	36.7 b	May 1 to May 6	April 20 to April 29	April 27 to May 4	Sept. 16 to Sept. 26

*Means within a column followed by the same letter do not differ significantly at P = 0.05

Table 2. Yield and productivity index of Japanese pear cultivars

Cultivar	Yield [kg tree ⁻¹]					Productivity index [kg cm ⁻² tree ⁻¹]
	2000	2001	2002	2003	cumulative 2000-2003	
'Shinseiki'	0.8 a	14.7 b	8.0 a	23.0 b	46.4 b	2.0 cb
'Chojuro'	1.8 b	13.5 b	16.0 b	18.8 b	50.1 b	2.1 c
'Hosui'	0.2 a	15.6 b	9.4 ab	13.9 ab	39.2 b	1.1 b
'Conference'	0.2 a	2.0 a	13.8 ab	6.6 a	22.6 a	0.6 a

*For explanation, see Table 1

Table 3. Fruit quality of Japanese pear cultivars

Cultivar	Mean fruit weight [g]				Skin color	Percentage of fruits greater than 7 cm in diameter (mean for 2001-2003)
	2001	2002	2003	mean for 2001-2003		
'Shinseiki'	168 a	233 ab	199 b	200 b	yellowish green	84
'Chojuro'	194 b	209 a	202 b	202 b	russeted brown	91
'Hosui'	191 b	244 b	188 b	208 b	russeted brown	85
'Conference'	177 a	209 a	123 b	170 a	russeted green	–

*For explanation, see Table 1

After hand thinning, 'Shinseiki' 'Chojuro' and 'Hosui' bore large fruits. The three-year mean fruit weights of all three cultivars were

about the same, and were higher than the three-year mean fruit weight of 'Conference'. In our trial, the trees were still very young. In Asian pears

on *P. communis* rootstock, mean fruit weight was reported to decrease as the trees got older (Rusterholz and Husistein, 1988).

'Shinseiki', 'Chojuro', 'Hosui' seem to be promising cultivars for commercial cultivation in Poland, though more trials are needed. In Hungary, eight Japanese pear cultivars were evaluated: 'Chojuro', 'Hosui', 'Ishiiwase', 'Kikusui', 'Kosui', 'Nijisseiki', 'Shinko' and 'Yakumo'. Only two of them, 'Hosui' and 'Nijisseiki', were selected for registration (Honty et al., 2003).

In central Poland, production of Asian pears is inexpensive, because they need only a few applications of chemicals a year to control pests and diseases. The development of the production of Asian pears in Poland will depend on market demand.

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PRZYDATNOŚĆ TRZECH ODMIAN GRUSZY AZJATYCKIEJ DO UPRAWY W SADACH TOWAROWYCH

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S T R E S Z C Z E N I E

W latach 2000-2003 oceniano wzrost, plonowanie i jakość owoców trzech odmian gruszy azjatyckiej (*Pyrus serotina* Rehder): 'Shinseiki', 'Chojuro' i 'Hosui'. 'Konferencja' (*P. communis* L.) była użyta jako odmiana kontrolna. Wiosną 1999 r. drzewa na siewkach gruszy kaukaskiej (*Pyrus communis* var. *caucasica* Fed.) posadzono w rozstawie $4 \times 2,5$ m, na glebie brunatnej, wytworzonej z gliny średniej pylastej, zalegającej na glinie ciężkiej. Wzrost drzew, oceniany na podstawie pola powierzchni przekroju pnia (PPPP), u odmian: 'Chojuro' i 'Shinseiki', od trzeciego roku po posadzeniu, był istotnie słabszy niż u 'Hosui' i odmiany 'Konferencja'. Grusze azjatyckie rozpoczęły owocowanie już w drugim roku po posadzeniu (2000) wydając niewielki plon. W trzecim roku plonowanie trzech odmian japońskich było wysokie (od 13,5 do 15,5 kg drzewo⁻¹) w porównaniu do 2,0 kg drzewo⁻¹ u odmiany 'Konferencja'. W latach 2000-2003 sumaryczny plon wyrażony w kg drzewo⁻¹ odmiany 'Chojuro' i 'Shinseiki' nie różnił się istotnie od 'Hosui', pomimo że u tej ostatniej odmiany był niższy o około 19%. Wartość wskaźnika plenności, obliczonego jako stosunek sumarycznego plonu za lata 2000-2003 do pola powierzchni przekroju pnia z jesieni 2003 r., była istotnie wyższa dla odmiany 'Chojuro' (2,1 kg cm⁻²) i 'Shinseiki' (2,0 kg cm⁻²) niż u 'Hosui' (1,1 kg cm⁻²) i odmiany 'Konferencja' (6 kg cm⁻²). Rocznie wykonywano jeden lub dwa zabiegi pestycydami w celu zwalczania mszyc. Na podstawie wstępnych badań wydaje się, że trzy oceniane odmiany japońskie są obiecujące do uprawy w sadach towarowych.

Słowa kluczowe: *Pyrus serotina*, grusze japońskie, odmiany, plenność, jakość owoców, grusza kaukaska (*Pyrus communis* var. *caucasica*)