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Estimation of plum and prune cultivars with morphogenetical traits

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Summary: The author post few years organizes the plum breeding program. He uses up earlier elaborated morphogenetic and productive characteristics and traits, already on such basis their selected 21 cultivars in the pomological garden at Cegléd. The Hungarian plum assortment and offer very specific and tight, thus that they endeavor, that the selection before then flare. There are indicating already only the perspective cultivars in present paper on basis of gathered data one decade underneath. Paralleling control was three type of used (Besztercei szilva Bt. 2, Green gage and Stanley). 12-sort trait according to were compared the cultivars. The productivity-biological standpoints without, the open pollination and pollen germination, over and above that the ripening on date big differences appear. The near future the 'C. 1501' (Yellow Besztercei), 'Ontario' and 'Mirabelle de Nancy' (yellow plums), the yes untimely 'Precoce di Guigno' (red plum), the very well abundant 'C. 940' and Victoria (lilac plums), over and above that 'Beregi datolya', 'Révfülöpi' and 'Szarvasi' (blue plums) cultivars setup suggest. The demonstrated cultivars out of further give for deputize value the Precoce di Giugno, as earliest ripening and the 'Beregi datolya' but the at the latest ripening.

Key words: plum breeding, sweet cherry, sour cherry

Introduction

The Hungarian plum breeding speeded program is making for repeat of cultivars pattern (*Surányi,* 2004a, 2004b, 2006*; Erdős & Surányi,* 2004), namely new and valuable varieties required helping for the plum growing. The Myrobalan C. 174 rootstock outstanding, because favorably operated the five cultivars ('Bluefre', 'Montfort', 'Stanley', 'Tuleu gras' and 'Tuleu timpuriu') productivity and on them the esquire cultivar somewhat infect the sharka virus (*Erdős & Surányi,* 1992, 1994; *Surányi & Erdős,* 1992; *Surányi,* 1996c).

The method parts of the program the followings:

- Choice of non-blue plum and prune cultivars in gene bank orchard (positive selection)
- Next introducing observations (for example Italian, German, English, American and French cvs)
- Investigations ripening and fruit form differences in hybrids
- Choice of sharka tolerant and resistant clone cultivars and forms at Cegléd (So far 360 clone of found virus less.)
- Finding out of new cultivars and forms in Hungarian county (Upper Tisza Valley, Tisza-hole and Somogy County) (*Surányi, 2004b*)
- Individual selection from seedlings of self-fertile and open pollinated seeds (*Tóth,* et al., 2005)
- Separation of breeding program for both European and Asian plums

Stranger experiences (English, French, German, Lombard) confirm the selection and especially the importance of individual selection (*Blažek & Karešová,* 1998; *Renaud & Lafargue,* 1998), connecting the cross breeding (*Jacob,* 2002, 2004; *Jänes & Pae, 2002*; *Hartmann,* 2004) and exploit the matter-of-course individuals diversity possibilities.

In our study (*Surányi,* 2005; *Tóth* et al., 2005) were value mostly same cultivars, but other way and duration according to. These plums mentioned study already short description also. The sharka sensibility of the European plums and prunes raiser countries at the moment the uppermost question, this way elude the most various refining statements, papers also (*Dragolski* et al., 2002, 2004*; Djuouvinov* et al., 2004; *Hartmann,* 1998a, 1998b, 2004; *Minev & Balev,* 2002; *Ogašanović* et al., 2004; *Turcu, I. & M. Botu,* 1998; *Zhivondov & Djouvinov,* 2002; *Racskó* et al., 2004).

The scouted plum collections thus the I. cadence field under circumstances visual scanned, then succeeds the II. and III. cadences the ELISA-test and PCR-trials are close the selection. We investigated the sharka sensibility to plums already earlier employ partly methodology (*Surányi,* 1996a; *Polak,* 2004), partly selection (*Surányi,* 1996b; *Renaud & Lafergue,* 1998; *Neumüller* et al., 2004).

The cross-breeding its costs reduced , that the late started program, for example the X- radiated mutant already not predicated, since by him perspective cultivars can not have generate (*Cociu* et al., 1996). Later starts value the cv. Jojo

Table 1 Fertility and flower morphological traits of plum cultivars (1992–2001)

Cultivar	Open pollination %	Peduncle length mm	Pistil length mm	Stamen number no.	Relative stamen number no./mm	Pollen germination %
Ageni 707	32.2	8.5	11.5	26.7	2.28	48.1
Beregi datolya	10.9	8.1	12.0	20.8	1.78	32.9
Besztercei Bt. 2	31.8	14.8	13.5	21.4	1.57	60.2
Besztercei muskotály	35.2	14.8	14.0	20.2	1.40	49.1
C. 940	42.3	15.0	12.3	25.8	2.11	50.0
C. 1501	21.0	12.7	12.9	26.8	2.06	36.2
Californian Blue	30.6	9.0	9.3	29.3	3.18	72.2
CT. 83	43.7	11.5	8.9	23.5	2.64	64.8
Green Gage	26.7	11.1	9.5	24.5	2.58	51.0
Sz. 9/21	33.1	17.1	12.0	28.9	2.40	63.2
Korai Besztercei Cs. 2	12.5	18.4	13.1	21.3	1.63	49.1
Lengyel szilva	26.5	14.1	12.8	22.3	1.81	59.3
Mirabelle de Nancy	44.4	9.4	10.8	25.6	2.35	52.2
Oneida	31.3	9.3	11.0	30.1	2.74	49.0
Ontario	32.0	9.2	10.7	27.0	2.54	64.4
Opal	30.9	7.4	11.4	30.5	2.52	57.2
Precoce di Giugno	28.1	9.6	10.8	27.4	2.58	38.9
Révfülöpi	27.4	11.7	11.9	26.8	2.20	51.0
Stanley	38.9	13.4	11.1	29.9	2.52	62.2
Szakarka	34.4	13.1	12.6	27.7	2.15	78.1
Szarvasi	29.2	11.5	12.4	28.3	2.30	49.3
Valor	28.8	10.8	11.3	27.2	2.38	51.4
Victoria	36.7	10.2	13.2	26.4	2.01	63.8
Yakima	16.9	10.3	11.8	26.7	2.29	44.0
L.S.D. 5 %	17.86	1.09	1.18	2.85	0.42	6.99

* average of 1993–1996–1997–1999 years

plum (*Hartmann,* 1998b, 2004), other western and southeast-European plums on without.

The recent refining plans but that's why not deals, since the traditional treatments possibilities still greater and in addition at a cheaper cost also s during that nor we know that, that what size the transgenic individuals gene stableness. Present study the earlier elaborated methodology used that already circumstantially under the non-domestica plums ratings described and used (*Surányi & Erdős,* 2004; *Surányi,* 2005).

Table 2 Stability of the flower morphogenetical traits

Year	Open pollination %	Peduncle length mm	Pistil length mm	Stamen number no.	Relative stamen number no./mm	Pollen germination %
1992.	–	10.9	12.4	25.5	2.06	58.1
1993.	32.0	12.1	12.7	25.2	1.98	62.0
1994.	–	11.1	12.0	25.9	2.16	52.2
1995.	–	11.7	12.3	26.3	2.14	54.3
1996.	20.9	10.5	11.1	25.6	2.31	46.1
1997.	35.5	11.6	12.0	25.6	2.13	49.7
1998.	–	10.6	10.2	27.9	2.74	44.0
1999.	32.9	11.3	11.2	26.6	2.38	46.2
2000.	–	11.2	10.9	28.8	2.64	43.9
2001.	–	12.0	12.3	25.0	2.07	53.7
L.S.D. 5 %	22.35	0.91	1.07	2.34	0.32	4.56

Table 3 Some production biological traits of plum cultivars (1988–1996)

Cultivar	Main blossom date	Ripening date	Fruit development duration days	Crop kg/fa	Average fruit mass g	Fruit peduncle length mm
Agen 707	12.04	07.09.	250	44.0	24.1	26.4
Beregi datolya	23.04.	18.09.	261	40.2	26.0	27.0
Besztercei Bt. 2	20.04.	12.09.	255	59.7	20.3	24.9
Besztercei muskotály	18.04.	10.09.	253	55.1	19.0	25.2
C. 940	10.04.	13.08.	225	63.9	26.5	24.7
C. 1501	17.04.	26.08.	238	37.4	34.7	25.8
Californian Blue	10.04.	20.08.	232	41.0	26.5	24.6
CT. 83	07.04.	26.08.	238	44.2	17.8	21.3
Green Gage	15.04.	21.08.	233	40.6	26.9	25.6
Sz. 9/21	17.04.	31.08.	243	57.7	30.2	24.7
Korai Besztercei Cs. 2	13.04.	25.08.	237	51.0	19.4	21.4
Lengyel szilva	14.04.	27.08.	239	41.3	21.1	26.0
Mirabelle de Nancy	16.04.	20.08.	232	60.3	22.2	28.5
Oneida	16.04.	21.08.	233	48.0	27.6	18.9
Ontario	09.04.	19.08.	231	62.1	31.0	23.0
Opal	13.04.	20.08.	232	51.2	28.9	23.8
Precoce di Giugno	08.04.	09.07.	190	59.7	27.5	25.1
Rèvfülöpi	14.04.	30.08.	242	46.6	20.3	25.4
Stanley	17.04.	30.08.	242	63.8	29.5	24.2
Szakarka	22.04.	27.08.	239	48.7	22.5	26.0
Szarvasi	14.04.	24.08.	236	45.0	21.8	25.5
Valor	15.04.	31.08.	243	47.2	34.3	24.9
Victoria	19.04.	01.09.	244	50.0	28.7	25.7
Yakima	17.04.	28.08.	237	41.4	28.0	27.5
L.S.D. 5 %	3.82	3.10	3.55	9.35	4.14	4.27

Materials and methods

The Hungarian plum growing and refining sorely obstruct the sharka contaminated the plantations. Our flower biological and taxonomical investments the valuable gene matter of Cegléd blocking after (*Tóth* et al., 1988; *Surányi & Erdős,* 1992; *Surányi,* 2004), sure morphogenetic traits also estimated the cultivars.

1980–1982 between Myrobalan B seedlings inoculated plum scions planted. The 24 cultivars 3–3 tree investigated. 1992–2001 between yearly 50–50 flower gathered, microscope underneath measured the flower and fruit peduncle length and pistil length; still were counting the functionally (pollen producing) stamens (*Surányi,* 1970, 1976).

There were observations 3–3 samples of each cultivar in 20 % of saccharose drops, with 24 hours incubation (and in

Table 4 A stability of the production biological traits

Year	Main blossom date days	Ripening date	Fruit development duration	Crop kg/fa	Average fruit mass g	Fruit peduncle length mm
1988	102.7	235.5	132.8	55.5	26.0	26.8
1989	106.1	234.3	128.2	50.3	25.3	25.9
1990	104.4	237.2	132.8	51.9	24.8	26.6
1991	103.5	236.0	132.5	49.2	30.2	27.1
1992	102.9	239.0	136.1	48.5	29.6	26.8
1993	99.8	230.1	130.3	56.7	25.7	26.2
1994	96.2	228.9	132.7	59.1	24.3	27.1
1995	104.6	236.4	131.8	50.1	26.8	25.9
1996	109.3	240.0	130.7	49.6	29.5	26.7
L.S.D. 5 %	3.54	3.34	–	7.95	3.98	4.67

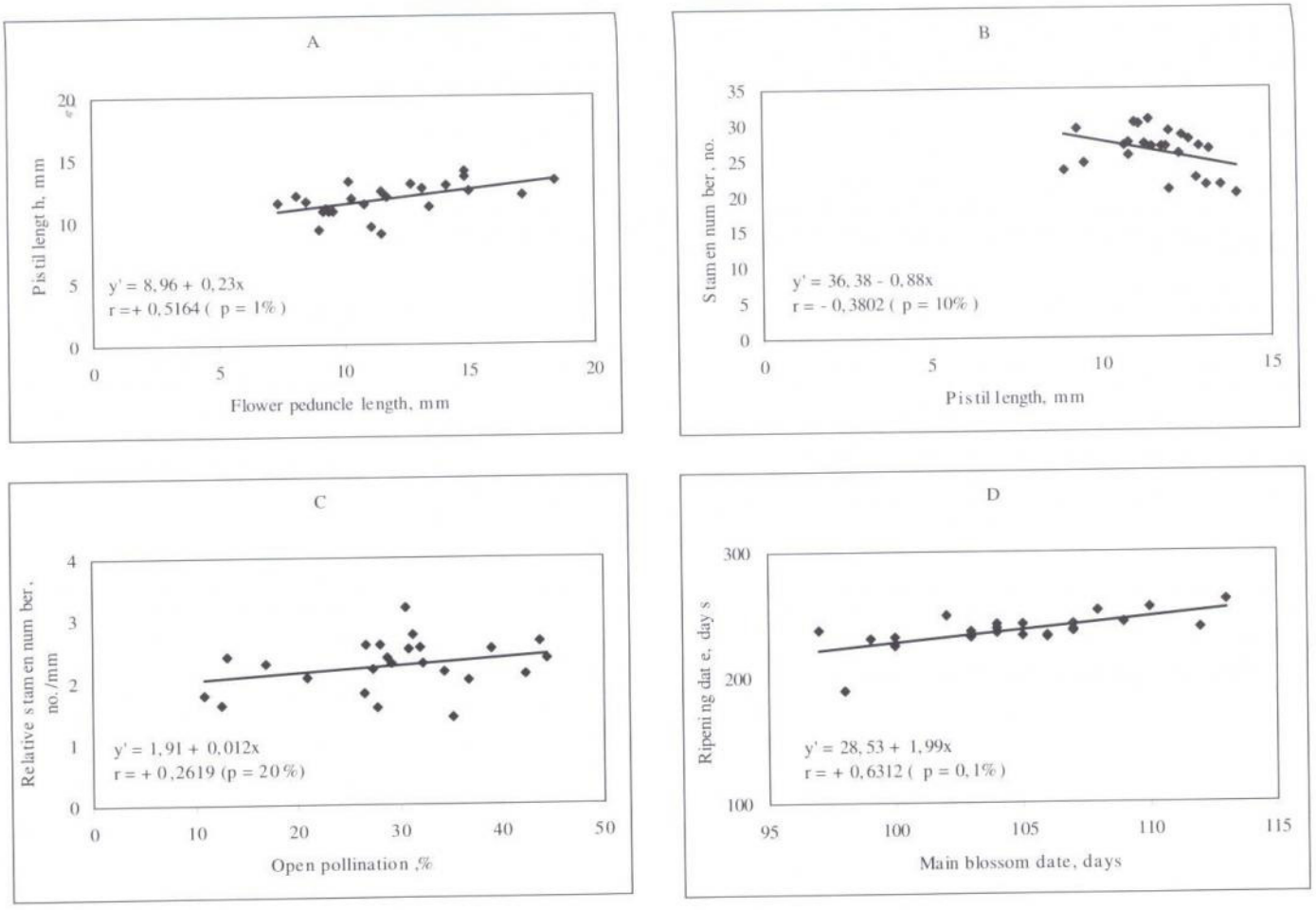

Figure 1 Relationships of different traits in plum and prune cultivars

Table 5 Some stochastical connection of different traits

Relationships	r-value
Open pollination, % **and** Relative stamen number, no./mm	+0,3025
Flower peduncle length, mm **and** Pistil length, mm	+0,5164*
Pistil length, mm **and** Stamen number, no.	–0,3802°
Relative stamen number, no./mm **and** Pollen germination, %	+0,2444
Crop, kg/tree **and** Average fruit mass, g	+0,1066
Fruit peduncle length, mm **and** Average fruit mass, g	+0,0163
Main blossom date, days **and** Ripening date, days	+0,6312**
Flower peduncle length, mm **and** Fruit peduncle length, mm, mm	–0,0385
Duration of fruit development, days **and** Crop, kg/tree	–0,2683

° P=10 %
* P= 5 %
** P= 1 %

the 20 °C) on the pollen germination viability. The pollen size 5–6-times longitude pollen had cultivating pollen quality viable. The relative stamen number of the stamen number and the pistil length ratio got. These trials and measuring 1992–2001 between carried (10 year long).

The main flowering and the fully ripening time stabilized and two data odds surrender the fruit development period. The little-plot plantation area everything wood one repetition reported (*Surányi,* 1983, 1991).

The gene bank orchard as a matter of fact tall biodiversity plantation area it had been; the pollination to him untold appropriate pollen donor cultivar she stood will, thus autogamy not scanned. The open pollination was investing 1993, 1996, 1997 and 1999 in year's value.

All of the cultivar of twigs about 4–600 flowers of open pollination resulted fruit value, that 8 week after finished. These the trials 1988-1996 between it's happened (9 year-old duration). The eventuality and connecting of singular data some of the morphogenetic traits with correlation counting analyze, out of four some graphically also typified (*Surányi & Erdős,* 2004b). 'Besztercei Bt. 2', 'Green Gage' and 'Stanley' as the control cultivar were of used.

Results and Discussion

Ten age-old morphogenetic data annual average paralleling contains the *Table 1,* the different genetic basic material and refining cultivar greatly margin. The flower peduncle and pistil length wide interval modulated, similarly the stamen number and relative stamen number also.

The pollen germination as well diversely it developed the 40 % underneath tube development weak viability means the 'Beregi datolya', 'C. 1501' and 'Precoce di Giugno' cultivars.

But these the open pollinated resulting fruit set also low it had been. Mostly the good pollen raiser cultivar pistil also viability underdeveloped the remaining members, the open pollination and the tube development % signal the strong connection also (r =–0,6546), that P=0.1 % almost significant.

Usually but the stochastic interrelations yet the *Table 5* revert. The greater (30 g over) fruit cultivar the 35 % over open pollination unfavorable, since in this case fruit thinning required finishes. The *Table 2* indicate the morphogenetic trait stableness, substantially smaller the value fluctuation, than that the cultivars between perceptible. However former observations compared to these varieties relative she was tall the pistil wave and the stamen number fluctuation.

Only 4 years observed open pollination in the event of the 1996 annual low worth the flowering period unfavorable weather states interpretable. The measured cultivars average main blossom date April 7–23 between (17 day long) modulated ripening on time the deviation greater (July 9–September 18 as 71 day long), the fruit development length also thus very different. The good period liver trees plants somewhat fluctuated, than that ripening time according to greater the variability the fruit massage, than the fruit peduncle length.

Absolutely every the *Table 1*, every the *Table 3* starring data variability can be greater, or smaller – supposed and different sharka contaminated next to. This however only hypothesis, since virus less sustainable orchard not she stood on order: the infection but spontaneously in the kind of spreads (*Table 3*).

While the phenophes annuity according to different, yet from the flowering to the ripening spreading duration surprisingly immutable show up, that ripening on the basis the measured plums environmental adaptive ability supposes.

The fruit peduncle length also stable trait, but their histological structure and diameter sciences without, slightly appropriates the flourish statement of sharka virus *(Table 4)*. All of these after it was interesting unravel, that measured data, trait change randomly to each another statutes, or determinate extrinsically and genetic reasons because of necessarily version.

The flower compartments have relation with and size the cultivar's average on the basis also more connection certified (*Surányi,* 1970, 1976, 1991; *Surányi & Tóth,* 1976).

The morphological sterility of flower in plums and the flower peduncle length also we can infer from s memorial – everything score 500 flower's data he was born (*Table 5* and *Figure 1A*). Loosely the connection the pistil length and stamen number in relation (*Figure 1B*). However the flower and the fruit peduncle length have relation with occasional, or the transport process continued and the pathogenic influence it has not been able characterizes.

Not found the fruit peduncle length and the average fruit massage between non significant connections. But two conspicuous correlations however found: the relative stamen and the pollen germination, or the open pollination % and the relative pollen number between (*Figure 1C*).

The perspective plums garnish which present study show, in reality spontaneously pattern quality, so that is it interesting the flowering and ripening very strong interrelations (*Figure 1D*). These really are new results also.

References

Blažek, J. & Karašová, R. (1998): Incidence of sharka in plum progenies in comparison with adult clonal material. Acta Hort. 478: 73–79.

Cociu, V. et al. (1996): Prunul. Edit. Conphys, Bucureşti.

Dragolski, K., Dinkova, H. & Minev, I. (2002): Rate PPV infection of some plum cultivars dependig on rootstock and management systems. Acta Hort. 577: 263–267.

Dragolski, K., Minev, I. & Djouvinov, V. (2004): Strategy to bring under control the losses of sharka in Bulgaria. Grønn Kunnskap 8 (112): 52.

Djouvinov, V., Bozhkova, V., Milusheva, S., & Gercheva, P. (2004): 70 years investigation on sharka in Bulgaria. Grønn Kunnskap 8 (112): 27.

Erdős, Z. & Surányi, D. (1992): Az alanyhatás szerepe néhány szilvafajta termőképességében. KÉE Lippay Ülésszak/ Kertészet 248-251.

Erdős, Z. & Surányi, D. (1994): Importance of the rootstock in productivity of five varieties. Acta Hort. 359: 243–248.

Hartmann, W. (1998a): Strategy for breeding sharka resistant plums. Acta Hort. 478: 31–38.

Hartmann, W. (1998b): New plum cultivars from Hohenheim. Acta Hort. 478: 171–174.

Hartmann, W. (2004): New results from plum breeding at Hohenheim. Grønn Kunnskap 8 (112): 39.

Jacob, H. B. (2002): Breeding of plums, prunes and mirabelles in Geiseneheim, Germany: Breeding goalss and previous realisation. Acta Hort. 577: 39–43.

Jacob, H. B. (2004): 25 years plum breeding in Geisenheim: Breeding targets and previous realisation. Grønn Kunnskap 8 (112): 67.

Jänes, H. & Pae, A. (2002): Cherry plum hybrid cultivars in Estonia. Acta Hort. 577: 181–186.

Minev, I. & Balev, M. (2002): Interspecific hybrids of the Prunus genus bred at RIMSA, Troyan. Acta Hort. 577: 195–198.

Neumüller, M., Hartmann, W. & Stösser, R. (2004): Inheritance of hipersensitivity of European plum agains plum pox virus (PPV). Grønn Kunnskap 8 (112): 21.

Ogašanović, D., Plazinić, R., Ranković, M., Stamenković, S. & Milinković, V. (2004): Pomological properties of new plum cultivars bred in Cacak. Grønn Kunnskap 8 (112): 38.

Polak, J. (2004): Variability of resistance to plum pox virus in individual naturally growed trees of myrobalan. Grønn Kunnskap 8 (112): 28.

Racskó, J., Holb, I., Szabó, Z. & Nyéki, J. (2004): Leaf and fruit susceptibility of Europen plum cultivars to plum pox potyvirus in Hungary. International Symposium on Plum and Prune Genetics, Breeding and Pomolgy to be arranged in Lofthus, Norway,5–9. September, 2004. (Lecture and Programme and Book of Abstract.)

Renaud, R. & Lafargue, B. (1998): Selectiopn and evaluation of mirabelle type hybrids – first results. Acta Hort. 478: 39–43.

Surányi, D. (1970): A csonthéjasok termékenyülési viszonyainak mutatója: a virágindex. Bot. Közlem. 57 (2): 135–138.

Surányi, D. (1976): Differentiation of self-fertility and self-sterility in *Prunus* by stamen number/pistil length ratio. HortScience. 11 (4): 406–407.

Surányi, D. (1983): Termesztett szilvafajták klónjainak virágmorfológiai sajátságai. Bot. Közlem. 70 (44): 179–188.

Surányi, D. (1991): A fajta, az alany és a környezet jelentősége a szilvatermesztés fejlesztésében. Doktori értekezés, (kézirat.) MTA, Bp.

Surányi, D. (1996a): Besztercei szilva klónok vizsgálata I. A hazai és külföldi eredetű klónok pollenjének életképessége és szabadtermékenyülése. Kert. Tud. 28 (1–2): 52–57.

Surányi, D. (1996b): Besztercei szilva klónok vizsgálata II. Korai Besztercei (Tv.) klónok leveleinek és virágainak összehasonlító elemzése. Bot. Közlem. 1996. 83 (1–2): 139–147.

Surányi, D. (1996c): Possibility for the determination of plum pox susceptibility with morphological traits on cv. 'Besztercei szilva' clones. Proc. Middle European Meet. '96 on plum pox. p. 25–28

Surányi, D. (2004a): Some features of variety's use and the cultivated plums in Hungary. Grønn Kunnskap 8 (112): 47.

Surányi, D. (2004b): Native plums of Hungary and traditional utilization of the plum and prune fruits. Grønn Kunnskap 8 (112): 86.

Surányi, D. (2005): Long investigations of flowers and leaves on mainly non-domestica plums. Int. J. Hortic. Sci. 11 (1): 73–79.

Surányi, D. (2006): Szilva. Mezőgazda Kiadó, Bp. (in press).

Surányi, D. & Erdős, Z. (1992): Korai Besztercei szilva klónok vizsgálata, különös tekintettel a virusérzékenységre. Kertgazdaság. 24 (3): 49–60.

Surányi, D. & Erdős, Z. (2004a): Comparative study of plum cultivars belonging to different taxons during 1980-1996. Int. J. Hortic. Sci. 10 (4): 13–19.

Surányi, D. & Erdős, Z. (2004b): Possibilities and difficulties og the introduction into Hungarian plum growing. Grønn Kunnskap 8 (112): 87.

Surányi, D. & Tóth, E. (1976): Sterilitás-megfigyelések Alutscha szilvafajtán. Bot. Közlem. 63 (4): 249–257.

Tóth, E. & Surányi, D. (1980): Szilva. Mezőgazdasági Kiadó, Bp.

Tóth, E., Surányi, D. & Erdős, Z. (1988): A Besztercei szilva változékonysága és klónszelekciója. Kertgazdaság. 20 (3): 24–36.

Tóth, E., Surányi, D. & Erdős, Z. (2005): A szilvafajták szelekciójának eredményei Cegléden. Kertgazdaság. 37: 67–77.

Turcu, E., Botu, I., & Botu, M. (1998): Evaluation of the production capacity of some cultivars grown in Romania. Acta Hort. 478: 179–186.

Zhivondov, A. & Djouvinov, V. (2002): Some results of the plum breeding programme at the Fruit-Growing Research Insitute in Plovdiv. Acta Hort. 577: 45–49.