THE TAXONOMY AND NOMENCLATURE OF PRIMULA AMOENA

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ABSTRACT. The results of hybridization experiments between *Primula amoena* and other members of subgenus *Primula* are given and discussed in conjunction with morphological and geographical data. It is concluded that the taxon should be treated at subspecific level and the necessary combination, *P. elatior* (L.) Hill subsp. *meyeri* (Rupr.) Valentine & Lamond, is made along with relevant synonymy and notes on variability.

In determining the taxonomic status of related species, many factors are relevant in addition to their morphology. These include their geographical distribution, and if sympatric, their habitat, and whether they hybridize to a greater or lesser extent. A species of interest from this point of view is *Primula amoena* M. Bieb. from E Turkey and Caucasia. Belonging to subgenus *Primula*, it is generally considered to be closely related to *P. elatior* (L.) Hill, and Valentine (1961) has shown that the two hybridize under experimental conditions. However, only a summary of the results of the experiments has been reported and as the possible isolating effects which may be operative have not been discussed it was thought worthwhile to give here the data *in extenso*, taking into account a number of other species and subspecies. In conjunction with observations made by Lamond while preparing the account of the genus for P. H. Davis, *Flora of Turkey*, vol. 6, the taxonomic position can then be more rationally considered.

EXPERIMENTAL DATA

The plants of *P. amoena* used were mainly those which were raised from seed collected by P. H. Davis in E Turkey (Rize) and sent to D.H.V. in 1952. A few experiments were also made with plants purchased from Messrs Jack Drake, Inverness-shire.

Plants of *P. elatior*, *P. vulgaris* Huds. and *P. veris* L. were grown from wild seed of British origin. Those of *P. juliae* Kusn. and *P. megaseaefolia* Boiss. were obtained from the Royal Botanic Garden, Edinburgh, and those of *P. elatior* subsp. *pallasii* (Lehm.) W. W. Sm. & Forrest from wild seed collected by P. H. Davis in Kurdistan in 1955. The plants of *P. elatior* subsp. *intricata* (Gren. & Godron) Lüdi came from wild seed collected in the Val d'Eyne, Pyrenees, and of subsp. *lofthousei* (H. -Harrison) W. W. Sm. & Fletcher from plants and seed originating in the Sierra Nevada in Southern Spain and obtained from the late Mr R. B. Cooke of Corbridge.

All crosses were made using potted plants in an insect-proof greenhouse and were legitimate, i.e. pin x thrum or the reciprocal. The results are presented in Table 1.

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TABLE I
HYBRIDIZATION EXPERIMENTS WITH *P. amoena*

Cross (female first)	Av. seed weight (mg)	No. of seeds sown	Germination %	Pollen fertility %
amoena x *veris* subsp. *veris*	0·19	150	0	—
Reciprocal		Not made		
amoena x *juliae*	0.76	26	15	64
Reciprocal		Not made		
megaseaefolia x *amoena*	0.45	30	3	77
Reciprocal		Not made		
amoena x *vulgaris* subsp. *vulgaris*	0.44	18	6	60
	0·26	54	0	—
	0·36	53	0	—
	0·29	66	0	—
	—	30	0	—
Reciprocal		Not made		
amoena x *elatior* subsp. *elatior*	0·63	69	46	—
Reciprocal	0·58	44	32	—
	0·59	89	52	—
amoena x *elatior* subsp. *intricata*	0·67	49	56	—
Reciprocal	0·80	102	84	—
amoena x *elatior* subsp. *lofthousei*	0·39	98	84	45
Reciprocal	1·79	54	72	—
amoena x *elatior* subsp. *pallasii*	1·22	40	85	76
Reciprocal	0·33	70	6	—

Note: Pollen fertility was estimated by stainability in acetocarmine.
Bracketed figures indicate different capsules from the same interstock cross. In *P. amoena* x *vulgaris* subsp. *vulgaris* three different interstock crosses were made.

DISCUSSION

The data from Table I fall clearly into two groups. Crosses of *P. amoena* with *P. veris*, *P. juliae*, *P. megaseaefolia* and *P. vulgaris* produced little or no viable seed, though when hybrids did arise, they were quite fertile. On the other hand the hybrids with *P. elatior* subspp. *elatior*, *intricata*, *lofthousei* and *pallasii* were not only reasonably fertile, but were readily produced in quite high yields. These data are conveniently discussed from two points of view, isolation and taxonomy.

ISOLATION. The question may be asked, do the species or subspecies investigated meet *P. amoena* in the field and, if so, are they likely to hybridize?

In the first group, *P. megaseaefolia* and *P. juliae* are both predominantly woodland plants, growing at rather low levels, and are unlikely to meet *P. amoena*, which is an upland plant of open ground, extending to the line of the melting snow in spring.

P. veris subsp. *columnae* (Ten.) Lüdi is the only *veris* taxon which occurs in the area of *P. amoena* in Turkey and it is found in alpine meadows at heights of 1200–2100 m where it might well come into contact with *P. amoena*. But judging from the evidence of the *P. amoena* x *veris* subsp. *veris* cross it seems unlikely that the taxa would hybridize. There is in general a strong genetical barrier to crosses between *P. elatior* and its subspecies and allies on the one hand, and *P. veris* and its subspecies on the other.

P. vulgaris subsp. *sibthorpii* (Hoffmans.) W. W. Sm. & Forrest occurs in the area of *P. amoena* and is known to ascend to 2500 m in E Turkey so that a meeting with *P. amoena* is a possibility; but it flowers earlier than *P. amoena*, and the experimental results in any case do not favour the idea of much gene-exchange.

Of the subspecies of *P. elatior* only subsp. *pallasii* and a subspecies for which no experimental data are available, subsp. *pseudoelatior* (Kusn.) W. W. Sm., occur in the same geographical area as *P. amoena*. Distribution and habitat of these three taxa are as follows:

	Distribution	*Habitat in Turkey*
P. amoena	N Caucasus, Abkhazia, Armenia, Georgia and Lazistan in NE Turkey	On rock ledges, stable scree, rocky slopes and open alpine meadows. 1820–3300 m. Flowering May–July.
P. elatior subsp. *pallasii*	From the Urals and the Caucasus through Turkey to Armenia and the Altai.	In marshy alpine meadows and gullies, and dry yayla ('alp') slopes. 1300–3200 m. Flowering April–July.
P. elatior subsp. *pseudoelatior*	Caucasus, Georgia and NE Turkey	Rocky slopes and scrub, stream banks. 2300–3050 m. Flowering June–July.

Thus there is a distinct overlap in both distribution and habitat of the three taxa, and hybridization is obviously a possibility. In one gathering from Turkey (*D.* 29952 from Prov Çoruh: Tiryal Da. above Murgul, 2400 m) both *P. elatior* subsp. *pallasii* and *P. elatior* subsp. *pseudoelatior* are represented, while *P. amoena* is known from the same mountain. But no intermediates or putative hybrids have been recorded here or elsewhere, and further field observations are desirable.

TAXONOMY. If ability to hybridize and form fertile hybrids is taken as a taxonomic criterion, *P. amoena* must be regarded as closely related to all the *P. elatior* subspecies studied. It should be mentioned here that all the taxa in Table 1 are diploid with 2n=22, and that all the hybrids show a high proportion of bivalents at meiosis. The figures for the only *P. amoena* hybrid which has been analysed (*P. amoena* x *P. elatior* subsp. *lofthousei*) are:—

Total no. of cells	11(2)	10(2)+2(1)	9(2)+4(1)	9(2)+1(3)+1(1)
87	68	11	2	6

Valentine (1972), in *Flora Europaea*, treated *intricata*, *lofthousei* and *pallasii* as subspecies of *P. elatior*, following Wright Smith and Fletcher (1948), and there would seem to be no reason why *P. amoena* should not be similarly treated. Two important distinguishing characters noted by Valentine (1961) were the length of the capsule and the colour of the flower. As regards the former, it now appears that the very long capsule developed by *P. amoena* in cultivation (c. 20 mm) and illustrated in Valentine (1961), is an effect of

cultivation. Capsules of comparable wild material average about 13 mm, and are no longer than capsules of *P. elatior* subsp. *elatior*. As regards flower colour, subsp. *sibthorpii* and subsp. *heterochroma* (Stapf) W. W. Sm. & Forrest of *P. vulgaris* show wide colour differences, comparable with that which distinguishes *P. amoena* from *P. elatior* subsp. *pallasii* and *pseudo-elatior*, so that this difference need be no bar to subspecific status.

It would thus seem reasonable to treat *P. amoena* as a subspecies of *P. elatior*, comparable in status with subsp. *pallasii*. The necessary nomenclature, including abbreviated synonymy, follows.

P. elatior (L.) Hill subsp. **meyeri** (Rupr.) Valentine & Lamond **comb. nov.**

Syn.: *P. meyeri* Rupr. in Bull. Acad. Imp. Sci. Pétersb. 6:224 (1863); A. Fedorov in Komarov, Fl. URSS 18:143 (1952); L. A. Smol'yaninova in Grossheim, Fl. Kavkaza 7:160 (1967).

P. amoena M. Bieb., Fl. Taur. Cauc. 1:138 (1808) excl. var. β; W. W. Smith in Bot. Mag. t. 9593 (1940); W. W. Smith & Fletcher in Trans. Bot. Soc. Edinb. 34:407–411 (1948); Fedorov. l.c. 142; Smol'yaninova l.c. 159.

P. elatior var. *amoena* (M. Bieb.) Duby in DC. Prodr. 8:36 (1849).

P. amoena var. *meyeri* (Rupr). Boiss., Fl. Orient. 4:26 (1879); W. W. Smith & Fletcher in Trans. Bot. Soc. Edinb. 34:411 (1948).

P. amoena subsp. *meyeri* (Rupr.) W. W. Smith & Forrest in Notes RBG Edinb. 16:42 (1928); O. Schwarz in Wiss. Zeits. Univ. Jena, math-nat. 17:317 (1968).

P. kusnetsovii Fed., l.c. 723; Smol'yaninova l.c. 160.

P. amoena subsp. *lazica* O. Schwarz l.c.

Attention has often been drawn to the variability of this taxon (e.g. E. K. Balls in *Gard. Chron.* ser. 3, 99:6, 1936; W. W. Smith & Fletcher, 1948) but it does not seem possible to make a formal division of the Turkish material in a useful way. All the characters used for differentiation in Caucasian populations whether as species, subspecies or varieties (indumentum, leaf shape, leaf margin, flower number) are found in varying combinations amongst the plants from Turkey.

References

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