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Long term investigations of flowers and leaves on mainly non-*domestica* plums

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Summary: The author dealt with plum species representing different eco-geographic areas by their genetic adaptation and their hybrids, as European (*P. domestica, P. italica, P. cerasifera*), Asian (*P. salicina, P. simonii, P. ussuriensis*), American (*P. americana, P. besseyi, P. munsoniana, P. tomentosa*). The rootstocks of the trees examined were seedlings of *C. 679 myrobalan* with the exception of *Laroda* and *Santa Rosa II*, which were grown on three different stocks: seedlings of *C. 174 myrobalan, C. 449 bitter almond* and *C. 471 sweet almond*. The size of peduncle, length of pistil, stamen number per flower, relative stamen number (SN/PL) have been suitable for description and distinction of varieties. Similarly shape of leaves, length of petiole, length and width of blade helped the identification.
The ratio of the dimensions of leaves, length of petiole and of leaf blade, also contributed to the distinction of European, Asian and American plum species, notwithstanding their relations with ecological conditions as well as historical, technical properties, pomological features, etc. Computed indicators (relative stamen number and shape-index of leaves) also have been useful data.
Significant correlations have been found between colour of nectaries and mean values of variety-groups. The potential values of non-European varieties for purposes of commercial production could be forecasted from the point of view of quality, ecological, pomological as well as market value. It is important, however, to know the effect of the rootstock and growing site as well as their interaction, on the one hand, whereas the resistance or tolerance of the varieties as limiting factors, at least to the sharka *(Plum pox)* virus, *Xanthomonas pruni*, on the other hand (cf. *Surányi & Erdős*, 2004a and 2004b).

Key words: *Prunus* species, flower and leaf morphology, acclimation, cultivars

Introduction

The utility of plum varieties of the world has been analysed thoroughly seven years ago (*Surányi & Erdős*, 1998) considering all taxonomic groups available. Data of yields prove the divergent values of the three groups of plums, Euopean, Asian and American, based mainly on their ecological, agronomic-pomological and historical properties (*Surányi*, 1998; *Surányi & Erdős*, 1998; *Faust & Surányi*, 1999).

The transformation of plum production is also expressed by the quick change of the varieties as consequence of various reasons:

1) There are limits of the production-biological abilities of the individual ecological groups.
2) Customs of nutrition and consumption changed a lot.
3) Requirements of the market developed new criteria of quality of plum as a commodity.
4) Meanwhile, new difficulties arose, diseases and pests threatened the trees.
5) Climatic changes and their consequences are possibly met by indirect means only.
6) The purpose to optimise ecological and economical conditions of the production is limited by insurmountable barriers.

As a new simplified slogan suggests „the tendency of climatic warming up suggests the preference of the *salicina*-type varieties, which are already rather popular on the market as well as in the production." That point of view means, however, considerable risk, though a study of *Sansavini* (1996) shows optimism for the outlooks of the market. Meanwhile, the questions related to the use of varieties as well as of the rootstocks are not answered yet, let alone the search for optimal growing sites and phytotechniques. Just after the first, relatively small cca. 150 ha plantation of *salicina* varieties – caution is recommended (cf. *Szabó & Nyéki*, 2002; *Szabó* et al., 2004). It was the objective of the "strategy" at Cegléd (*Surányi & Erdős*, 2004a, 2004b).

The acclimation of Asian plums are eagerly promoted, whereas the increasing, heavy sharka *(Plum pox)* infection (cf. *V. Németh*, 1986) indicating the alleged consequences of the climatic changes urges a thorough survey of the global warming up within the Carpathian basin. *Czelnai* (2003) presented already a protocol of meeting the dangerous consequences of the climatic catastrophe. *Bartholy* et al (2004) stated that the trends of the 20eth century indicate two periods of warming up in the summer season (1901–1945 and 1975–1999), which proved to be more marked during the winter half-year periods. The lack of precipitation seemed to be stabilised especially around the Lake Balaton, Sió-Valley and some parts of the Hungarian Great Plain, where the signs of desertification are critical.

Varga-Haszonits (2003) examined the agricultural consequences of the climatic changes and forecasted the expected scenario. According to the author, it is not easy to trace the trend within the complicated system of climatic changes, which is only known during the period between 800 and 2000 after Christ in Central Europe (cf. *Anonymus*, 1976). *Varga-Haszonits* (2003) had good reasons to distinguish between meteorological values and critical parameters of cultivated plants, because in spite of the warming there are winter and spring frosts, troubles in photosynthesis, gas exchange in clogged soils and excessive drought impairing agriculture heavily. The prognosis of *Antal* (2003) forecasts troubles in forestry as well as in other kinds of arboriculture, i.e. fruit growing too (cf. *Szabó* et al,. 2004).

For the description of European, Asian and American eco-geographical groups of plum species and varieties, the same criteria of taxonomy and floral morphology are utilised as in the previous relevant literature (*Dahl*, 1935; *Röder*, 1940; *Tóth*, 1957, 1968; *Dermine & Liard*, 1957, 1978; *Surányi*, 1976). Data are collected through several years as outlined in the book assigned to Plums (*Tóth & Surányi*, 1980) as well as in earlier publications (*Surányi*, 1978, 1985, 1991). In older collections of varieties there are hardly any non-European plums (e.g. belonging to *P. salicina* or *P. simonii* or teir interspecific), however, the eagerly pursued acclimation produced quite a few plantations of non-European varieties, which could not be evaluated yet, thus decisive judgements must wait for additional years.

The plantation of eight Japanese plum varieties, which are successful in California, has been a plain failure at Cegléd. After 3 years, only single grafts survived in the orchard in spite of the well isolated site and the careful handling of first class graftlings by the Szarka-nursery. The variety *Santa Rosa II* alone produced less than 40 % successful grafts, whereas *Black Amber*, *Friar* and *Duarte* started better than 75 % (*Surányi & Kölber*, 1996, not published).

Present study applied morphogenetic and pomological methods first of all of *Hedrick* el al. (1911), *Röder* (1940), *Tóth* (1957), *Dermine & Liard* (1957 and 1978), *Harsányi* (1979), *Surányi & Erdős* (1998), whereas genetical terms of *Bellini & Nencetti* (1993), *Sansavini* et al. (1996a and 1996b), *Okie* (1996). Morphological analyses utilised mainly means developed by *Dahl* (1935), *Tóth* (1957), *Knight* (1969), *Tóth & Surányi* (1980), furthermore, *Szabó & Nyéki* (2000 and 2002).

Material and method

In 1980, 1983, 1984 and 1987, altogether 42 plum varieties have been grafted on C. 679 Myrobalan rootstock. Their floral morphology has been the objective of examination in 1990–1995, leaf morphology in 1990–1994. Each sampling comprised 50 replicates. For two Japanese plum varieties (*Laroda* and *Santa Rosa*), flower samples were repeated 100 times, (peduncle length. pistil length, stamen number and relative stamen number) leaf samples 50 times between 1987 and 1991, yearly.

Phenotypic characters are presented and analysed as means of individual measurements or computed counts (relative stamen number, shape indices of leaves), morphological marks. Data of different years are also considered as replicates. We collected the flowers grown on short fertile shoots, the leaves on the 3–4th nodes of healthy shoots. The colour of the nectaries are identified according to the international colour scale. Rootstock-effects expected on the two thoroughly examined Japanese varieties needed double as many replicates, so a 100 fold "inner sample" represented the means of the five years, each.

Mean values as characteristics of flowers and leaves served also for the regression analyses, of which the correlation coefficients (r-values) are presented. Colour of nectaries, lengths of peduncles and leaf stems (petioles) constituted group-characteristics for the 42 varieties plus the two Japanese plums on three different rootstocks each, altogether 48 items. The colour of nectaries and the length of peduncles as well as petioles (short, medium and long) are considered as units subject to analyses of variation with different numbers of replicates.

The individual items belonged partly to distinct botanic species or derivatives of different ancestors, thus we may distinguished *P. domestica* (3), *P. italica* (4), furthermore *P. cerasifera* (8), *P. salicina* (5), *P. americana* (3), *P. tomentosa* (3) type of varieties, whereas interspecific hybrids of the former species and of *P. besseyi*, (19).

The list of varieties in the respective collection represented by 5 trees each: Bonnie 221, De Soto and Weaver (*P. americana*); Cherna Afkazka, Dzhanka 1, Dzhanka 3, Kometa, Myr W 40, Nadezhda, Purpurovaya and Zlota Afkazka (*P. cerasifera*); Brompton, Chrudiemer, De Maris (*P. domestica*); Oktyabrskaya, Sentyabrskaya 21, Sentyabrskaya 23 and Sopernitsa (*P. italica*); Abundance, Burbank, Duarte, Elephant Heart and Frontier (*P. salicina*); Yakima (*P. simonii*); Drilea 473, Drilea W. 53 and Drilea W. 54 (*P. tomentosa*). Varieties of hybrid origin are: Compass (*P. besseyi* x *P. hortulana mineri*); *Oka* (*P. besseyi* x *P. salicina*); Marianna 2624 (*P. cerasifera* x *P. munsoniana*); KS 4, KS 9, KS 31, Methley, Santa Rosa (*P. cerasifera* x *P. salicina*); Goff, Laurie Wells and Redcoat (Burbank x Wolf) (*P. salicina* x *americana*); Brookred and Winered (*P. salicina* x *P. besseyi*); Friar (Gaviota x Nubiana) (*P. salicina* x /*cerasifera* x *salicina*/), *Friar* and *Laroda* (Gaviota x Santa Rosa /*P. salicina* x /*P. cerasifera* x *P. salicina*), or Mohawk (Italian Prune x Hall) (*P. italica* x *P. domestica*) (cf. *Ramming & Cociu*, 1992; *Faust & Surányi*, 1999; *Surányi & Erdős*, 1998, 2004).

Finally, we like to remark that the taxonomic characterisation on the basis of data raised at Cegléd, partially published already, suggests precaution because of the limited number of varieties, especially non-European ones, examined experimentally. Beginning with 1980, four times (1980, 1983, 1984, 1987) the trees grafted on myrobalan rootstock have been examined, additionally, two varieties Laroda and Santa Rosa have been grown on three different rootstocks:

Table 1. Characterisation of the plum flowers at Cegléd (1990–1995)

Cultivar	Peduncle length mm	Pistil length mm	Stamen number no	Relative stamen number no./mm	Colour of nectary
Abundance	8.8	10.3	29.7	2.93	orange-green
Bonnie 221	8.7	10.1	21.5	2.14	green
Brompton	6.6	9.4	27.2	2.93	green
Brookred	7.1	10.3	24.3	2.35	green
Burbank	9.8	8.8	18.7	2.13	brownish green
Cherna Afkazka	8.2	9.6	28.7	3.01	green
Chrudiemer	6.9	7.7	25.1	3.25	green
Compass	4.1	8.5	22.4	2.74	green
De Maris	9.0	12.5	22.6	1.76	green
De Soto	6.8	12.7	27.5	2.18	orange
Desertnaya	9.6	10.1	21.5	2.14	green
Drilea 473	6.0	7.2	18.3	2.50	dark green
Drilea W 53	5.9	7.1	18.5	2.58	dark green
Drilea W 54	6.0	7.1	18.4	2.60	green
Duarte	6.9	14.0	29.7	2.13	orange
Dzhanka 1	7.9	8.0	21.4	2.61	orange
Dzhanka 3	9.0	8.3	20.5	2.51	purplish green
Elephant Heart	11.2	8.9	26.2	2.81	orange-green
Friar	6.6	10.3	28.0	2.77	dark green
Frontier	7.7	13.6	21.6	1.59	green
Goff	10.1	10.1	20.6	2.03	brownish orange
Kometa	6.7	10.1	24.2	2.42	olive
KS 4	10.0	11.3	25.8	2.30	greenish orange
KS 9	11.2	10.7	24.9	2.38	green
KS 31	10.8	11.2	22.9	2.04	greenish orange
Laurie Wells	6.8	6.8	27.9	2.17	greenish orange
Marianna 2624	8.7	9.2	27.6	3.00	greenish orange
Methley	12.9	9.3	26.4	2.82	green
Mohawk	8.1	13.9	21.9	1.57	green
Myr. W 40	7.4	10.2	26.1	2.58	greenish orange
Nadezhda	8.1	9.2	26.1	2.80	purplish green
Oka	10.0	9.2	27.1	3.13	dark green
Oktyabrskaya	9.1	8.1	18.4	2.09	green
Purpurovaya	9.8	7.3	29.3	3.91	purplish green
Redcoat	8.6	8.4	20.8	2.52	purplish green
Sentyabrskaya 21	10.3	11.0	19.2	1.81	dark green
Sentyabrskaya 23	10.4	11.3	20.1	1.77	green
Sopernitsa	12.2	12.0	25.5	2.24	greenish orange
Weaver	6.3	8.7	16.1	1.86	brownish green
Winered	9.6	9.3	25.3	2.62	green
Yakima	10.3	11.8	26.8	2.29	green
Zlota Afkazka	8.5	8.6	29.5	3.48	green
LSD 5 %	**0.89**	**0.78**	**1.37**	**0.29**	–

Table 2. Stability of the flower compartments year by year (1990–1995)

Year	Peduncle length mm	Pistil length mm	Stamen number no.	Relative stamen number no./mm
1990	8.7	10.3	24.5	2.38
1991	8.1	10.2	24.4	2.39
1992	7.9	10.0	24.4	2.44
1993	8.1	10.2	24.9	2.44
1994	8.8	10.4	24.6	2.36
1995	8.5	10.3	24.1	2.33
LSD 5 %	**1.02**	**0.59**	**0.92**	**0.24**

C. 174 myrobalan, C. 449 bitter almond and C. 471 sweet almond (cf. *Surányi,* 1999; *Surányi & Erdős,* 2004a).

Results and Discussion

Table 1 presents the characteristics of reproductive organs also as means of measurements over six years. Length of peduncle and of pistil, stamen number as well as relative number (SN/PL) have been suitable to distinguish varieties. The shortest peduncles were typical for *Compass*, which are grouped into inflorescences like *P. tomentosa* 3 and the variety *Weaver*. No tight correlation has been found with the size of the pistil compared with results obtained from many data raised upon a few varieties. (*Surányi & Tóth,* 1976, 1977; *Tóth & Surányi,* 1980). In the length of pistil, *Laurie Wells* and *P. tomentosa* varieties excelled, whereas long pistils, longer than 12 mm as a mean, are not exceptions in cultivated plums. We found very long pistils, which have been attributed earlier to a tendency in female type flowers, and found in some egg- and date-type varieties as well as in the *C. 970 Besztercei szilva* clone (*Tóth,* 1957; *Surányi,* 1985; *Tóth & Surányi,* 1980; *Surányi,* 1991).

According to Table 1, the stamina number is rather variable, in varieties of intergeneric hybrid origin, less than 18 was typical, though occasionally more than 30 stamina per flower are also found. It is of interest, as we published it already repeatedly, there is a negative trend between the mean values of varieties and the seasons *(cf. Table 7)*. The relative stamina number is correlated with the length of pistil of the flower in question, which is an undoubted sign of competition for resources (cf. *Surányi,* 1985 and 1991).

The individual components of the phenotype are summarised in Table 2, which proves the stability of seasonal means in the reproductive organs as no significant differences are found. Much smaller differences are available in the experiment aiming to evaluate the effects caused by rootstocks in spite of the higher number of replicates compared with the varietal (i.e. scion) effects. Rootstocks caused smaller differences, only C. 174 myrobalan produced longer peduncle and pistil than the other two stocks on both scions, Laroda and Santa Rosa II *(Table 3)*. The relative per cent differences are not significant, generally. In analysing data of flower morphology, significant correlations have been revealed in Laroda and Santa Rosa II, whereas in leaf-morphology no similar correlation has been found. However, marked rootstock-effects are observed in leaf morphology, but not consequently.

A safe identification of varieties is possible according to the data of adult leaves *(Table 4)*. Petiole measures of the 48 items displayed wide variation, Abundance and Nadezhda excelled with very short petioles, whereas Oktyabrskaya and Sopernitsa developed very long leaf stems. It is not excluded, however, that some unknown virus infection could be considered as causal factor of the "petiole-effects".

Table 4 shows also the length of leaf blades. Sopernitsa had the largest but relatively narrow leaf with an index around 2,

Table 3. Characterisation of rootstock's effect on two P. salicina plums (1988–1993)

Cultivars	Peduncle length mm	Pistil length mm	Stamen number no.	Relative stamen number no./mm	Colour of nectary
Laroda/ C. 174 MY	10.5	10.1	24.5	2.44	green
Laroda/ C. 449 BA	10.1	10.0	25.0	2.49	green
Laroda/ C. 471 SA	9.8	10.0	25.3	2.58	green
LSD 5 %	**2.04**	**3.09**	**1.88**	**0.23**	–
Santa Rosa/ C. 174 MY	10.4	8.8	26.0	2.92	greenish orange
Santa Rosa/ C. 449 BA	10.0	8.6	26.4	3.07	greenish orange
Santa Rosa/ C. 471 SA	10.2	8.7	26.2	2.99	greenish orange
LSD 5 %	**2.47**	**1.89**	**2.41**	**0.27**	–

Seedlings: MY – **Myrobalan** BA – **bitter almond** SA – **sweet almond**

Table 4. Leaf characterisation of the plum leaves at Cegléd (1990–1994)

Cultivars	Petiole length mm	Length of leaf blade mm	Width of leaf blade mm	Form index
Abundance	10.3	69.4	34.6	2.01
Bonnie 221	15.6	57.8	39.8	1.45
Brompton	14.2	58.4	41.3	1.41
Brookred	16.3	71.3	46.5	1.53
Burbank	13.4	60.5	37.5	1.62
Cherna Afkazka	13.1	47.0	29.9	1.57
Chrudiemer	14.2	63.8	39.5	1.64
Compass	13.7	76.3	32.3	2.36
De Maris	11.5	64.2	41.5	1.55
De Soto	11.1	100.0	43.5	2.30
Desertnaya	17.8	71.0	39.9	1.78
Drilea 473	13.5	60.0	31.9	1.88
Drilea W 53	13.5	60.6	32.6	1.86
Drilea W 54	13.2	60.8	32.5	1.87
Duarte	11.5	61.7	33.1	1.86
Dzhanka 1	21.6	64.1	30.5	2.10
Dzhanka 3	21.3	64.4	30.6	2.10
Elephant Heart	13.3	70.4	28.4	2.48
Friar	16.5	65.6	40.3	1.63
Frontier	12.4	82.6	43.6	1.89
Goff	15.8	69.5	36.2	1.92
Kometa	14.2	69.6	41.7	1.67
KS 31	20.2	90.6	49.5	1.83
KS 4	14.4	76.8	36.7	2.09
KS 9	21.4	77.4	44.4	1.74
Laurie Wells	15.8	60.2	38.9	1.58
Marianna 2624	16.3	55.6	30.5	1.82
Methley	12.5	74.8	35.2	2.12
Mohawk	13.5	70.0	31.7	2.21
Myr. W 40	15.7	61.5	30.4	2.02
Nadezhda	10.2	77.2	61.6	1.23
Oka	12.6	68.5	47.6	1.44
Oktyabrskaya	23.1	73.5	40.2	1.83
Purpurovaya	18.4	81.7	48.4	1.69
Redcoat	15.0	67.7	40.4	1.68
Sentyabrskaya 21	19.1	89.5	44.8	2.00
Sentyabrskaya 23	19.4	119.6	62.0	1.93
Sopernitsa	25.4	122.3	61.4	2.00
Weaver	19.1	91.2	41.4	2.20
Winered	18.2	76.2	40.3	1.89
Yakima	12.6	70.4	28.8	2.44
Zlota Afkazka	10.8	51.6	24.5	2.11
LSD 5 %	**10.23**	**6.03**	**4.11**	**0.16**

Table 5. Stability of the leaf parts year by year (1990–1994)

Year	Petiole length mm	Length of lamina mm	Width of lamina mm	Form index
1990	15.2	70.8	37.5	1.89
1991	15.7	74.1	38.9	1.90
1992	15.4	72.6	38.6	1.88
1993	15.0	74.1	39.1	1.86
1994	15.3	72.9	38.5	1.88
LSD 5 %	**1.59**	**4.85**	**2.74**	**0.16**

Table 6. Leaf characterisation of plum leaves at Cegléd (1988–1993)

Cultivars	Petiole length mm	Length of lamina mm	Width of lamina mm	Form index
Laroda/ C. 174 MY	14.7	87.7	43.5	2.02
Laroda/ C. 449 BA	14.4	87.4	43.0	2.03
Laroda/ C. 471 SA	14.5	87.2	42.7	2.05
LSD 5 %	**0.26**	**0.28**	**0.41**	**0.16**
Santa Rosa/ C. 174 MY	13.1	58.4	30.6	1.91
Santa Rosa/ C. 449 BA	12.9	57.1	30.2	1.89
Santa Rosa/ C. 471 SA	12.9	57.4	30.6	1.88
LSD 5 %	**0.37**	**0.33**	**0.56**	**0.14**

Seedlings: MY – **Myrobalan** BA – **bitter almond** SA – **sweet almond**

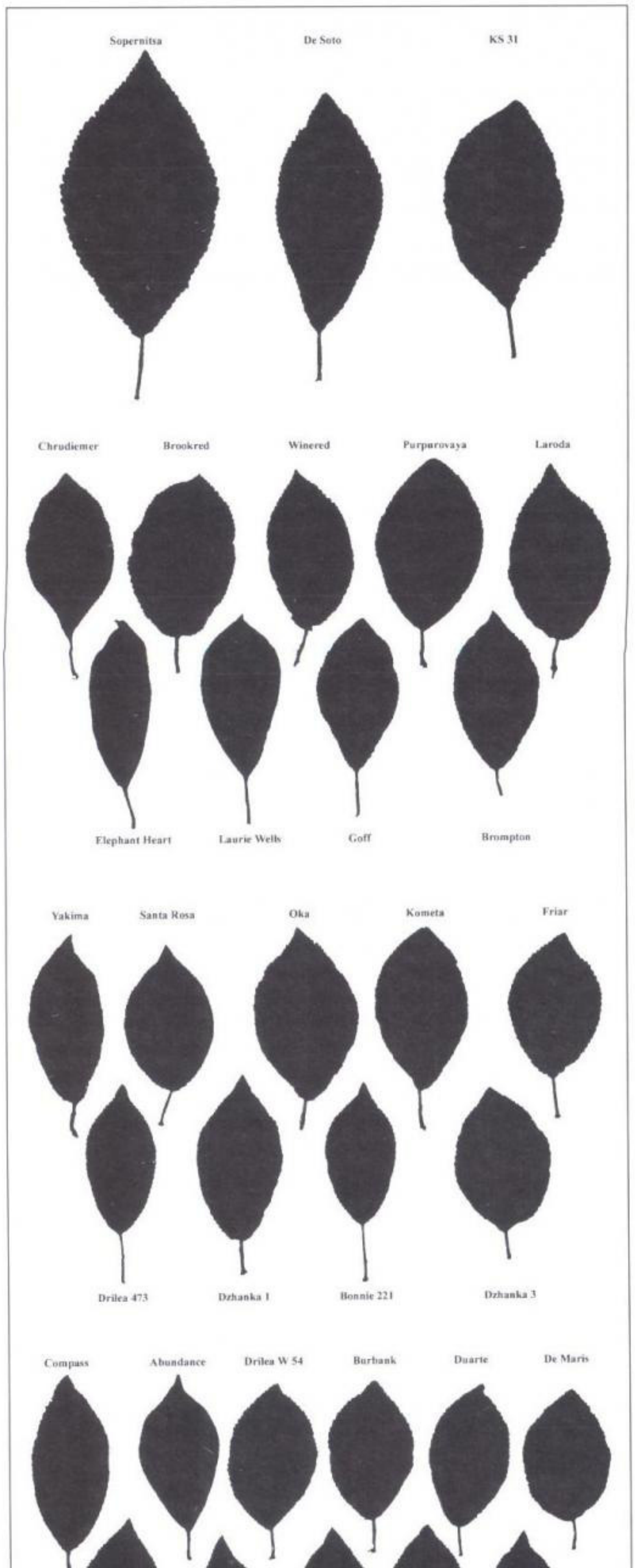
Table 7. Summary of correlation analysis (1990–1995* and 1990–1994**)

Relationships	**r-value according to cultivars**	**r-value according to years**
in flowers		
Peduncle lenght and Pistil length	+0.2983	*+0.9089*
and Relative stamen number	+0.0111	+0.0084
Pistil length and Stamen number	–0.2704	–0.2434
r-value and P=5 %	0.3044	0.8114
in leaves		
Petiole length and Length of blade	*+0.3958*	+0.2133
and Width of blade	*+0.4293*	+0.1403
and Form index	–0.0954	+0.0052
Length and Width of blade	*+0.7867*	*+0.9730*
r-value and P=5 %	0.3044	0.8783

Note: sloped is significant

Table 8. Relationship of flower and leaf traits according to the colour of nectary (1990–1994)

Measures	**Orange and purple n=18 nectaries**	**Green n=30 nectaries**	**Trait LSD 5 %**
Peduncle length, mm	9.2	8.5	0.83
Pistil length, mm	10.3	9.8	0.70
Stamen number, no.	25.9	23.1	1.59
Relative stamen number, no./mm	2.58	2.34	0.12
Petiole length, mm	15.6	15.1	0.85
Length of blade, mm	78.8	72.1	2.73
Width of blade, mm	41.5	39.4	1.86
Form index of the blade	1.91	1.82	0.38



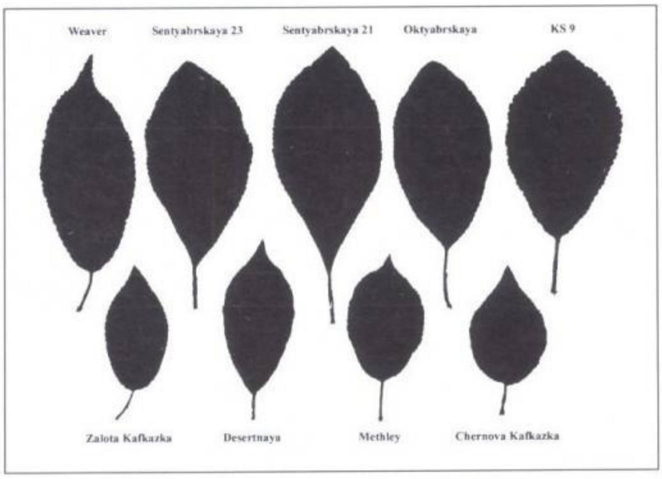


Figure 1. Diversity of plum leaves on size and form (size 1:25 ratio)

leaves of Yakima had 2.44 and of Nadezhda 1.23 only. Very short, hardly tapering leaves are typical to Cherna Afkazka and Zlota Afkazka, but they are also proportionally narrow. Sentyabrskaya 23 and Sopernitsa head markedly broad leaves.

Earlier studies proved that the actual yields are not tightly correlated with leaf measures, therefore no immediate effects of photosynthetic activity of individual trees on the content of soluble solids could be stated, although Jovančević (1978) induced by defoliation in the variety *Požegača* changes of the appearance of fruits and reduced chemical quality, which indicate the importance of the ratio leaf/fruit.

Table 5 shows convincingly the varietal specificity of the measures of leaves grown on the third or fourth node of long shoots. The effect of rootstock on the leaf-phenotype, however, was not significant *(Table 6)*. The stability of leaf-size data is supported by correlation analysis, i.e. length of the petiole is correlated significantly with the length and width of the leaf blade. In plum varieties, considering healthy leaves only, the proportions of leaf dimensions are unequivocally decisive *(Figure 1)*, and any change of the ratios may considered as a consequence or symptom of virus infection, especially Plum pox. (cf. *Surányi*, 2005, in press).

Between the flower comparts, the correlations were much more loose *(Table 7)*, which may explained as a consequence of the large taxonomic and genetic distances between the varieties manifested in a considerable morphological diversity. Flowers may appear either alone or in groups of 2 and 3, their size may be small, large or very large, but in *P. salicina* and *P. tomentosa*, we are rather dealing with inflorescences (*Surányi,* 1978), moreover, within one inflorescence the individual flowers are of different size. Meanwhile an unexpected tight correlation was found between the length of petiole (leaf stem) and the relative stamen number. No reasonable interpretation could be given to this observation *(Figure 2)* although this contention proved to be consistent as indicated in earlier papers (*Surányi*, 1972 and 1973).

At the end of the 1980-es, correlations have been revealed between the colour of nectaries and the stamen number, which is of micro-evolutionary significance.

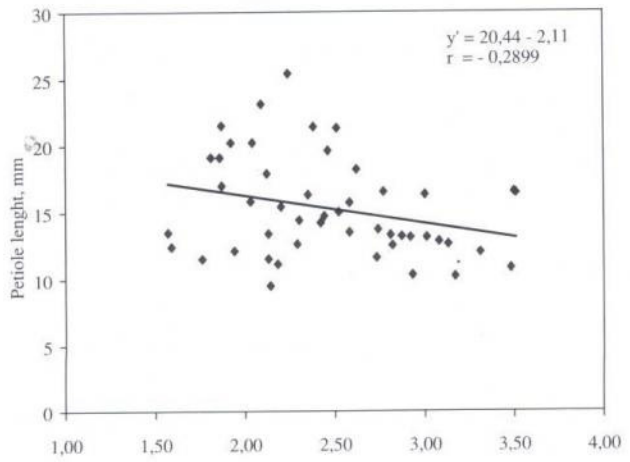


Figure 2. A stochastic relationship between relative stamen number (SN/PL) and petiole length

Table 9. Relationship of flower and leaf traits according to length of peduncle (1990–1994)

Measures	Long n=16	Medium n=20	Short n=12	LSD 5 %
	peduncle length			
Peduncle length, mm	10.8	8.7	6.3	0.92
Pistil length, mm	10.2	9.7	9.4	0.67
Stamen number, no.	24.6	24.1	23.5	0.79
Relative stamen number, no./mm	2.41	2.48	2.50	0.22
Petiole length, mm	15.9	15.3	14.4	0.81
Length of lamina, mm	79.8	67.4	69.6	6.13
Width of lamina, mm	40.8	37.9	38.0	3.10
Form index of blade	1.96	1.78	1.82	0.25

Table 10. Relationship of flower and leaf traits according to length of petiole (1990–1994)

Measures	Long n=9	Medium n=19	Short n=20	LSD 5 %
	petiole length			
Peduncle length, mm	9.7	8.7	8.4	1.24
Pistil length, mm	9.9	9.5	10.0	0.69
Stamen number, no.	21.0	25.0	24.6	3.17
Relative stamen number, no./mm	2.12	2.65	2.49	0.44
Petiole length, mm	21.2	15.5	12.4	0.75
Length of blade, mm	88.1	70.5	66.4	8.68
Width of blade, mm	45.0	39.4	35.7	2.12
Form index of blade	1.99	1.79	1.88	0.20

Essentially, 30 varieties have green or greenish nectaries, whereas the rest of varieties develop orange or purplish ones. The phenomenon of hipoandry was associated with the green nectaries (*Surányi & Orosz-Kovács,* 1992). The difference between the former two groups displayed only a slight trend, if sizes of peduncle and pistil have been considered. The length of petiole has been less specific than the size of leaf blade *(Table 8)*.

In spite of the earlier morphological analyses of varieties, which did not prove any trend, the length of peduncle seemed to be related to other morphological traits, all the same. There was some trend-like and significant difference between groups of specific petiole-lengths and stamen number *(Table 9)*. In variety groups of distinct lengths of petioles, there was a remarkable negative correlation with the stamen number, which is supposed to be an effect of Sharka (Plum Pox) virus infection being present in the collection of varieties. Measures of leaves suggested the same conclusion *(Table 10)*.

All those results led to the conclusion that a proper acclimation should not and cannot be dispensed from a thorough evaluation and individual selection of the new accessions. The objective of pomology should serve also for practical purposes. The "traditional pomology" is certainly slower and more clumsy than the actually preferred way of frantic search for novelties urging to an evaluation of varieties. The performance of a well founded selection of varieties is proved by the longevity of the varieties registered earlier for commercial production as well as for home gardens.

The actual growing practice is not without risk from the point of view of ecology as well as of genetics because 2 to 4 years are not sufficient to assess the utility of woody plants, their adaptive ability and the inherent diseases carried on by scion wood causing heavy damages on the long run. Further concern is related with the uncontrolled gene-flow and the possible deterioration of varieties by genetically modified organisms.

The most important consequences are summarised below:

1. Plum species and varieties, distant from the European plums genetically and in their ecological requirements are accurately described – and identified – by means of the morphological terms presented in this paper. First of all, variation of the size of pistil and the stamen number being "regulated" by the former, corroborates the hypothesis of tight functional coordination between the parts of the flower.
2. The information concerning the morphogenetics and the pomological characteristics published earlier on a high number of acclimated varieties (*Surányi & Erdős,* 2004a and 2004b) will contribute to and shorten the first phase of the process of acclimation, which facilitates the sorting out of unsuitable items before their incorporation into the Gene Bank II collection. At Cegléd, this policy has been already adopted being unequivocally thrifty.
3. In the collection, from nearly 400 varieties, most of them being non-*domestica* types, 44 have been chosen at the beginning, subsequently, 20 of them have been subject to detailed tests and pomological analyses because being considered to be potentially promising.
4. The experiment designed to assess rootstock effects on *P. salicina* plums including flower- and leaf-morphology, did not produce spectacular results, but as a contradiction to Mediterranean experiences, almond seedlings were not significantly superior to the C. 174 myrobalan rootstock.

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