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Phenological and flower morphological studies on different plum and prune cultivars

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Summary: 20–22 and 5–7 years of kind collection of 100 cultivars studied phenology and floral morphological basis of characteristics in 1994–1998 and 2009–2011. The varieties were collected 3–5 trees in the gene garden, all were on C. 359 myrobalan seedling. Detecting differences between the test cultivars are suitable for stamps, and also show that relatively short-term observations are useful for describing the comparison, to distinguish varieties. The taxonomic ordination of cultivars and groups of fruits suitable to distinguish colors shown that the flowering and ripening time, the nature of the reproductive organs and even Sharka-rate sensitivity is associated with those groups. Differences between the age of trees mainly sexual organs and fertility were shown. Affecting rate of climatic effects was not as large as the first line of erratic rainfall, air temperature spikes or possible values would be expected. The results of the breed, a gene bank of perception, in particular, the localization of hybrids, clone-type variants are useful in the analysis. Among other things – this is due to late-maturing, relatively well-stored temporarily, and not-blue plums, Sharka-infected tolerant or resistant varieties selection (cf. SURÁNYI 2013a-c) and will be disseminate in Hungary.

Key words: plum, cultivars, phenology, flower

Introduction

The studies of plum cultivars are now little attention to spend a long period of observation and cultivar selection of new cultivar forms. Apart from some exceptional cases in studies longer than ten years it is hardly usual to deal with the flower biology and -phenology of cultivars. Beyond the difficult nature of the work, disturbing factors due to the changing phytotechnical methods also play a role in this, and naturally the age of trees also changes in the meantime (*Staub 1982; Hedrick et al. 1911; Keöpeczy-Nagy 1943; Tóth 1957 and 1969; Surányi 1991 and 2009).*

Shorter-term observations covering a large number of cultivars are more frequent, on the other hand, more frequent *(Dahl 1935; Röder 1940; Tóth 1957, 1975; Dermine – Liard 1957 and 1978; Brózik 1960; Surányi 1980A, B, 1985 and 1986 Tóth and Surányi 1980).* In fact, in most works descriptions of cultivar with morphological accuracy are found *(Bailey 1898; Hedrick et al. 1911; Domin 1944; Gourley – Howlett 1941; Taylor 1949; Brooks – Olmo 1952; Dermine – Liard 1957 and 1978; Morrison 1964; Bordeianu et al. 1965 and 1969; Bellini et al. 1982).*

The Hungarian plum descriptions *(Lippay 1667; Bereczki 1877–1887; Rudinai Molnár – Angyal 1900–1909; Angyal 1926; Gombocz 1934; Rapaics 1935; Tóth 1957; Brózik 1960; Tomcsányi 1960; Harsányi 1979 and 1988)* contain highly valuable phenological observations too, built on the best Hungarian works *(Bereczki 1877–1887; Hegyfoky 1926; Keöpeczy-Nagy 1943),* though in the subjects worked up we may find the major results of phenology recently pushed into the back ground in the international literature *(Schnelle 1955; Gardner et al. 1952; Willing 1960; Overcash 1962; Bordeianu et al. 1965 and 1969; Knight 1969; Vondraček 1975).*

In connection with the cultivars of the plum cultivar collection established in Cegléd in 1954/55 we have studied many a question and published the results; we encountered the problems of year effect first of all in of flower biology investigations *(Surányi 1985),* that we took into consideration in the phenological evaluations and in the prognosis of the chemical fruit thinning effect *(Surányi 1991)*, too. Fortunately, however, the ongoing studies are completed, because of the variety and diversity of the collections of the kind gene bank research base form. Furthermore, it is possible to change the climate changing of modeling the reaction *(Surányi 2009 and 2013a).*

Material and methods

100 cultivars and clones of plum trees were planted in gene resource function studies in plantations; it will be indicate taxonomic distribution of plums in Table 7. The old trees in 1976–1978 and 1982–1984, the young trees were planted in 2002–2004. All observed plum cultivars grafted on *Prunus cerasifera* 'C. 359' and 'C. 679' seedling rootstocks. The trees were 20–22 years between 1994–1999, and 5–7 years old trees 2009–2011, on this years determined in bloom and the beginning of the ripening, 50–50 pieces of the same cultivar's flowers of pistil length, stamen number and calculated from

them the relative stamen number, and 3–3 each cultivars of pollen in the sample, 15% sucrose dependent-drop in the pollen viability on 20 °C was determined *(Surányi 1991).*

The surveys have been determined in the leaves and fruit symptoms value, if the fruit is sharka symptoms showed a stone core, persisting symptoms could also get information *(V. Németh 1979).* The visible and practical method was as follows: the infection was expressed as the relative number of leaves and fruit (minimum of 50 pieces); 2–2 in the stone core (minimum of 20 pieces) is a number, which can then be supplied on a relative indicator.

Sharka leaf symptoms were:

1 – the foliage on one sector
2 – at least on one side of the tree
3 – the whole tree, generally;

Symptoms of fruit:

1 – if rarely found in symptomatic fruits
2 – number of aggressive symptomatic fruits, small-scale blue falling
3 – symptomatic, occasionally distorted, and very small fruit, prominent blue falling;

Finally, the rock putamen symptoms:

1 – no or very few candidate spots
2 – arising partly circular spots,
3 – the core area as a whole spots *(Surányi 2011).*

The data processing of the plum cultivars of comparison in addition to the ontogenetic their analysis was performed, seeking to find solutions to the tree's age influences the type of collection types fertilization ability to (reproductive characteristics) and sharka sensitivity of open-field visual recordings of. The continuation of previous analysis is ontogenetic effects of study *(Surányi 1993 and 1994)* as model for studies. There were climate in the two measured period the average air temperature and the annual precipitation referable age-old and the crucial months (in April the flowering, in August the ripening) worth I had worked up at Meteorological Station of Cegléd.

Results and discussion

In contrast to an earlier, 22-year duration by experiment *(Surányi 1993 and 1994),* in this case, compared to two relatively short and in two different species plantations: the plum trees age were different. The year and month in two significant was (because of the bloom and ripening), the average air temperature of 7 % and the annual rainfall shows a difference of 14,3% *(Table 1).* This picture is much more extreme in 1994–1998 and the 2009–2011 periods, some years. While in 1997 the average air temperature in April (27,3%), and the 1997th and 1998th differences in annual rainfall varies (87,8%), while for 2009 of years, average temperatures in April (13,8 %) were outstanding. But in the year, and the key months of high rainfall difference is striking (1,1> <72,5 mm, and 6.4> <62,0 mm).

The main flowering of plum varieties studied period 1 to 22 April, ranged from (91,5 to 111,5), which was even greater in the current year. The earliest blossom as in Moldvai korai, followed by Marianna W. 39, two clone of Oka (W. 23 and 557-2 W. 23) and finally Santa Rosa, that all non-domestica plum varieties. However, the true blue plums are like Szarvasi, and the Plovdivna deszertna, H-247 and Ageni 698 blooms most late (22 April). The 6 × 4 or 7 × 5 m spacing and cultivar of collections given diversity for specific environmental and pollination conditions and created surrounding the blossom so that neither frost nor the late-summer drought were assessed only what they do not already.

Table 1. Typical meteorological data measured during the tests (Data of 519th Meteorological Station, at Cegléd)

Years Months	Mean annual temperature, °C	Yearly precipitation amounts, mm
1994	**12,1**	**439,3**
April	11,9	76,9
August	22,9	88,1
1995	**10,9**	**668,8**
April	11,4	33,3
August	21,3	72,5
1996	**10,1**	**520,1**
April	11,9	32,7
August	21,3	41,4
1997	**12,1**	**378,4**
April	16,3	21,1
August	21,2	32,1
1998	**12,2**	**710,6**
April	12,6	76,5
August	21,9	56,5
Mean	11,5	543,4
April	12,8	48,1
August	21,7	58,1
2009	**13,0**	**509,9**
April	16,5	1,1
August	23,9	36,5
2010	**11,6**	**946,4**
April	12,9	72,5
August	22,6	62,0
2011	**12,4**	**407,5**
April	14,4	10,0
August	24,5	6,4
Mean	12,3	621,3
April	14,6	27,8
August	23,7	35,0

The early ripening time also non-domestica cultivars observed (Marianna W. 23, Nadezsda W. 23 W, Oka W. 23 and Oka 557-2 W. 23, Zsalta Afazka, between July 3–12), to which the classified Ruth Gerstetter (2 to 9 July) such exceptional European plum varieties. The latest ripening

plum varieties 1-3 September (244.5 to 246.0 days from first) came on and the President and Späth Anna, but this includes the Brompton, Debreceni muskotály, Óriás and N. 918 as well *(cf. Faust – Surányi 1999).*

The aphid infection and protection against them is affected in the same way for each cultivar, so visual inspections to determine the extent of infection Sharka variety sensibility characteristic of trees. The Czernowitzer, Hohenheim 4, Schwäbische Frühzwetsche, Montfort, Mirabelle de Nancy and Ontario relative resistance showed, but the Beregi datolya and Szakarka – along with several other cultivar, such as late ripening plums leaves may be particularly attractive to aphids (e.g. higher assimilate content of leaves) *(Table 2).*

Table 2. Characterization of plum and prune cultivars with phenological and sharka symptom traits

***Note**: From the first day (days)

Cultivar	Flowering time*		Ripening time*		Sharka symptoms	
	1994/1999	2009/2011	1994/1999	2009/2011	1996–1999	2009–2011
Ageni 698 (9)	108,8	102,3	243,0	244,5	1,7	1,1
Ageni 707 (9)	107,7	102,0	238,3	244,0	1,9	1,3
Althann Bb. 91 (7)	105,5	99,0	228,4	236,1	2,9	2,3
Beregi datolya (9)	107,7	101,3	238,5	239,3	4,1	2,7
Bódi szilva (1)	102,8	98,7	209,7	203,7	2,5	1,3
Bon-bon (7)	105,3	100,7	231,2	220,3	2,3	1,7
Brompton (1)	103,8	101,5	236,0	241,1	0,7	0
Bühler Frühzwetsche (1)	107,2	101,3	221,5	219,3	1,1	0,3
C. 940 Hollandi (5)	105,5	100,7	231,2	231,7	2,8	2,2
C. 1501 Sárga szilva (5)	104,8	100,3	222,0	240,0	1,8	1,4
C. 1512 Duránci (8)	103,3	100,0	233,0	240,7	3,4	1,7
Cambridge Gage (7)	107,2	100,3	225,3	234,3	3,2	1,3
Columbia (7)	107,7	102,0	216,7	235,0	3,3	1,7
Czar (8)	106,3	102,0	211,0	207,5	0,9	0,1
Czernowitzer Zwetschge (3)	103,5	100,3	204,4	202,3	0,2	0
Csahticka (3)	108,5	101,3	225,2	218,3	2,5	1,3
Cservena Afazka (2)	100,2	100,0	234,7	236,2	2,4	1,3
Debreceni muskotály (3)	106,0	100,7	241,0	236,0	1,7	1,2
Déli Vengerka (6)	102,2	99,7	227,5	235,7	1,7	1,3
Dombrovica (3)	101,4	100,0	224,4	222,3	1,1	0,3
Drjanovszka (3)	109,3	102,3	234,2	236,0	2,6	1,7
Dzsanka 1/4 (2)	95,0	98,5	215,8	227,2	0,9	0,7
Dzsanka 3 (2)	96,8	98,5	218,2	223,4	1,8	2,2
Englebert herceg (3)	104,7	100,3	220,3	211,0	1,8	1,2
Erdélyi nyakas (9)	107,3	103,6	230,8	232,9	2,6	3,3
Ersinger Frühzwetsche (3)	105,0	95,7	204,8	209,3	4,1	2,7
Francia narancs (6)	103,2	100,3	235,5	235,7	3,9	1,3
French Improved (3)	108,3	104,0	227,0	233,0	1,4	1,4
Gabrovszka (3)	106,8	102,5	225,4	236,1	1,3	1,1
Golden sugar (6)	107,8	101,0	229,0	236,0	3,8	2,7
Gras Dames (6)	104,2	103,3	228,2	235,3	1,1	1,2
H-243 (4)	106,7	103,0	226,4	232,0	1,6	1,3
H-247 (4)	109,8	102,7	233,5	229,3	1,7	1,5
H-331 (4)	107,2	102,3	215,0	228,0	2,8	2,1
H-422 (4)	108,0	101,7	228,3	234,7	3,5	2,7
H-647 (4)	105,7	103,0	231,3	237,2	2,2	0,7
H-671 (4)	105,8	101,0	222,0	223,7	1,6	0,3
H-921 (3)	107,7	101,7	237,5	240,0	1,6	1,3
Hohenheim 2 (3)	103,2	100,9	200,8	203,6	0,6	0
Hohenheim 5 (3)	108,2	103,0	224,8	228,7	3,9	2,7
Honey Moon (8)	103,0	100,4	228,5	225,3	3,5	2,3
Imperial Epineuse (3)	108,0	101,7	237,3	238,7	2,2	1,2
Jubileumi kék (3)	105,5	101,3	214,7	218,0	2,4	1,2
Kazah szilva (3)	106,3	100,3	218,0	235,0	1,9	0
Kecskemét 101 (1)	103,5	100,0	223,5	210,3	1,1	1,4
Kék úri szilva (10)	108,0	102,3	234,7	220,3	2,3	1,7

Table 2. Continue

Cultivar	Flowering time*		Ripening time*		Sharka symptoms	
	1994/1999	2009/2011	1994/1999	2009/2011	1996–1999	2009–2011
Königsbacher Frühzwetsche (3)	103,0	99,7	205,5	204,3	2,2	2,3
Küsztendilszka (3)	108,0	102,7	205,5	202,5	2,9	1,1
Laroda (11)	98,0	100,7	222,3	204,5	2,3	1,2
Laxton Blau (9)	108,5	102,7	218,3	208,5	2,2	1,5
Lengyel szilva (4)	108,3	100,7	224,5	226,7	3,2	1,6
Lepperman Emma (3)	103,0	99,0	205,0	201,0	1,9	0,7
Loehr Pflaume (1)	104,2	100,3	230,3	234,0	1,8	1,3
Mammuth Dorota (8)	104,8	100,3	203,8	216,3	1,4	1,3
Marianna W. 39 (13)	96,5	93,7	192,0	198,7	0,9	1,5
Methley (11)	97,8	94,7	195,0	193,0	0,6	0
Mirabelle de Nancy (10)	107,8	101,3	228,2	222,7	0,6	0
Moldvai korai (3)	91,5	101,7	211,5	204,3	2,4	1,7
Monsigneur (10)	104,7	102,6	218,5	213,4	1,7	0
Montfort (5)	96,7	99,0	205,7	199,7	0,9	0,3
N. 686 (9)	109,0	102,0	228,8	224,0	2,2	2,2
N. 918 (9)	107,3	102,0	242,0	237,2	1,8	1,4
Nadezsda (11)	100,0	100,0	188,5	184,3	1,1	1,2
Oka W. 23 (13)	96,0	94,7	206,8	209,0	0,8	1,1
Oka 557-2 W. 23 (13)	95,5	93,7	205,1	208,0	2,1	3,3
Oneida (8)	106,8	103,5	231,5	224,5	1,6	0
Ontario (5)	105,7	101,5	207,2	204,0	0,5	0,3
Opal (8)	104,5	99,7	203,3	200,0	1,4	0,3
Óriás (5)	103,8	100,7	238,5	239,0	1,2	1,1
Pacific (6)	105,6	102,7	238,1	233,0	3,8	2,7
Paczelt szilvája (4)	108,2	104,0	226,7	221,1	1,9	1,7
Plovdivna deszertna (3)	109,8	102,3	240,5	231,7	3,7	2,3
Plovdivna szinja (3)	108,5	101,0	239,3	238,5	3,4	2,7
President (3)	104,2	99,3	244,5	242,0	2,9	1,4
Purpurovaja (2)	98,7	99,5	197,0	194,1	1,1	1,1
Queston (8)	102,5	101,0	198,7	195,0	1,8	1,3
Révfülöpi szilva (4)	107,8	102,0	233,0	233,0	4,1	2,7
Royal de Tours (6)	106,4	103,3	225,8	220,1	1,3	0,7
Ruth Gerstetter (5)	104,2	99,0	188,4	183,6	1,4	1,3
Santa Rosa (11)	98,5	95,0	220,7	208,7	0,8	1,1
Schüler Frühzwetsche (3)	104,3	100,3	216,8	207,0	0,8	1,2
Schwäbische Frühzwetsche (3)	104,9	103,3	210,7	202,5	0,6	0
Sermina (122)	105,0	101,0	204,6	200,0	1,2	0,7
Späth Anna (5)	108,2	102,3	240,0	246,0	2,3	3,4
Sugar (6)	108,7	102,8	219,0	222,4	1,5	1,3
Szakarka (3)	107,7	102,0	235,0	236,0	1,7	2,6
Szarvasi szilva (4)	111,5	103,0	236,5	235,3	3,8	1,3
Tuleu gras (3)	110,6	104,0	236,0	230,7	2,2	2,7
Utility (12)	102,0	99,3	217,7	215,3	2,1	1,5
Valjevka (3)	107,3	102,7	238,8	237,0	0,9	1,4
Valor (3)	105,0	101,0	230,3	240,7	2,3	1,3
Verity (3)	106,2	100,3	234,0	239,7	0,7	1,7
Victoria (6)	105,7	101,0	233,5	238,0	1,7	2,2
Wangenheim's Frühzwetsche (3)	108,3	102,7	229,4	230,3	0,8	1,5
Yakima (4)	105,5	101,5	224,3	225,6	1,2	1,3
Zimmers Frühzwetche (1)	103,5	99,7	204,4	201,0	2,1	1,7
Zöld ringló (7)	106,3	100,3	229,3	236,5	1,4	1,7
Zsalta Afazka (2)	100,7	100,5	190,0	192,4	1,5	2,1
$LSD_{5\%}$	2,32	2,50	3,59	4,58	0,67	0,53

Indicators of plum varieties developed to characterize the reproductive organ in flowers *(Surányi 1970, 1976a-b and 1985),* into the current gene bank of plum cultivars also investigated *(Table 3).* A wide range of pistil length changes when turn growing edge length proportions between Purpurovaja and Späth Anna are. The plum of Bódi, Dzsanka 1/4, two Oka clone variety, Nadezsda, Purpurovaja and Zsalta Afazka are "non-classical" plum varieties, while very long pistil like Dombrovica, H-331, Jubileumi kék, Pacific, Schüler Frühzwetsche and Späth Anna real blue plums.

Table 3. Estimation of flowers in *Prunus* cultivars (Cegléd)

Cultivar	Pistil lenght,mm		Stamen number, no.		SN/PL, no./mm		Pollen germination,%	
	1994/1999	2009/2011	1994/1999	2009/2011	1994/1999	2009/2011	1994/1999	2009/2011
Ageni 698 (9)	12,0	12,2	27,0	27,1	2,26	2,20	57,4	58,6
Ageni 707 (9)	11,8	12,3	25,1	24,6	2,10	1,97	56,1	54,1
Althann Bb. 91 (7)	10,3	10,0	24,4	24,6	2,40	2,41	58,6	56,3
Beregi datolya (9)	13,5	12,9	18,3	19,2	1,32	1,40	60,0	58,8
Bódi szilva (1)	9,2	9,4	21,8	21,5	2,31	2,28	75,1	70,1
Bon-bon (7)	10,5	10,4	30,0	29,7	2,85	2,78	58,0	56,6
Brompton (1)	9,5	9,8	27,0	26,8	2,80	2,72	61,4	63,0
Bühler Frühzwetsche (1)	11,4	11,7	20,0	19,7	1,71	1,67	46,1	43,4
C. 940 Hollandi (5)	12,6	13,0	22,7	22,4	1,80	1,70	65,5	64,2
C. 1501 Sárga szilva (5)	11,7	12,1	25,5	25,1	2,16	2,06	53,3	55,5
C. 1512 Duránci (8)	13,5	13,7	28,2	27,7	2,09	2,00	57,3	52,2
Cambridge Gage (7)	11,3	11,1	27,7	27,5	2,45	2,51	43,1	45,0
Columbia (7)	10,1	9,7	26,0	26,4	2,59	2,69	54,0	49,6
Czar (8)	11,6	11,8	29,1	29,2	2,48	2,41	59,7	57,4
Czernowitzer Zwetschge (3)	13,7	13,4	26,0	26,3	1,82	1,95	52,5	50,2
Csahticka (3)	12,0	11,8	19,7	20,1	1,63	1,70	53,2	52,7
Cservena Afazka (2)	9,8	10,3	28,3	27,5	2,85	2,71	50,5	51,0
Debreceni muskotály (3)	9,7	10,1	26,9	28,7	2,77	2,81	60,2	58,4
Déli Vengerka (6)	11,5	11,2	29,0	29,4	2,55	2,62	51,8	54,2
Dombrovica (3)	14,1	13,8	25,9	26,3	1,82	1,90	61,0	59,5
Drjanovszka (3)	13,6	13,5	27,4	27,4	2,01	2,05	41,0	43,8
Dzsanka 1/4 (2)	13,2	13,6	27,7	27,4	2,07	2,00	55,9	55,0
Dzsanka 3 (2)	8,1	8,5	20,7	20,3	2,55	2,41	54,2	53,3
Englebert herceg (3)	12,8	12,6	22,5	22,8	1,76	1,81	68,2	65,6
Erdélyi nyakas (9)	9,9	10,4	20,8	19,4	2,10	1,86	40,8	45,2
Ersinger Frühzwetsche (3)	13,5	13,2	22,3	22,1	1,65	1,69	70,2	68,8
Francia narancs (6)	14,5	14,4	29,3	29,5	2,00	2,05	58,5	55,5
French Improved (3)	11,6	12,0	29,0	28,8	2,47	2,40	43,3	41,0
Gabrovszka (3)	12,7	12,5	27,1	27,4	2,18	2,21	49,1	52,4
Golden sugar (6)	12,4	12,6	32,0	31,7	2,51	2,55	15,5	20,1
Gras Dames (6)	11,1	11,4	28,8	28,5	2,60	2,50	34,6	37,2
H-243 (4)	12,5	12,6	29,0	28,8	2,29	2,25	48,9	50,3
H-247 (4)	12,1	11,7	19,7	20,3	1,65	1,73	52,2	54,7
H-331 (4)	13,2	13,0	24,4	24,7	1,80	1,91	51,4	54,1
H-422 (4)	11,1	11,4	24,9	25,2	2,26	2,21	53,0	50,9
H-647 (4)	12,5	12,7	27,6	27,4	2,20	2,15	66,8	59,8
H-671 (4)	10,5	10,7	27,1	26,8	2,55	2,50	70,2	68,3
H-921 (3)	11,8	12,1	30,5	29,6	2,50	2,44	55,0	54,0
Hohenheim 2 (3)	11,7	12,2	28,6	28,0	2,40	2,39	46,6	45,5
Hohenheim 4 (3)	11,1	11,6	30,8	29,6	2,75	2,58	57,2	56,9
Hohenheim 5 (3)	10,8	11,2	25,9	25,3	2,34	2,25	60,3	59,4
Honey Moon (8)	13,0	12,8	25,1	25,7	1,88	1,99	40,1	43,1
Imperial Epineuse (3)	9,8	10,4	27,8	26,4	2,77	2,55	47,6	44,0
Jubileumi kék (3)	14,0	13,8	28,5	28,8	1,95	2,08	66,0	64,7
Kazah szilva (3)	12,7	12,8	26,8	26,7	2,11	2,05	61,5	60,5
Kecskemét 101 (1)	9,8	10,2	26,6	26,3	2,73	2,58	58,2	50,8
Kék úri szilva (10)	10,5	10,4	22,6	22,5	2,13	2,16	50,7	51,1
Kökényszilva 1 (1)	12,0	11,7	23,3	23,6	1,94	2,02	60,3	58,4

Table 3. Continue

Cultivar	Pistil lenght,mm		Stamen number, no.		SN/PL, no./mm		Pollen germination,%	
	1994/1999	2009/2011	1994/1999	2009/2011	1994/1999	2009/2011	1994/1999	2009/2011
Küsztendilszka (3)	10,9	10,5	18,5	19,1	1,69	1,81	67,8	65,3
Laroda (11)	8,3	8,5	31,2	30,8	3,68	3,62	39,5	42,2
Laxton Blau (9)	12,3	12,0	24,4	24,9	2,01	2,08	44,7	47,1
Lengyel szilva (4)	12,6	12,4	20,9	21,2	1,65	1,71	60,0	55,6
Lepperman Emma (3)	11,6	12,2	22,4	22,0	1,90	1,80	58,4	54,0
Loehr Pflaume (1)	12,2	12,1	27,1	26,8	2,20	2,23	63,3	59,4
Mammuth Dorota (8)	11,7	12,1	23,3	23,0	2,02	1,90	80,1	77,7
Marianna W. 39 (13)	9,2	9,5	27,6	27,4	3,00	2,88	53,1	56,3
Methley (11)	9,1	8,9	29,8	29,6	3,24	3,32	41,0	45,2
Mirabelle de Nancy (10)	11,0	11,2	25,6	25,4	2,30	2,26	66,5	64,4
Moldvai korai (3)	12,0	11,9	25,5	25,3	2,11	2,15	49,4	50,4
Monsigneur (10)	12,1	12,3	27,2	26,8	2,25	2,18	52,0	53,5
Montfort (5)	11,6	12,0	27,9	27,1	2,45	2,28	46,4	48,6
N. 686 (9)	11,4	11,5	27,0	27,0	2,34	2,37	50,0	50,8
N. 918 (9)	10,7	10,6	27,6	27,8	2,55	2,62	51,6	49,6
Nadezsda (11)	9,2	9,5	26,7	26,4	2,88	2,78	40,4	43,0
Oka W. 23 (13)	9,0	9,1	27,2	27,0	3,10	2,98	40,2	44,7
Oka 557-2 W. 23 (13)	8,9	9,3	27,0	26,7	3,04	2,90	45,0	44,4
Oneida (8)	10,7	10,9	30,2	29,7	2,78	2,72	60,4	59,6
Ontario (5)	10,5	10,7	26,4	26,0	2,48	2,43	62,2	60,0
Opal (8)	11,3	11,5	28,6	28,3	2,52	2,46	66,3	62,3
Óriás (5)	11,6	12,0	28,9	28,6	2,44	2,37	45,1	47,3
Pacific (6)	13,6	13,9	20,0	19,6	1,50	1,41	67,0	66,2
Paczelt szilvája (4)	10,6	10,5	26,5	26,6	2,46	2,53	60,0	58,8
Plovdivna deszertna (3)	11,5	12,0	22,0	21,6	1,91	1,80	58,9	56,4
Plovdivna szinja (3)	10,7	10,5	25,4	25,3	2,37	2,42	37,2	40,0
President (3)	11,5	12,1	22,4	22,0	1,94	1,82	63,1	62,1
Purpurovaja (2)	7.6	8,4	28,9	28,0	3,72	3,38	43,3	40,8
Queston (8)	13,6	14,0	28,5	27,9	2,02	1,98	46,0	49,2
Révfülöpi szilva (4)	12,6	12,7	20,4	20,2	1,54	1,60	56,9	56,1
Royal de Tours (6)	10,7	10,6	22,8	22,8	2,15	2,15	49,0	50,2
Ruth Gerstetter (5)	10,2	10,5	26,3	25,8	2,60	2,45	46,2	47,8
Santa Rosa (11)	8,6	9,0	26,7	26,5	3,09	2,90	24,4	27,0
Schüler Frühzwetsche (3)	14,2	14,2	30,8	30,4	2,38	2,18	69,2	66,0
Schwäbische Frühzwetsche (3)	11,4	11,6	28,9	28,8	2,53	2,47	60,1	56,5
Sermina (122)	10,8	11,1	22,8	22,5	2,11	2,02	35,1	34,8
Späth Anna (5)	14,5	14,4	21,5	21,6	1,50	1,53	58,2	55,5
Sugar (6)	10,4	10,8	30,5	30,0	2,89	2,78	41,0	43,4
Szakarka (3)	12,0	11,7	22,6	22,9	1,88	1,96	70,7	68,8
Szarvasi szilva (4)	11,5	11,5	22,0	22,2	1,88	1,93	55,3	54,4
Tuleu gras (3)	9,9	10,0	20,1	20,1	2,00	2,05	0,0	0,0
Utility (12)	12,7	13,0	27,3	26,8	2,15	2,06	0,0	0,0
Valjevka (3)	11,1	10,7	28,0	28,3	2,50	2,64	57,5	54,3
Valor (3)	11,5	11,8	27,0	26,7	2,35	2,26	42,4	47,6
Verity (3)	11,8	11,6	27,8	27,5	2,40	2,36	53,8	48,9
Victoria (6)	13,0	13,3	26,8	26,5	2,05	1,98	59,4	58,0
Wangenheim's Frühzwetsche (3)	11,4	11,7	27,0	26,7	2,36	2,27	76,0	71,0
Yakima (4)	11,5	12,0	27,5	27,0	2,40	2,25	50,5	49,8
Zimmers Frühzwetche (1)	10,9	10,6	21,8	22,4	1,92	2,11	56,2	58,2
Zöld ringló (7)	12,2	12,5	27,5	27,1	2,21	2,15	59,9	59,2
Zsalta Afazka (2)	8,8	9,2	29,1	28,8	3,30	3,16	48,9	47,0
$LSD_{5\%}$	0,64	0,77	0,89	1,07	0,17	0,13	4,34	5,72

A typical stamen number from 18,3 to 32,0 pc/flower was between cultivars, separated by a few staminate (as of hypoandry) Csahticska, Ersinger Frühzwetsche, H-247, Kék úri, Kökényszilva 1, Küsztendilszka, Pacific, President, Sermina, Tuleu gras and Zimmer's Frühzwetsche, but staminate and find many varieties of plums (as of polyandry) against him as Golden sugar, Czar, Francia narancs, French Improved, Hohenheim 4, Oneida, Schüler Frühzwetsche and Sugar. It can be observed that the types of the two groups are almost exclusively blue plums. The relative stamen (SN / PL) is much clearer than the variety of differences. The high SN/PL ratio of non-specific domestica plums (Laroda, Cservena Afazka, H-671, Marianna W. 23, Oka W. 23 and 557-2 W. 23, and then Zsalta Afazka was specific. However, the low value (Beregi datolya, Pacific and Späth Anna) has actually constitutes fertilization (morphological and functional reasons) barrier too feminine flowers produce *(see Dahl 1935; Röder 1940; Kobel 1954; Tóth 1957 and 1969; Kárpáti 1967).*

The pollen germination of plums is also very different. The male sterile Tuleu gras, but Golden sugar and Utility breeds compared, however, the Bódi, Ersinger Frühzwetsche, H-671, Mammuth Dorota and Wangenheim's Frühzwetsche had high pollen viability, such as pollination considered very suitable. 1996 and 1997 was studied in low (open) fertilizing Montfort additional pollination. The Wangenheim's Frühzwetsche and Bódi plum as pollen donor was particularly good: the pollinating more than doubled in the fruit set of Montfort (SURÁNYI 1997, unpublished).

Of different ages plum varieties are typically important stamps comparing few publications in some of the older literature *(cf. Hedrick et al. 1911; Dahl 1935; Röder 1940; Tóth 1957; Ramming – Cociu 1992; Faust – Surányi 1999),* although they could provide not only environmental factors – onthogenetic perspective *(cf. Surányi 1993 and 1994)* explain the often contradictory and self-fertilization data available. *Tóth (1957)* analysis of just about Santa Rosa species seems to confirm this. *Table 4* according to the degree of Sharka symptoms and reproductive data, the average of the elderly (20–22 years old) and young (5–7 years old) plantations – were significantly different (Table 4), while the period of the two types were tested positive correlation between the stamps according to *(Table 5, Figure 1–3).*

Table 4. Comparison of old and young plum trees in field (Cegléd)

Traits	Old trees	Young trees	LSD 5 %
Blossom time	104,86	100,82	0,60
Ripening time	222,59	221,71	2,51
Sharka symptoms, 0→5	1,97	1,41	0,153
Pistil length, mm	11,42	11,54	0,058
Stamen number, no.	25,90	25,76	0,092
Relative stamen number, no./mm	2,20	2,29	0,024
Pollen germination, %	52,86	52,32	0,53

Table 5. Relationship of age of trees and traits in plums

Traits	r-value between old and young trees
Blossom time	+0,6906
Ripening time	+0,4758
Sharka symptoms, 0→5	+0,3352
Pistil length, mm	+0,9799
Stamen number, no.	+0,9804
Relative stamen number, no./mm	+0,9791
Pollen germination, %	+0,9816

Table 6. Stability of connection according age of trees

Relationship	On old trees	On young trees
Blossom time and ripening time	+0,4758	+0,3524
Pistil length and stamen number	–0,9899	–0,3593

Europe- and in the Carpathian Basin in *P. domestica*, *P. italica* and *P. syriaca* taxon sharing mechanism dominant species (in 79 varieties), but other species and varieties in the two collections are also important for the plum growing, some of which can also be source of rootstock kind (21 species) *(cf. Kárpáti 1967; Küppers 1976a-d, 1977) (Table 7).*

Table 7. Taxonomic distribution of measured plum cultivars

Taxon	No. of cultivars
1 Damson, *Prunus insititia*	7
2 Cherry plum, *P. cerasifera*	5
3. Domestic plum, *Prunus domestica*	31
4 Hungarian plum, *P.* x *domestica* convar. *hungarica*	10
5 Round plum, *P.* x *domestica* convar. *rotunda*	5
6 Paradise plum, *P.* x *italica* convar. *pomariorum*	0
7 Gage. *P.* x *italica* convar. *claudiana*	5
8 Egg plum, *P.* x *italica* convar. *ovoidea*	7
9 Date plum, *P.* x *italica* convar. *mamillaris*	8
10 Mirabelle, *P.* x *syriaca* convar. *cerea*	3
11 Japanese plum, *P. salicina*	4
12 Pseudo-apricot, *P. coccomilia*	2
13 Other plums, *Prunocerasus* sp.	3

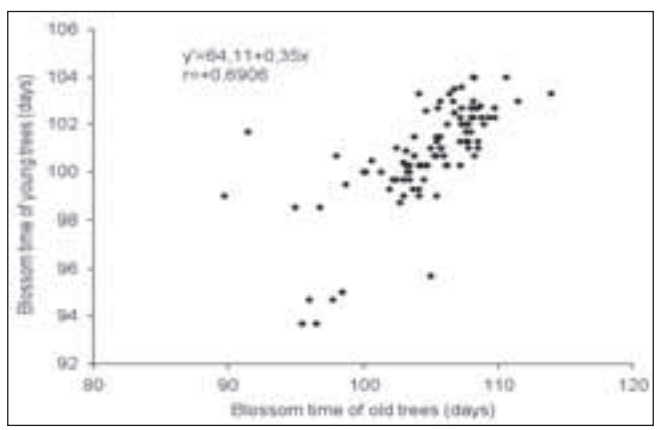

Figure 1. Blossom time relationship between cultivars and age of trees

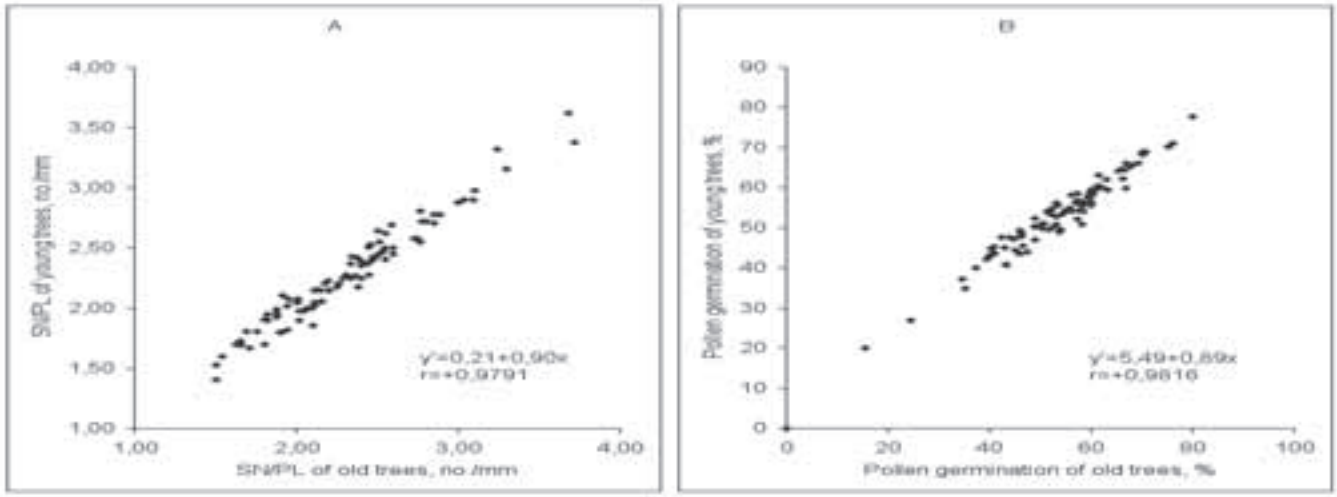

Figure 2. Characterization of sexual organs on various old plum trees

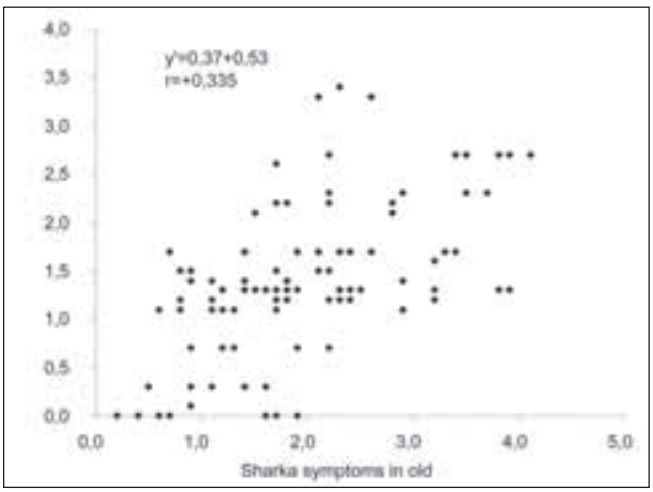

Figure 3. Sharka symptoms depending in the extent of cultivars

Particular kind of image of the phenological taxonomical characteristic necessarily affect the nature of the *P. cerasifera*, *P. salicina* and *Prunocerasus* sp. types of early blossom, and Table 6 for properly – the first ripened fruit, too. The taxa Sharka symptoms compared to hardly explained vegetative and reproductive phenophases (with the exception, however, of *P. syriaca*) (Table 8). Essentially, the difference between the taxa reproductive organs were statistically significant according to the F-test and the pistil length and the stamen number – together with the relative stamen number now seem to characterize the groups (*cf. Terpó 1974; Nyéki 1980; Faust 1989)* (Table 9).

Table 8. Characterization of plum taxons with phenological and sharka symptom traits (mean)

	CULTIVAR	Flowering time		Ripening time		Sharka symptoms	
		1994/1999	2009/2011	1994/1999	2009/2011	1996–1999	2009–2011
1	*Prunus insititia*	103,93	100,17	221,24	203,67	1,79	1,03
2	*Prunus cerasifera*	98,28	99,44	211,14	214,66	1,54	1,48
3	*Prunus domestica*	105,75	101,20	224,31	224,38	1,91	1,35
4	*Prunus x domestica convar. hungarica*	107,68	102,26	227,41	229,69	2,51	1,56
5	*Prunus x domestica convar. rotunda*	103,70	100,50	219,00	220,57	1,56	1,43
6	*Prunus x italica convar. pomariorum*	105,48	101,76	229,58	232,03	2,35	1,68
7	*Prunus x italica convar. claudiana*	106,42	100,46	226,18	232,44	2,62	1,74
8	*Prunus x italica convar. ovoidea*	104,46	100,99	215,69	215,61	2,00	1,00
9	*Prunus x italica convar. mamillaris*	108,04	102,27	234,24	232,91	2,36	1,93
10	*Prunus x syriaca convar. cerea*	106,83	102,07	227,13	218,80	1,53	0,57
11	*Prunus salicina*	98,58	97,60	206,63	197,63	1,20	0,88
12	*Prunus coccomilia*	103,51	100,15	211,15	207,65	1,65	1,12
13	*Prunocerasus* sp.	96,00	94,03	203,30	205,23	1,27	1,97
	F-test	1,91	2,25	1,93	3,67	1,09	1,68

Table 9. Estimation of sexual organs in *Prunus* taxons (mean)

	CULTIVAR	Pistil lenght, mm		Stamen number, no.		SN/PL, no./mm		Pollen germination,%	
		1994/1999	2009/2011	1994/1999	2009/2011	1994/1999	2009/2011	1994/1999	2009/2011
1	*Prunus insititia*	10,7	10,8	23,9	23,9	2,23	2,21	60,1	57,6
2	*Prunus cerasifera*	10,0	10,0	26,9	26,4	2,88	2,68	50,6	49,4
3	*Prunus domestica*	11,9	11,9	25,8	25,7	2,23	2,24	54,9	53,7
4	*Prunus x domestica convar. hungarica*	11,9	11,9	24,5	24,6	2,07	2,09	56,8	55,7
5	*Prunus x domestica convar. rotunda*	11,8	12,1	25,6	25,2	2,18	2,11	53,8	54,1
6	*Prunus x italica convar. pomariorum*	12,2	12,3	27,4	27,3	2,30	2,34	47,1	48,1
7	*Prunus x italica convar. claudiana*	10,9	10,7	27,1	27,1	2,52	2,54	54,7	53,3
8	*Prunus x italica convar. ovoidea*	12,2	12,4	27,6	27,4	2,33	2,17	58,6	57,4
9	*Prunus x italica convar. mamillaris*	11,7	11,7	24,3	24,3	2,10	2,16	51,5	52,0
10	*Prunus x syriaca convar. cerea*	11,2	11,3	25,1	24,9	2,22	2,25	56,4	56,3
11	*Prunus salicina*	8,8	9,0	28,6	28,3	3,21	3,18	36,3	39,4
12	*Prunus coccomilia*	11,8	12,1	25,1	24,7	2,07	2,04	17,6	17,4
13	*Prunocerasus* sp.	9,0	9,3	27,3	27,0	3,00	2,92	46,1	48,5
	F-test	2,00	1,79	1,91	1,72	3,45	2,04	1,53	1,94

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