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General Part

Evaluation of taxonomic characters

The evaluation of taxonomic characters in this study is based mainly on the investigation of a great amount of herbarium specimens. Important information was obtained from a biosystematic research carried out in local populations of *Prangos ferulacea* (Herrnstadt & Heyn 1975b).

We arrived at the conclusion that many characters on which previous authors based specific delimitation should be altogether discarded or used within certain limits. The main diagnostic characters used in this study are listed below:

- *Leaves.* The extent to which leaves are dissected and the shape and size of leaf lobes have been found to be valuable diagnostic characters within certain limits. However, basal and cauline leaves of one plant may differ in these characters. Comparison between plants is to be based, therefore, on one type of leaves only, preferably on the basal ones which show a smaller range of variation within plants.
- *Umbels.* The number of rays and their size in terminal umbels were found to be specific characters. The ratio of hermaphrodite versus male flowers in lateral umbels may also serve, at least in some cases, for specific characterization.
- *Bracts and bracteoles.* Both are typical for some species, but may be deciduous at an early stage of development and therefore of little use in herbarium specimens. It should be noted that, at least in some species, the shape, size and number of bracteoles are not similar in different umbellules of the terminal umbel.
- *Sepals.* The existence or lack of sepals is an important diagnostic character.
- *Corolla.* The pubescence of the outer surface of the corolla has served for subdivision of the genus into groups (Boissier 1872). It has been found to be a stable character within species.
- *Fruit.* The taxonomy of *Prangos,* as of *Umbelliferae* in general, is based mainly on fruit morphology. The characters of diagnostic value are the form and texture of fruit, the degree of development of ribs and wings and the shape of wings. However, within some species, certain fruit characters (*e.g.*, outgrowths between wings in *P. pabularia* or width of wings in *P. ferulacea*) show a continuous variation. Fruit characters may change gradually during ontogenesis. For that reason only mature mericarps should serve for comparison (Herrnstadt & Heyn 1975b). The fruit anatomy has been found to be a most important character for the grouping of species into sections (see p. 15).

Distribution

Prangos is mainly a plant of the Irano-Turanian phytogeographic region. The majority of species occur between 30°-40°E. and 30°-70°N. *P. trifida* and *P. ferulacea* are the only two species distributed west to 30° and the *P. pabularia* species complex east as far as 80°.

Species are recorded to grow mainly on soils developed from chalky rocks, rarely on loess, basalt and in Central Asia in salines. Korovin (1961) discussed speciation in the genus on different soils.

Some of the characteristic features of *Prangos* make the genus well adapted to growing in extreme habitats. All the species are perennials and, according to their life form, belong to the group of hemicryptophytes (Raunkiaer 1934). In such plants only the underground parts remain alive for more than one season and the remnants of the dead stems and leaves of each year may be seen as a fibrous collar around the base of the plant (see fig. 3). In *P. ferulacea* we found that the buds are buried 5-10 cm below the surface of the soil.

Germination in *Prangos* follows an uniform pattern: the shoot apex is enveloped by a cotyledonary tube up to a certain degree of development and is protected by it from desiccation. Such a cotyledonary tube was observed in *Prangos* (Yaniševskii & Pervuhina 1948) and in various other umbelliferous genera (Haccius 1952, Tronchet 1967, Zoz & Chernykh 1961).

The two most outstanding features in the geographic distribution of *Prangos* are the occurrence of two centres of speciation and the great number of species endemic to very small areas (point endemics).

Among the 24 known species of the genus, only very few have a wide range of distribution. *P. ferulacea* (map 2) and *P. pabularia* (map 1) mentioned above, which are distributed throughout a large area, are the most variable species and might, in fact, be aggregate species. *P. trifida* (map 5) is the only exclusively North Mediterranean species of the genus.

All remaining species (maps 1-7) are clustered around two centers: the western (Turkey to W. Iran, including Syria) comprising the majority of species and the eastern (E. Iran, Afghanistan to Central Asia) comprising 6 species. About half of the species are endemics with a most restricted area of distribution.

The large proportion of endemic plants in the high mountain areas of the Irano-Turanian phytogeographic region has been pointed out in botanical literature of recent years (Davis 1971, Zohary 1973). The species of the genus *Prangos* which occur, more or less exclusively, on mountain slopes, mainly at over 1000 m and up to 4000 m, may serve as a further illustration of this phenomenon.

The correlation between distribution patterns and species groups is discussed in connection with evolution in the genus (pp. 17-21).

Chromosome studies

Previous records of chromosome numbers are very few in *Prangos*. They are $2n = 22$ in *Cachrys odontalgica* (Kordyum 1967) and $2n = 36$ in *Prangos pabularia* (Podlech & Dieterle 1969). According to Moore (1971), chromosomal data are relatively few in the *Umbelliferae*, covering only about 30% of the species of the family.

In the present study, chromosomes have been counted in 6 species (23 samples). We did not succeed to carry out a wider study, due to the small proportion of viable seeds available and the difficulties in obtaining seedlings for cytological investigations (see p. 9).

The chromosome numbers found by us are summarized in table 1. These, and the previous record in *Prangos odontalgica,* show the basic chromosome number of *Prangos* to be $x = 11$ (the only exception, $2n = 36$ of Podlech & Dieterle, needs further elucidation). Three levels of "ploidy" have been found in our study: $n = 11$, $n = 22$ and $n = 33$. Except for *P. ferulacea* ($n = 22$, 33) and its close relative *P. asperula* subsp. *haussknechtii* ($n = 33$), all species studied are diploids ($n = 11$).

Polyploidy is a comparatively rare phenomenon in the *Umbelliferae,* more so the occurrence of hexaploidy ($n = 33$) which is not recorded at all in the *Smyrnieae,* the tribe to which *Prangos* belongs (cf. Moore 1971). The fact that *P. ferulacea,* the most variable and widespread species in the genus, is a polyploid, may perhaps serve as an example for the positive correlation between polyploidy and adaptivity to diverse habitats.

However, the concept presented here is incomplete, as chromosomal data for the majority of species, including European populations of *P. ferulacea* and the only other European species, *P. trifida,* are so far not available.

The karyotypes of all species are symmetric. Chromosomes are metacentric or submetacentric and about equal in length. As the root tips have been pretreated by para-dichlorobenzene, it is difficult to reach any conclusions as to the absolute length of chromosomes. However, the size of chromosomes does not seem to decrease with higher ploidy level (pl. I).

Pollen

Pollen grains of the *Umbelliferae* are characterized by their general uniformity. A thorough palynological survey has been carried out during many years by Cerceau-Larrival (*e.g.,* 1962, 1963, 1965, 1967, 1971). She grouped the pollen grains around 5 basic types according to the inner outline of the endexine (nexine). The types are: subrhomboidal *(Rh),* subcircular *(C),* ovoid *(O),* subrectangular *(Rg)* and equatorially constricted *(E).* She examined two species from the genus studied here *"Cachrys alpina" (= Prangos trifida)* and *"Cachrys goniocarpa" (= P. ferulacea),* and included both in the *Rg* type.

In our study, acetolyzed pollen (according to Erdtman 1952) of 8 species of *Prangos* has been studied. Pollen grains from 14 populations of *P. ferulacea* from diverse localities, throughout its range of distribution, have been compared. The sources of the pollen are listed in table 2.

By measuring in each sample 20 viable pollen grains by the light microscope, the average size was recorded. The length of pollen grains was found to range from 39 to 65 μm. However, in cases where several pollen samples of one species were measured, a considerable variation in size between populations was observed: in 3 samples of *P. pabularia* the lowest record was 44 μm, the highest 53 μm; in 14 samples of *P. ferulacea,* 39 and 65 μm, respectively.

Contrary to Cerceau-Larrival (1971), who assumes the internal contour of the endexine to be a stable generic character, some infrageneric and even infraspecific variation has been found by us in *Prangos* (table 2; pl. II-III).

Species	Sources*	2*n*	*n*	Pl. I
P. (Intactae) ferulacea	Turkey, entre Trabzon et Erzurum, *Carbonnier JC/70/1* (W)	44		A
	Turkey, Malatya, Dogansehir, Eskiköy, *Peşmen*	66		B
	Israel, Aiyalon valley, Beyt-Hashmonai, *Herrnstadt*	66		
	Israel, Esdraelon Plain, Dovrat, *Herrnstadt* . . .		33	
	Israel, Lower Galilee, Belvoir, *Herrnstadt*		33	
	Israel, Lower Galilee, Beyt-Netofa valley, *Herrnstadt*	66		
	Israel, Upper Galilee, Rosh-Pinna, *Herrnstadt*		33	
	Israel, Upper Galilee, Mt. Almon, *Herrnstadt*	66		
	Israel, Upper Galilee, Meyron junction, *Herrnstadt*		33	
	Iran, Azerbidjan, Ghoje Dagh, *Lamond 4961* . .	66		
	USSR, Hort. Bot. Acad. Sci., Armeniae Erevan	66		
	USSR, Bot. Gard. Moscow, No. 714	66		
P. (Intactae) asperula subsp. *hausknechtii*	Iran, Azerbidjan, *Lamond 4617*	66		C
P. (Intactae) gaubae	Iran, Azerbidjan, *Lamond 4443*	22		
	Iran, Azerbidjan, *Rechinger 42662* (W)	22		D
P. (Intactae) bucharica	Afghanistan, Takhar, *Anders 6807* (W)	22		E
P. (Prangos) pabularia	Turkey, Gümüsane, *Lamond 2597*	22		
	Turkey, entre Erzurum et Agri, *Carbonnier JC/70/2* (W)	22		F
	Turkey, Malatya, Dogansehir, Eskikoy, *Peşmen*	22		
	Turkey, Malatya, 27 km N. of Gölbasi, *Alava 6950*	22		
	USSR, Hort. Bot. Acad. Sci., Mosqua "H-276" No. 904	22		
	USSR, Hort. Bot. Acad. Sci., Armeniae Erevan	22		
P. (Prangos) uloptera	USSR, Hort. Bot. Acad. Sci., Mosqua "H-276" No. 905	22		G

*Voucher specimens or seeds at HUJ, unless otherwise stated.

Table 1. – Chromosome numbers in the genus *Prangos*.

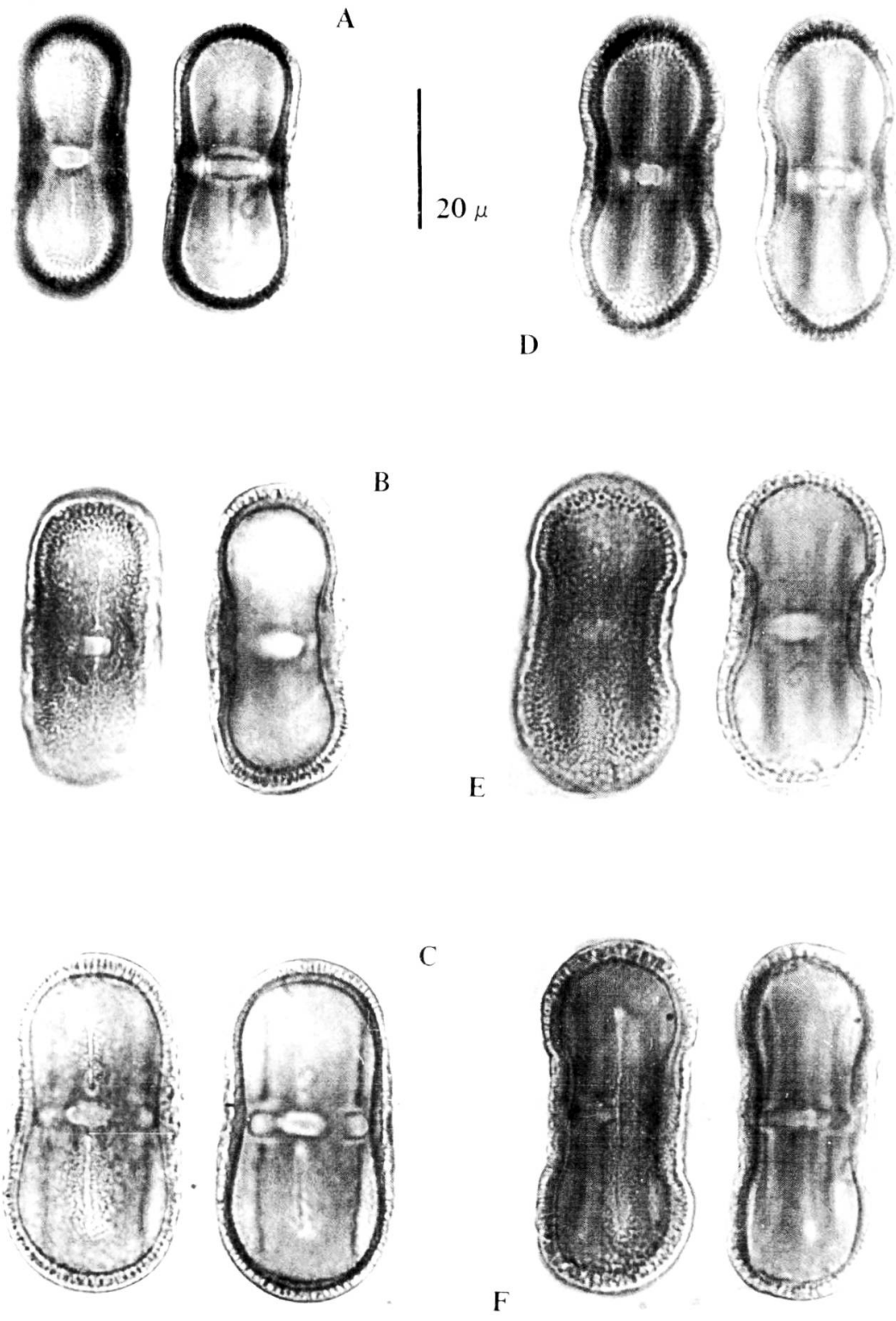
Species	Source	Basic shape*	Plate
P. pabularia	Turkey: Munzur Dag, *Davis 31365* (E)	O, E (Rg)	
	Turkey: 12 km from Özaep to Van, *Davis 44346* (E)	O	
	Turkey: Kavussapah Dag, *Davis 23055* (E)	O	
	Afghanistan: Takhar, Oberes Khausch-Tal, *Podlech 11785* (E)	Rg (R)	
P. uloptera	Turkey: Van, *Huber-Morath 9292* (herb. Hub.-Mor.)	O (Rg)	
	Turkey: Resadiye-Kotum, *Davis 22376* (E)	O (Rg) E?	
P. peucedanifolia	Turkey: 10 km S von Sürgü, *Huber-Morath 13657* (herb. Hub.-Mor.)	O (Rg)	
P. platychloena	Turkey: Pülümir, *M. & D. Zohary 3011* (HUJ) . . .	Rg-O	
P. ferulacea	Turkey: 6 km S. of Bitlis, *Davis 43063* (E)	Rg	
	Turkey: 32 km from Çat to Erzurum, *Davis 47376* (E)	O?	
	Turkey: 2 km S.W. of Hamur, *Davis 44172* (E)	Rg	II F
	Turkey: Nemrut Dagh, 7600 ft., *Davis 23568* (E)	Rg	II D-E
	Turkey: 8 km from Kars, *Davis 30611* (E, HUJ)	Rg-O	
	Italy: Sicily, supra Panormum, *Leresche* (G)	E	II A
	Italy: Sicily, prana della Canna, *Huet du Pavillon* (G)	Rg	II B
	Romania: Inter Verciorova et Guravoie, *Degen* (JE)	O	III C
	Greece. Peloponnesos: Olonos, *Cyrén* (GB)	O (E)	II C
	Israel: Philon, *Herrnstadt* (HUJ)	(Rg) O (E)	
	Israel: Between Zafed and Rosh Pinna, *Herrnstadt* (HUJ)	O	III D
	Israel: Tel Arad, *Herrnstadt* (HUJ)	Rg-O	
	Iran: prope Schiras, *Kotschy 324* (JE)	E	III B
	USSR. Azerbaijan: Schuscha, 5-6.1838, *Hohenacker* (JE)	Rg	III A
P. uechtritzii	Turkey: Hadim Taçkent, *Huber-Morath 8604* (herb. Hub.-Mor.)	Rg-O	
P. acaulis	Iran: Persepolis, *Kotschy 835* (G-BOIS)	Rg-O	
P. meliocarpoides	Turkey: near Tuz Golu, *Davis 18655* (E)	(E) O (Rg)	

*Abbreviations according to Cerceau-Larrival (1971). See explanation in the text.

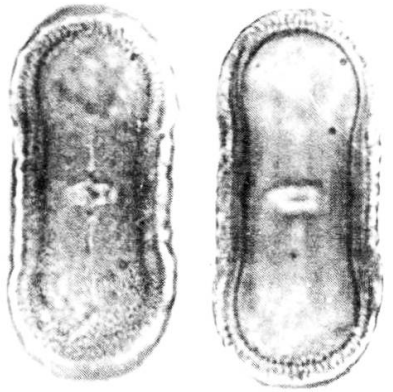
Table 2. – Types of pollen grains in the genus *Prangos.*

Mitotic metaphase plates in squashes of root tips (pretreated with α-paradichlorobenzene, stained with orcein-acetate 2%).
A, *Prangos ferulacea* ($2n = 44$); B, *P. ferulacea* ($2n = 66$); C, *P. asperula* subsp. *haussknechtii* ($2n = 66$); D, *P. gaubae* ($2n = 22$); E, *P. bucharica* ($2n = 22$); F, *P. pabularia* ($2n = 22$); G, *P. uloptera* ($2n = 22$); for localities see table 1).

Pl. II

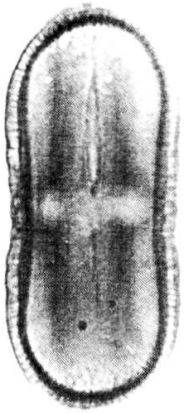


Pollen grains of *Prangos ferulacea* from diverse localities (light microscope; photograph of two levels: one focussed on the ectexine and the second on the inner outline of the endexine. **A, B,** Italy; **C,** Greece; **D-F,** Turkey. For a detailed list of localities see table 2.

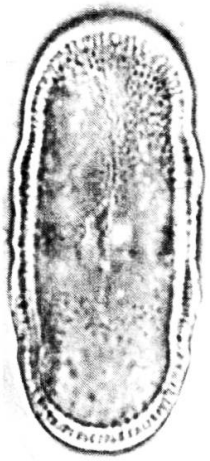


A

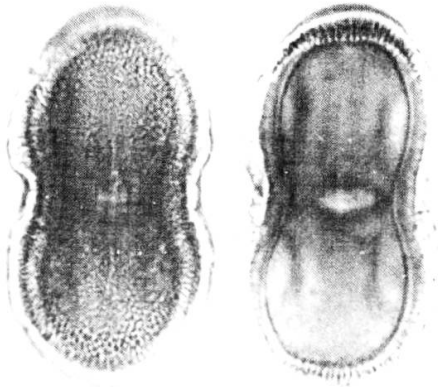
20 μ



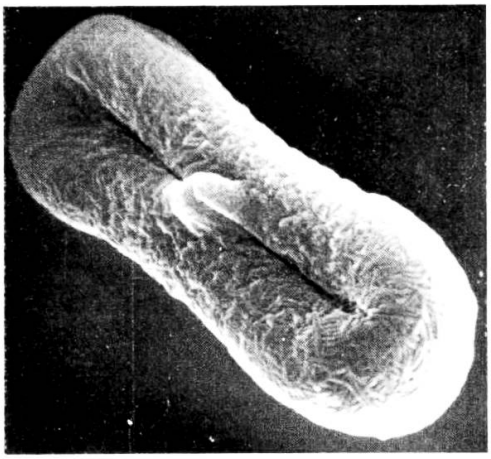
C



D

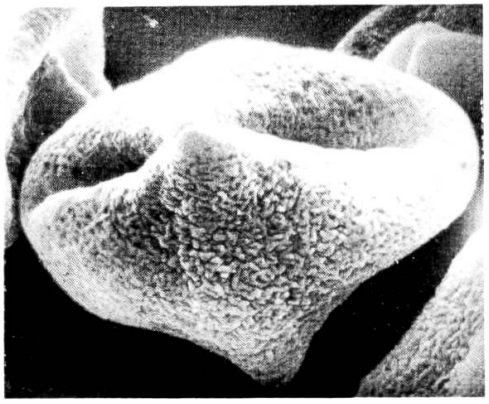


B



E

10 μ



F

10 μ

A-D, pollen grains of *Prangos ferulacea* from diverse localities (continued from pl. II, *q.v.*). **A**, USSR; **B**, Iran; **C**, Romania; **D**, Israel. **E**, pollen of *Heptaptera anisoptera* from Israel (scanning electrone microscope); **F**, pollen of *Trachydium* sp. from Afghanistan (scanning electrone microscope).

A comparison of the pollen of *Prangos* and related genera is included in table 3.

The tectal surface of the pollen of all *Prangos* species studied by SEM is uniform and agrees with that recorded by Cerceau-Larrival (1971, pl. 9). This character is more or less identical in all the genera related to *Prangos* (pl. II-III).

Fruit anatomy

Fruits of *Prangos* are, as a rule, conspicuously large and have a thick layer of mesocarp. The seeds are small as compared to the whole size of the mericarps and consist mainly of the endosperm (fig. 1 A-C), whereas the embryo occupies only about 5% of the volume of the mericarp. The endosperm, which contains lipids and proteins, has involute margins in the mature fruit, a character common to the species of the tribe *Smyrnieae*. Involution of the endosperm proceeds gradually during fruit ontogenesis (Herrnstadt & Heyn 1975b; fig. 4 A-C).

The thick mesocarp tissue of the fruit of some umbelliferous species has been mentioned under various names: spongy tissue, aerenchyme, pleenchyme, etc. Briquet (1929) discussed its adaptive value for seed dispersal by water and described the cells as "full with air", having lignified but never suberized cell walls.

In cross sections of fruits of *Prangos* species studied by us, the thin cell walls of the wide mesocarp layer reacted positively to Sudan IV and negatively to phloroglucinol, proving the existence of suberin, not lignin.

The nature of the mesocarp tissue adapts *Prangos* fruits to dispersal by water or wind. The habitat of the majority of species is on mountain slopes, where fruit dispersal is possible by wind but not by water. Some of the evolutionary trends in the genus *Prangos* lead to the improvement of the adaptation of the fruit to wind dispersal (see p. 17).

Fedtschenko (1899) was the first who proposed a subdivision of *Prangos* (sensu Boissier – not including *Cachrys*) according to fruit anatomy. He recognized two species groups without formal taxonomic rank: the first is characterized by a dense, uninterrupted layer of mesocarp and the second by mericarps with mesocarp divided into five blocks by the exocarp.

Kuzmina (1962) subdivided *Prangos* (without *Cachrys*) into two sections – *P.* sect. *Prangos* and sect. *Intactae*. She mainly followed Fedtschenko (1899) adding, among other diagnostic characters, the different distribution pattern of the vascular bundles in the two sections: in *P.* sect. *Prangos* they occur in and around the mesocarp, in sect. *Intactae* around the mesocarp only.

In our studies we arrived at the conclusion that *P.* sect. *Intactae* Kuzmina comprises, in fact, two anatomical groups which are considered by us as two separate sections: while in *P.* sect. *Intactae* s.str. the aerenchymatous mesocarp is subdivided into 5 blocks; in our new section, *P.* sect. *Meliocarpoides*, this tissue is continuous. Kuzmina, who was aware of the two anatomical types in her *P.* sect. *Intactae*, did not, however, evaluate them properly.

It seems to us that the continuous mesocarp, which among the genera related to *Prangos* occurs only in *Cryptodiscus* (cf. fig. 1 A-G), should be regarded as a derived character in the genus. The fruit anatomy in general is one of the diagnostic characters of *Prangos* with respect to the genera considered as its relatives: *Heptaptera*, *Hippomarathrum*, *Cryptodiscus* and *Trachydium* (fig. 1; table 3).

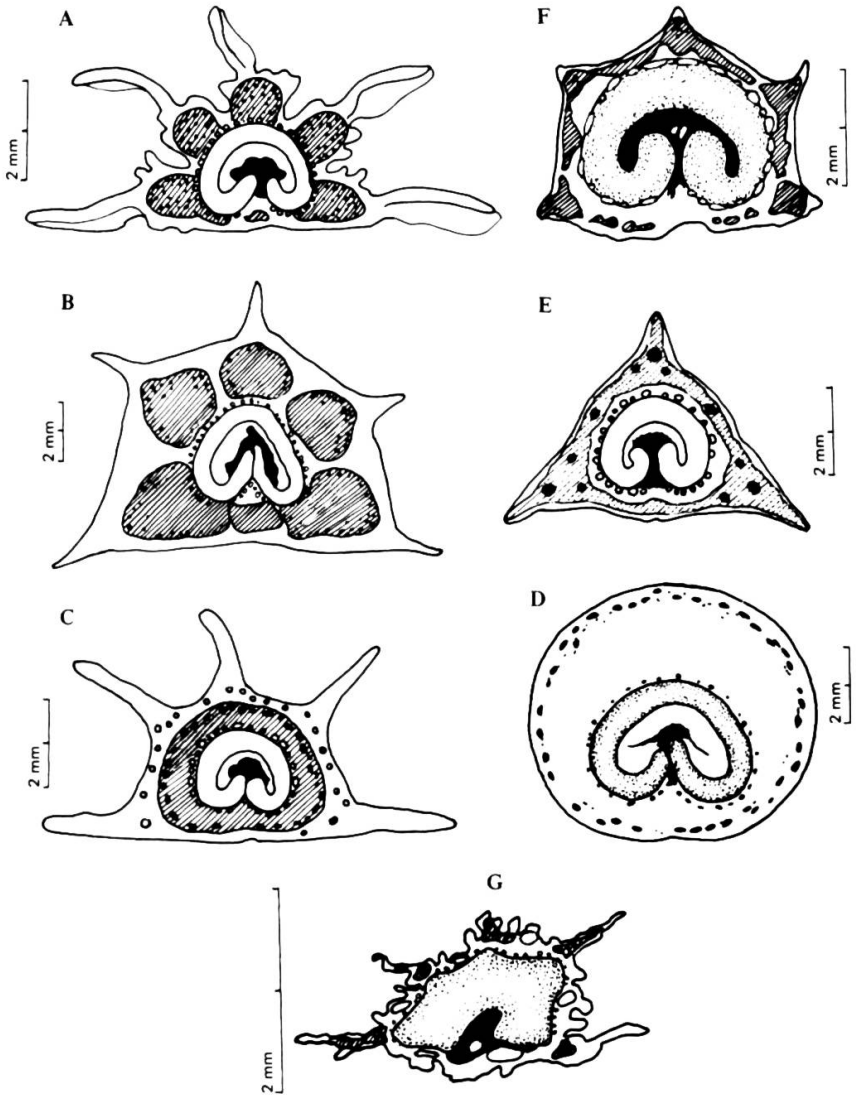


Fig. 1. – Cross sections of fruits of *Prangos* and related genera. **A**, *P. (Prangos) pabularia;* **B**, *P. (Intactae) ferulacea;* **C**, *P. (Meliocarpoides) meliocarpoides;* **D**, *Cryptodiscus persica;* **E**, *Heptaptera anisoptera;* **F**, *Hippomarathrum cristatum;* **G**, *Trachydium* sp. (Afghanistan, *Furse 8754,* K). – Dots = vascular bundles; circles = vittae.

Evolutionary trends in Prangos

In order to understand the evolutionary trends in *Prangos,* they have to be studied in a frame including related genera.

In floristic treatments the genera *Hippomarathrum* (sensu auct.), *Heptaptera* Boiss. & Reuter (= *Colladonia*), *Cryptodiscus* Schrenk and *Trachydium* Boiss. are usually considered as close to *Prangos,* or are even united with it. Discussion of the relationship of *Prangos* with *Heptaptera* and *Hippomarathrum* have been included by us in papers previously published (Herrnstadt & Heyn 1971, 1975b). In table 3 the distribution of characters in *Prangos* and related genera is summarized.

It must be stressed that our knowledge of *Prangos* is much more thorough than of the other genera, and that even in *Prangos* information on infraspecific variation is somewhat unbalanced: whereas we are well acquainted with every detail of variation in *P. ferulacea* in which we were able to carry out field studies, we had to rely in other species on herbarium material only. As stated above, this material was, at least in several cases, rather scarce and unsatisfactory.

From all available data, plants with the following combination of characters may be suggested as the hypothetical "basic *Prangos*": glabrous to somewhat papillate plants with compound, at least 3-pinnate, leaves with long lobes; sepals conspicuous and petals with reflexed margins; fruit somewhat suberized and with entire, straight-margined wings; no outgrowths on the fruits surface.

Some of the above basic characters may be discerned in *P.* sect. *Prangos* (species 1-3): *P. pabularia, P. latiloba* and *P. uloptera,* which occupy the easternmost part of the area of the genus (E. Turkey to S.E. USSR and Kashmir – map 1). These are the only *Prangos* species with conspicuous sepals and with thickened mesocarp occurring exclusively under the primary ribs of the mericarps.

Two important evolutionary trends of the genus in general may be seen in *P.* sect. *Prangos:* there is a gradual variation in fruit morphology from the typical *"uloptera"* to the extreme *"pabularia"* type, *i.e.,* from fruit with straight to slightly undulate, entire-margined wings without any outgrowths between them, to fruit with plicate, crenate to fimbriate-margined wings and with outgrowths varying in shape, size and density on the wings and between them; intermediate forms are abundant (table 4; fig. 5). A similar trend of outgrowths development in *P.* sect. *Intactae* (group 4) will be discussed below.

In *P.* sect. *Intactae,* in which 19 out of the 24 species of the genus are included, it is possible to derive all existing forms from the "basic *Prangos* type" by assuming the existence of three main trends in fruit evolution.

1. Moderate thickening of the mesocarp, together with increase of the width and, subsequently, undulation of the wings.
2. Extreme thickening of the mesocarp, together with wing reduction.
3. Development of outgrowths on fruit surface.

Trends 1 and 2 are of adaptive value for wind dispersal (see p. 15).

Based on these trends it is possible to divide *P.* sect. *Intactae* roughly into 4 main species-groups connected by intermediates, and several exceptional forms (fig. 2). Within each group there are some parallel trends of variation, as increase in pubescence of vegetative parts, more rarely also of petals, and decrease in length of leaf lobes. At least some of the species in each group are endemic.

Genus	*Number of species*	*Fruit*							
		shape	*length in mm*	*ribs*	*surface*	*mericarps*	*endosperm*	*pericarp*	*position of vascular bundles*
Prangos	24	ellipsoid to globose pyriform	(7-) 10-25 (-30)	absent to winged	glabrous, pubescent, tuberculate	equal, separated	margins involute	> endosperm	corresponding with primary ribs, or scattered. Sect. *Meliocarpoides* (fig. 1 A-C)
Cryptodiscus	4*	subglobose to subcylindrical	4-9	obtuse	glabrous, densely pubescent	equal, geminate	margins involute	> endosperm	scattered (fig. 1 D)
Heptaptera	6	wedge-shaped	(8-) 10-20 (-25)	winged	glabrous	unequal, separated	margins involute	> endosperm	corresponding with primary ribs (fig. 1 E)
Hippomarathrum	12*	obpyriform to broadly globose	(4-) 5-10 (-11)	obtuse to conspicous	glabrous, papillate, verrucose	equal, separated	margins involute	< endosperm	corresponding with primary ribs (fig. 1 F)
Trachydium	10*	ovoid to subglobose	1-4	conspicous to winged	vesiculose	equal, separated	margins straight	< endosperm	corresponding with primary ribs (fig. 1 G)

*According to Willis (1966).

Genus	*Leaves*		*Calyx teeth*	*Pollen shape**	*Chromosome numbers*	*Distribution*
	degrees of dissection	*terminal lobes*				
Prangos	(3-)4-6	filiform to broad-linear	– (sect. *Intactae* & *Meliocarpoides*) + (sect. *Prangos*)	Rg (O, E)	$n = 11$ (6 spp.) [$n = 18$ (1 sp.)] $n = 22, 33$ (1 sp.) $n = 33$ (1 sp.)	N. & E. Medit., Iraq, Iran, Afghanistan, C. Asia, Kashmir
Cryptodiscus	± 3	linear to ovate	–	Rg	–	Iran, C. Asia
Heptaptera	none to 3(-4)	ovate to elliptic	–	Rg (O)	$n = 11$ (1 sp.)	N.E. & E. Medit., Iraq, W. Iran
Hippomarathrum	(3-)4-6	filiform to linear	+	Rg (O)	$n = 11$ (2 spp.)	N. & E. Medit., Iran, Caucasus
Trachydium	2-3	linear to ovate	+	Rh	–	Turkey, Iran, Afghanistan, C. Asia, Himalaya

*Classified according to Cerceau-Larrival (1971).

Table 3. – Comparison of *Prangos* with related genera.

The first group (species 4-7) includes *P. ferulacea* and the related species: *P. uechtritzii, P. asperula* and *P. denticulata.* The only two polyploid species found so far in the genus are from this group (cf. table 1). *P. ferulacea* is the most widespread and variable species in the genus and within it both trends 1 and 2 of the genus are represented. There is a gradual increase of scabridity of all plant parts within *P. ferulacea* and *P. asperula.* Except for *P. ferulacea,* the species of the group occur from Central Anatolia to Central and Southern Iran and along the Eastern Mediterranean basin.

P. platychloena (species 8) from Eastern Turkey with fruits resembling those of the first group differs, however, from all other species of the genus in some unique characters and has to be kept separately.

The species of the second group (species 9-12) represent the first trend of evolution. They are *P. peucedanifolia, P. acaulis, P. hermonis* and *P. corymbosa,* distributed from E. Anatolia through Syria and Iraq to Northern Iran. Their broad-winged fruits have a well developed corky mesocarp and are quite uniform.

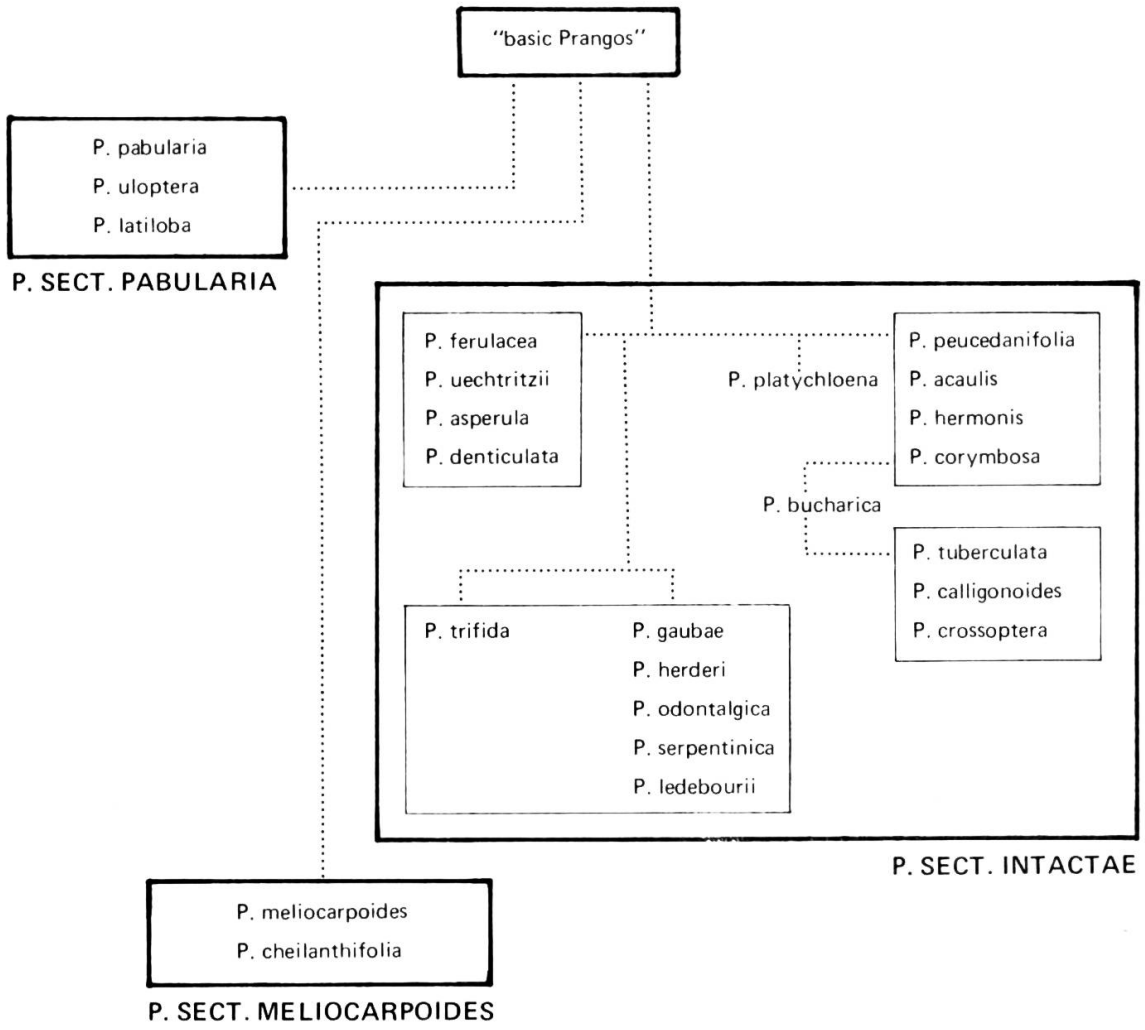


Fig. 2. – Relationships in the genus *Prangos.*

Within the group, there is a trend to increase in pubescence and to decrease in size of leaf-lobes and petioles.

The third group comprises species with wingless fruit, the end line of development of trend 2. The species (13-18) are *P. trifida, P. gaubae, P. herderi, P. odontalgica, P. serpentinica* and *P. ledebourii.* Except for the European *P. trifida,* the species are distributed mainly in Central Asia, some of them are endemic to small areas. Within the group there is a trend to reduction of the leaf-lobes. *P. ledebourii* is unique in having mericarps with conspicuous primary ribs and keels between them.

P. bucharica (species 19), from Afghanistan and Central Asia, resembles *P. peucedanifolia* in habit and fruit morphology. However, the commissural face of the mericarps is not obovate, as in the majority of *Prangos* species, but pear-shaped (fig. 21). Such a commissural face is characteristic also for *P. tuberculata* and *P. calligonoides,* of group 4 (species 20-22), but not for *P. crossoptera* of this group. This W. Iranian group shows a trend to gradual increase, in size and density, of the outgrowths on the fruit surface, a trend similarly observed in *P.* sect. *Prangos.*

The two species of *P.* sect. *Meliocarpoides, P. meliocarpoides* from Anatolia and *P. cheilanthifolia* from Iran (species 23 and 24), differ from all other species in their fruit anatomy which seems to be derived from that prevailing in other sections of *Prangos* (see pp. 16-17). Some unique fruit features of *P. cheilanthifolia* (indumentum, shape of mericarps and wings) raise the question whether this species, together with *"Cachrys eriantha"* (see p. 84), should not be included in a separate genus.

Fig. 2 is a representation of the relationships within the genus *Prangos* as assumed by us.