International Journal of Horticultural Science 2011, 17 (1–2): 13–16.
Agroinform Publishing House, Budapest, Printed in Hungary
ISSN 1585-0404

New sweet cherry cultivars in intensive plantings

Szabó, Z.[1], Farkas, E.[2], Soltész, M.[3], Fieszl, Cs.[1], Balázs, G.[1], Nyéki, J.[1]

[1]University of Debrecen Centre for Agricultural and Applied Economic Sciences, H-4032 Debrecen, Böszörményi út 138., Hungary, E-mail: zszabo@agr.unideb.hu
[2]Alma 2000 Ltd., 8911 Nagykutas, Almasétány 1., Hungary
[3]Collage of Kecskemét, Faculty of Horticulture, H-6000 Kecskemét, Erdei Ferenc tér 1–3.

Summary: The study took place in the largest sweet cherry plantation in West Hungary. The purpose has been the identification of those varieties, which will be suitable for intense cultivation, early fruiting and excellent fruit quality, moreover, the selection of the optimal phyto-technical procedures. At the same time, scion-rootstock combinations have been tested also from the point of view of growing intensity and fruiting in high-density plantation. The dense planting is induced to start fruiting early and yield regularly by special methods. Yielding was stimulated by maintaining the balance of vegetative-generative growth by binding the shoots, by summer pruning, by cuts on the trunk and root pruning. Best experiences have been found in yield and quality in the following varieties: Canada Giant, Carmen, Firm Red, Giant Red, Katalin, Kordia, Regina. Dense planting has been feasible also on vigorous rootstock, like *P. mahaleb.* Dwarfing rootstocks like P-HL-A, Gisela 6, accelerate the formation of flower buds and yielding earlier with fruits of adequate size. 'Firm Red' and 'Giant Red' excelled with their large fruit (>27 mm diameter) in all combinations, thus being promising under Hungarian conditions.

Keywords: cherry, variety, rootstock, training system, pruning

Introduction

In developed countries, the intensity of fruit growing practices grew significantly during the last 2–3 decennia. In countries, where land and man power are expensive, the high density plantations are preferred.

In Italy, growing systems applied are highly variable as presented by *Lugli & Musacchi* (2009). Climatic conditions and marketing require in other countries special growing constructions for fruit plantations. Conditions and possibilities are summarised for a high tunnel cherry production system by *Lang* (2009).

In Hungary, Soltész et al. (2000) surveyed the possible growing systems applied in fruit growing. A comprehensive study of the possible cherry growing systems is available since *Hrotkó* et al. (2008), who dealt also with the training of young trees. *Gonda* et al. (2007) developed the crown forms and the respective pruning systems for the new Hungarian cherry varieties recommended in high density plantations.

The volume of cherry grown in Hungary declined during the last two decennia by 40–50%. At the moment, plantations of 2000 ha produce yearly 10 000 tons of cherries. Home consumption and export possibilities justify the establishment of new cherry plantings. The economics as well as adequate fruit quality of cherry production is bound exclusively to the intense high density planting systems. The purpose of the present study is to find the right sweet cherry varieties, which are productive and promise excellent quality, and at the same time we endeavour to develop the variety specific growing technologies.

Materials and methods

The plantation examined is in the Western Hungarian commune, Nagykutas, 230 m above sea level. Meteorological data are: yearly mean temperature: 101°C, precipitation 693 mm, number of sunny hours 1927.

The brown forest soil has a favourable water husbandry, and keeps well soil humidity being sandy loam with low acidity. Pruning was performed twice, in the winter and after harvest.

The date of the commercial plantations were 1999 and 2003, on *P.mahaleb* seedling, the planting design was 3.5×1.0 and 4 × 1.1 m, the trees were trained to slender spindle. The commercial yield of the plantation amounted 2–3 t/ha in the 3rd year already and attained the maximum with the 7th year. Occasionally, 20 t/ha yields occurred. The experiment for testing rootstocks was planted is 2006, using *P. mahaleb,* P-HL-A, Gisela 6, Ma×Ma 14, planted to 3.5×1.0 m distance with Giant Red, Firm Red varieties. Properties as tree size, blooming date, flower density, fruit load, yield, fruit quality have been registered.

Results and discussion

Evaluation of the varieties

In Hungary, the leading sweet cherry varieties are: Germersdorfi óriás, Bigarreau Burlat, Katalin, Van and Linda. In recent plantations appear some new Hungarian

(Carmen and Vera) and foreign (Sweet Heart, Firm Red and Giant Red) varieties.

Varieties supposed to become important in Hungary are tested under conditions of intense technologies. Their phenological phases of bloom and harvest periods, yields and fruit characteristics are registered.

Regarding the date of blooming periods, the differences between varieties did not surpass a 3–4 days' period, the times of blooming largely overlapped each other in the assortment. As a rare exception, in 2008, weather conditions prolonged the beginning of bloom up to 13 days. The blooming period lasted 5–16 days. During the next three years, the start of bloom between the earliest and latest blooming varieties occurred within 5 days. The blooming period lasted more than 10 days in the earliest starting varieties as a consequence of the cool spring of 2008. In the following seasons, the blooming periods of varieties were medium long and differed less from each other. In 2010, the cool and wet weather lengthened the blooming period to 14–20 days *(Table 1).*

Dates of ripening varied yearly between the seasons along a period of 10–15 days, and also the sequence of varieties might change. In *Figure 1,* overage data of ripening are shown. From the point of view of the market, varieties producing fruits with a diameter more than 28 mm are considered to be of interest. Among the traditional varieties, Canada Giant, Katalin and Regina are suitable, among the new ones Firm Red and Giant Red *(Table 2).* Except Canada Giant, the content of soluble solids in the fruit was high enough.

Evaluation of the rootstocks

In Hungary, *Prunus mahaleb* as a rootstock for cherry trees is generally utilised. Grafts are made on *P. mahaleb* at a rate of 80–90% as well as in the plantation examined. The way to moderate growing vigour is relied essentially to root pruning.

Growing intensity of Firm Red and Giant Red varieties was similar on the four different rootstocks examined. Nevertheless, most vigour was observed on grafts using *P. mahaleb* and on MaxMa 14, whereas the lowest size was experienced on Gisela 6 rootstocks *(Table 3).* Those trees needed a supporting system, absolutely.

Rootstocks are decisive in determining the date of bloom as well as the intensity of blooming *(Table 4).* Higher vigour is combined with later bloom and lower flower density especially in the first fruiting year.

The early and intense flower production of trees grafted to Gisela 6 was outstanding. As a result, fruiting began earlier on those trees, consequently fruit thinning is soon actual. In 2010, flower density was mediocre, all the same, fruit set was poor on the trees grafted on *P. mahaleb.*

The mean diameter of fruits was larger than 27 mm in all combinations. Largest fruits were harvested in the first year of the experiment (2008). In Giant Red, more than 30 mm, in Firm Red, more than 28 mm diameters are measured *(Table 5).* In the content of soluble solids, no significant differences are produced by the rootstocks, on the contrary, seasonal effects were distinct.

Table 1: Blooming dates of sweet cherry varieties at Nagykutas (2008–2011)

Variety	2008		2009		2010		2011	
	Start of bloom	Length of blooming period (days)	Start of bloom	Length of blooming period (days))	Start of bloom	Length of blooming period (days))	Start of bloom	Length of blooming period (days))
Aida	April 06	8	April 08.	14	April 07.	16	April 07.	7
Alex	April 05.	10	April 08.	13	April 07.	18	April 09.	8
Canada Giant	April 03.	10	April 10.	12	April 08.	18	April 10.	10
Carmen	April 09.	10	April 09.	14	April 07.	17	April 09.	10
Celeste	March 31	10	April 08.	9	–	–	–	–
Chelan	March 29	16	April 09.	11	–	–	–	–
Cristalina	April 04	9	April 09.	12	April 08.	15	April 05.	9
Ferrovia	April 05.	9	April 09.	8	–	–	–	–
Firm Red *	April 05.	15	April 08.	14	April 09.	15	April 06,	10
Germesdorfi 3	April 03.	16	April 09.	12	April 09.	18	April 09.	9
Giant Red *	April 05.	12	April 09.	13	April 08.	15	April 08,	9
Katalin	April 01.	16	April 08.	14	–	–	–	–
Kordia	April 03.	10	April 08.	11	April 09.	14	April 07.	12
Krupnoplodnaja	April 11.	8	April 09.	13	April 09.	20	April 10.	8
Lambert	April 08.	8	April 08.	13	April 08.	17	April 07.	9
Linda	April 09.	10	April 08.	12	April 08.	15	–	–

*Remark: Firm Red and Giant Red are grafted ont Maxma 14 rootstocks, whereas the rest is grown on *P. mahaleb* seedling roots

Table 2: Diameter, weigth and soluble solids content of cherry fruits (Nagykutas, 2008–2011)

Variety	2008		2009			2010			2011		
	Diameter (mm)	Mass of fruits (g)	Diameter of fruits (mm)	Mass of fruits (g)	Soluble solids content (%)	Diameter of fruits (mm)	Mass of fruits (g)	Soluble solids content (%)	Diameter of fruits (mm)	Mass of fruits (g)	Soluble solids content (%)
Aida	21,5	5,9	24,1	6,8	16,3	24,5	7,8	13,9	25,2	7,9	17,2
Alex	–	–	24,9	8,1	19,6	23	6,9	14,9	–	–	–
Canada Giant	27,4	9,4	26,2	9,5	13,8	26,2	8,2	13,3	27,7	11,1	14,0
Carmen	30,9	14,6	25,2	8,5	12,7	26,1	9,5	12,7	–	–	–
Celeste	28,3	9,9	25,2	6,8	12,2	–	–	–	–	–	–
Chelan	23,1	6,8	23,7	7,5	13,7	–	–	–	–	–	–
Cristalina	27	9,3	–	–	–	25,3	7,8	17,9	26,1	9,8	13,8
Ferrovia	28	10,4	23,9	7,8	14,2	–	–	–	–	–	–
Firm Red *	28,1	9,5	28,2	9,4	17,3	28,2	9,1	17	30,7	11,7	16,8
Germesdorfi 3	–	–	25	8,7	15,5	26,3	8,7	13,5	26,6	9,2	12,7
Giant Red *	30,3	12,8	28,1	9,4	18,9	27,1	10	17,1	31,4	13,7	17,1
Katalin	26,2	10,4	27,1	9,9	19,8	27	10,2	18,6	–	–	–
Kordia	24,6	8,3	–	–	–	26,9	10	16,7	–	–	–
Krupnoplodnaja	24,3	7	23,6	7,5	17,9	23,7	7,3	15,1	27,0	9,8	16,9
Lambert	27,2	9,7	30,4	11,9	14,6	25,4	8,8	16,6	28,8	11,4	15,9
Linda	23,7	7,2	23,5	6,8	16,3	25,7	9,2	17,9	27,4	10,4	15,1
Regina	26,7	10,5	28,6	12,5	16,4	27,8	11,3	17,8	31,3	15,0	18,5
Sandra Rose	30,4	11,4	26,3	9,4	18,2	–	–	–	–	–	–
Santina	22,8	6,5	25,1	9	16,3	25,2	7,9	14,9	24,9	7,6	16,9
Skeena	26,2	9,1	24,7	8,7	–	26,3	9,7	16,3	–	–	–
Sunburst	26,9	9,2	27,2	10,8	16,2	–	–	–	–	–	–
Sweet Early	–	–	26,9	9,7	–	24,4	7,8	11,5	–	–	–
Sweet Heart	–	–	–	–	16,7	23,4	7,8	15,3	–	–	–
Sympfony	23,1	6,9	23,9	7,8	14,2	–	–	–	–	–	–
Techlovan	29,5	14,4	25,7	9	11,9	–	–	–	–	–	–
Vera	26,2	8,8	25	8	13,7	27,4	9,7	12,5	27,7	10,4	19,2

*Remark: Firm Red and Giant Red are grafted ont Maxma 14 rootstocks, whereas the rest is grown on *P. mahaleb* seedling roots

Table 3: Three size of sweet cherry trees grown on different rootstocks (Nagykutas, 2010)

Rootstock	Giant Red				Firm Red			
	Girth of the trunk (cm)	Height of the tree (m)	Diameter of the crown (m)		Girth of the trunk (cm)	Height of the tree (m)	Diameter of the crown (m)	
			At the row length	Perpendicularly to the row			At the row length	Perpendicularly to the row
P. mahaleb	22.4	2.7	2.0	1.7	25.3	3.1	2.0	2.0
Maxma 14	24.6	3.0	1.6	1.7	24.5	3.1	2.0	1.6
P-HL-A	23.6	3.1	1.8	1.5	22.4	3.1	1.9	1.6
Gisela 6	21.0	2.9	1.5	1.7	18.7	2.8	1.6	1.5

Table 4: Beginning of bloom and flower density of sweet cherry varieties (Nagykutas, 2008–2011)

Rootstock	Giant Red								Firm Red							
	2008		2009		2010		2011		2008		2009		2010		2011	
	Start of bloom	Flower density (0–5)	Start of bloom	Flower density (0–5)	Start of bloom	Flower density (0–5)	Start of bloom	Flower density (0–5)	Start of bloom	Flower density (0–5)	Start of bloom	Flower density (0–5)	Start of bloom	Flower density (0–5)	Start of bloom	Flower density (0–5)
P. mahaleb	April 5.	2	April 09.	2,4	April 08.	3,4	April 07.	2,8	April 5.	2	April 08.	2,7	April 09.	4,1	April 07.	3,2
Maxma 14	April 8.	2	April 08.	2	April 07.	3,7	April 08.	2,6	April 6.	2	April 08.	2,2	April 07.	4,3	April 06.	3,7
P-HL-A	April 4.	3	April 08.	2,9	April 08.	4,5	April 06.	2,8	April 5.	3	April 08.	2,7	April 08.	3,9	April 06.	3,4
Gisela 6	April 3.	5	April 08.	4,3	April 07.	3,5	April 07.	4	April 2.	5	April 09.	4,3	April 07.	4,2	April 07.	4,1

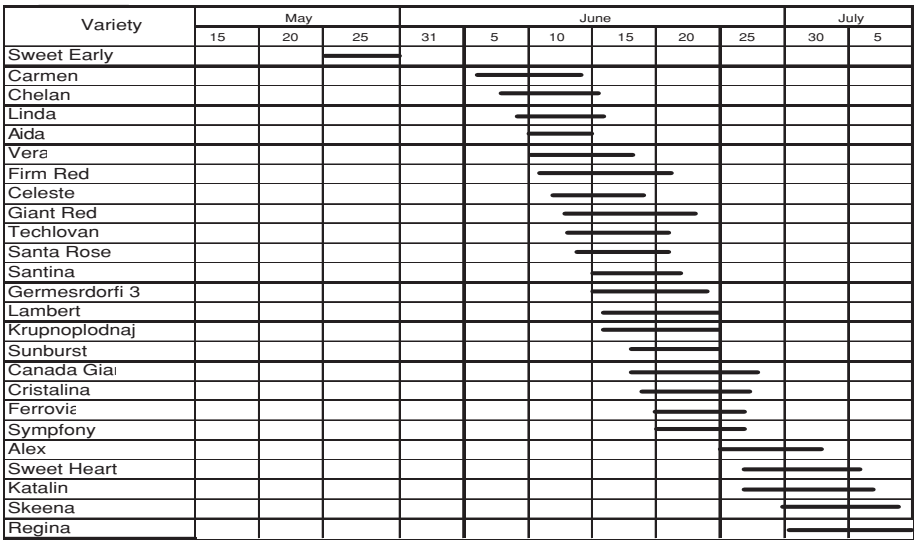

Figure 1: Maturity chart

Conclusion

Adaptation to novel marketing possibilities suggests an extension of super intensive growing practices. For that purpose, varieties with large fruit size and early fruiting are needed.

Dense planting has been feasible also on vigorous rootstock, like *P. mahaleb.* Dwarfing rootstocks like P-HL-A, Gizela 6, accelerate the formation of flower buds and yielding earlier with fruits of adequate size. 'Firm Red' and 'Giant Red' excelled with their large fruit (>27 mm diameter) in all combinations, thus being promising under Hungarian conditions.

Table 5: Fruit quality of sweet cherry trees grown on different rootstocks (Nagykutas, 2008–2011)

Rootstock		Giant Red			Firm Red		
		diameter (mm)	mass (g)	content of soluble solids (%)	diameter (mm)	mass (g)	content of soluble solids (%)
P. mahaleb	2008	30,3	12,8	16,6	28,1	9,5	14,1
	2009	27,7	10,4	18,2	28,2	9,4	17,3
	2010	–	–	–	–	–	–
	2011	27,9	10,2	16,9	30,5	11,8	16,2
Maxma 14	2008	30,3	12,5	18,7	28,2	9,5	15,5
	2009	27,6	10,4	18,1	27,8	9,3	17,1
	2010	27,1	10	16,2	28,2	9,1	17,1
	2011	29,7	13,0	17,6	30,7	11,7	16,8
P-HL-A	2008	31,3	13,7	19,7	29,9	10,9	16,6
	2009	27,7	10,4	17,5	27,9	9,4	17
	2010	28,4	10,3	16,8	28,1	9,3	17,2
	2011	31,4	13,7	17,1	31,2	12,6	17,4
Gisela 6	2008	30,6	12,7	17,8	28,4	9,8	14,8
	2009	28,4	10,9	18,6	28,8	9,4	17,3
	2010	29	10	17,2	27,4	10,1	17
	2011	29,2	11,6	17,4	32,2	13,6	16,9

Aknowledgement

Research was sponsored by NFÜ (project number: TECH_08-A3/2-2008-0373)

References

Gonda, I., Király, K. & Holb, I. (2007): Examination of growth of cherry cultivars adapted to intensive production. Acta Horticulturae, 732: 429–434.

Hrotko, K., Magyar, L., Gyeviki, M. & Simon, G. (2008): Sistemi di allevamento e potatura per impianti ad alta densitá: le esperienze dell' Ungheria. Frutticoltura 70 (3): 10–18.

Lang, G. A. & Meland, M. (2009): High tunnel production systems for the late season sweet cherry market. 6th International Cherry symposium. November 15–19. Renoca-Vina del Mar, Chile. Abstract Book 18.

Lugli, S. & Musacchi, S. (2009): L'evoluzione delle forme di allevamento nella cerasicolture specializzata. Convegno „Il ciliego ad alta densita': il futuro a portata di mano", Ferrara 5 Giugno

Soltész, M., Szabó, Z. & Nyéki, J. (2000): Training systems of fruit trees in Hungary. International Journal of Horticultural Science 6, (1): 123–127.