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# A new hybrid of the Alpine flora: Antennaria carpatica × A. dioica

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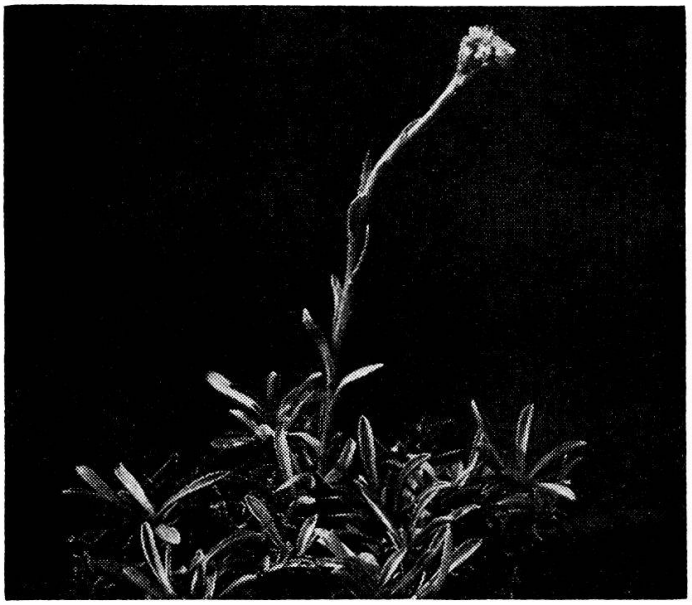

Fig. 1. *Antennaria carpatica* × *A. dioica* from l'Etherolla. ½ natural size. Coll. 19. VII. 1967.

In the present paper the author describes *Antennaria carpatica* (Wahlenb.) Bluff et Fingerh. ×*A. dioica* (L.) Gaertn., a hybrid found recently in the Alps. Its first specimens have been collected together with *A. carpatica* and *A. dioica;* however, in view of some morphological differences they could not be assigned to any of these species. The cytological investigations (Urbańska-Worytkiewicz, in press) revealed a different chromosome number viz. 42 as compared with those of *Antennaria carpatica* (2n = 56) and *A. dioica* (2n = 28).

Hybrids between *A. carpatica* and *A. dioica* have not been recorded hitherto from the natural habitats. On the other hand, they were obtained by the author in previous experiments (Urbańska 1959, 1962, 1965). Thus, a comparative morphological study of the aberrant plants from the Alps and of typical *Antennaria* specimens from this region could be supplemented by the

resp. analysis of experimental hybrids. These investigations added further evidence in favour of the opinion that the newly found Alpine plants should be regarded as interspecific hybrids.

The material consisted of 21 hybrid plants collected in five natural habitats in the Alps. The list of localities is given on p. 24. The populations at l'Etherolla and Mt. Rouge were sampled in two successive years. The following qualitative characters were scored: shape of the basal leaves, colour of involucral phyllaries, colour of the corolla of pistillate florets, colour of pistils, type of rhizomes. In addition, the length of some flower organs was measured. For comparison, a parallel study was performed on typical populations of *Antennaria carpatica* and *A. dioica* from the Alps as well as on the experimental hybrids.

*Antennaria carpatica* (Wahlenb.) Bluff et Fingerh. $\times$*A. dioica* (L.) Gaertn. hybr. nov. (Fig. 1).

*Planta perennis. Radices numerosae, non ramosae. Rhizoma verticale, vel subverticale. Stolones steriles erecti, abbreviati, in parte superiore rosulas foliorum ferentes. Caules floriferi erecti, (5.0) 6.0–11.5 (14.1) cm alt., non dense canotomentosi. Folia caulina sessilia, lanceolata usque linearia, pubescentia, patula lanata, apice scariosa, (12.0) 12.6–32.0 (35.0) mm lg., (1.0) 1.5–3.0 (4.0) mm lt. Folia basalia lanceolata vel obovato-lanceolata, acuta vel mucronata, (18.0) 19.0–48.0 (52.0) mm lg., (2.0) 3.0–8.0 (9.0) mm lt., tomentoso-lanata, trinervia. Planta dioica. Capitula numero (3) 4–5 (6) interdum longius tomentosa, capitula masculina (7.0) 8.0–11.0 mm alt. et 4.0–6.0 mm lt., capitula feminea (7.0) 8.0–10.5 (11.0) mm alt. et (3.0) 4.0–7.0 (8.2) mm lt. Involucri phylla in parte inferiore viridia, parte media pallide brunea, raro rubella, in parte superiore scariosa, alba; externa breviora, basi lanata et attenuata, interiora linearia. Involucri phylla capitulorum femineorum oblonga, apice acuta, saepe dentato-laciniata, involucri phylla capitulorum masculinorum ovato-oblonga, apice obtusa vel laciniata. Flores masculini (5.0) 5.5–6.0 mm lg., 5-obtusidentati, styles apice dilatatus, non bifidus, ovarium vacuum. Pappus albus, (5.0) 5.1–5.8 (6.2) mm lg., pappi pili apice dilatati, plani marginibus scabri. Flores feminei filiformes, corolla (3.2) 3.5–4.8 (5.0) mm lg., stylus corolla excedens ca. 0.8 mm, apice bifidus, ovarium ca. 1 mm lg. Semina matura non vidi. Pappus albus, (5.0) 5.2–7.3 (8.0) mm lg., pappi pili tenues. Fl. VII–VIII.*

*Numerus chromosomatum 2n = 42, planta hexaploida.*

*Ab Antennaria dioica forma foliorum basalium et absentia sarmentorum procumbentium, ab Antennaria carpatica colore involucri phyllorum, differt.*

*Habitat in alpibus Helvetiae et Galliae.*

Perennial plant with short, vertical rhizomes. In this respect the hybrid corresponds to *Antennaria carpatica*, whereas in *A. dioica* the occurence of runners is a diagnostic character.

Stems bearing inflorescences straight, (5.0) 6.0–11.5 (14.1) cm high, sparsely tomentose. Cauline leaves sessile, lanceolate to linear, lanate with scarious tips, (12.0) 12.6–32.0 (35.0) mm long and (1.0) 1.5–3.0 (4.0) mm broad.

The basal leaves lanceolate to oblanceolate, acute or mucronate, (18.0) 19.0–48.0 (52.0) mm long, (2.0) 3.0–8.0 (9.0) mm broad, tapering gradually in lower part, tomentose, trinervate. They manifest notable similarity to *Antennaria carpatica* differing distinctly from short, spathulate leaves of *A. dioica.*

Heads in number (3) 4–5 (6), tomentose. Male heads (7.0) 8.0–11.0 mm high and 4.0–6.0 mm broad, female ones (7.0) 8.0–10.5 (11.0) mm high and (3.0) 4.0–7.0 (8.2) mm broad. Involucral phyllaries green at the base, pale brown and somewhat pink about the middle part, scarious and white in the upper part. This is the most distinct character by which the hybrid plants show their similarity to *Antennaria dioica* from the same habitats. Phyllaries of *A. carpatica* are green at the base, but dark brown or even blackish in the middle part and brown toward the apex.

The outer phyllaries woolly below, shorter than the inner ones. In the female heads they are oblongate and acute, often with erosed tips, in the male heads being ovato-oblong, blunt or sometimes laciniate in the upper part.

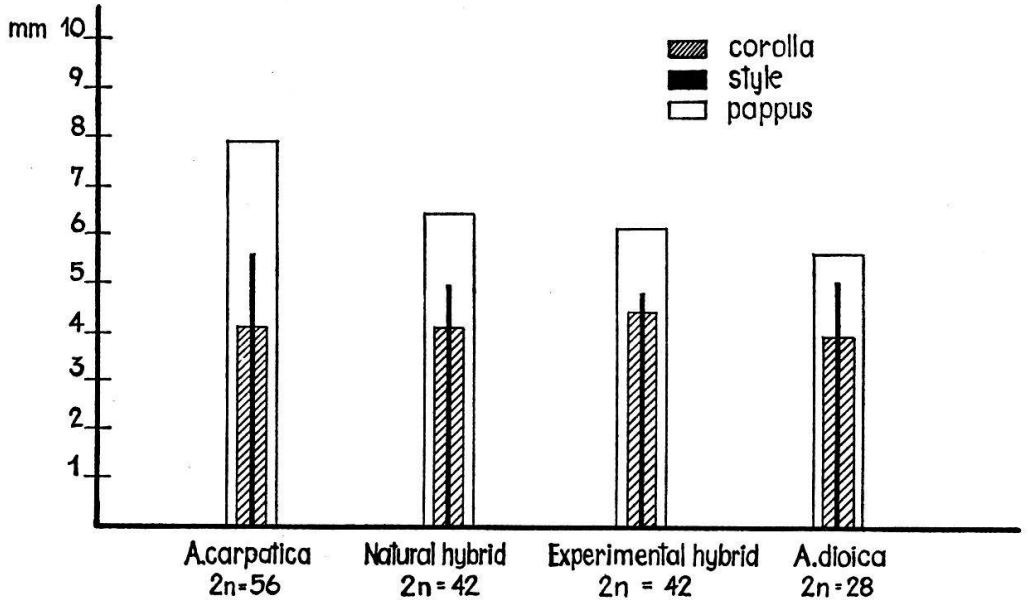


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Fig. 2. The average length of the organs in pistillate florets of *Antennaria carpatica, A. dioica* and the hybrids.

Staminate florets (5.0) 5.5–6.0 mm long. Style widened at the top, not bifid. The ovary shows a defective development. Bristles of the pappus white, (5.0) 5.1–5.8 (6.2) mm long, somewhat club-shaped with toothed margins.

Pistillate florets filiform, corolla in most plants studies purplish, (3.2) 3.5–4.8 (5.0) mm long; style bifid, exserted ca. 0.8 mm, ovary ca. 1 mm long. The ovules are developed, but at the post-floral stages most of them degenerate. The pappus bristles white, thin (5.0) 5.2–7.3 (8.0) mm long, exceed-

Table 1. Phytosociological records of two stands with *Antennaria carpatica* × *A. dioica*.

| Number of the record | 1 | 2 |
|---|---|---|
| Date | 19. VII. 1967 | 20. VII. 1967 |
| Locality | l'Etherolla (Valais) | Oberaarsee, Grimsel |
| Altitude a.s.l. | ca. 2400 m | ca. 2350 m |
| Situation | top ridge | steep rocky slope |
| Exposure | SW | SSW |
| Slope | ca. 20% | ca. 60% |
| Underground | calcareous slate | calcareous slate |

| Species | 1 | 2 | Species | 1 | 2 |
|---|---|---|---|---|---|
| *Elyna myosuroides* | 3–4 | 3 | *Gentiana Kochiana* | + | – |
| *Avena versicolor* | 2 | 1–2 | *Luzula sudetica* | + | – |
| *Festuca pumila* | 1 | 1 | *Viscaria alpina* | + | – |
| *Poa alpina* | 1–2 | + | *Androsace obtusifolia* | + | – |
| *Juncus trifidus* | + | 1 | *Thesium alpinum* | + | – |
| *Polygonum viviparum* | 1 | 2 | *Nigritella nigra* | + | – |
| *Antennaria dioica* | 1 | 1 | *Viola calcarata* | + | – |
| *Antennaria carpatica* | 1 | 1 | *Chrysanthemum alpinum* | + | – |
| *Antennaria carpatica* × *A. dioica* | + | + | *Minuartia verna* | + | – |
| *Trifolium alpinum* | 1 | + | *Lotus alpinus* | – | 1–2 |
| *Pulsatilla vernalis* | 1 | + | *Euphrasia minima* | – | 2 |
| *Silene excapa* | 1–2 | + | *Primula farinosa* | – | + |
| *Erigeron uniflorus* | 1 | + | *Lloydia serotina* | – | + |
| *Hieracium alpinum* | + | + | *Vaccinium uliginosum* | – | + |
| *Hieracium piliferum* | + | 1 | *Vaccinium Vitis-idaea* | – | + |
| *Leontodon helveticus* | + | 1 | *Loiseleuria procumbens* | – | + |
| *Ligusticum simplex* | + | + | *Pedicularis Kerneri* | – | + |
| *Luzula lutea* | 1 | + | *Carex sempervirens* | – | + |
| *Carex atrata* | + | + | *Carex curvula* | – | + |
| *Campanula Scheuchzeri* | + | + | *Parnassia palustris* | – | + |
| *Primula hirsuta* | + | + | *Trifolium Thalii* | – | + |
| *Myosotis alpestris* | + | + | *Anthoxanthum alpinum* | – | + |
| *Veronica bellidioides* | 1 | + | *Salix retusa* | – | + |
| *Galium anisophyllum* | + | + | *Salix reticulata* | – | + |
| *Potentilla aurea* | + | + | *Bartsia alpina* | – | + |
| *Geum montanum* | + | + | | | |
| *Homogyne alpina* | + | + | *Cetraria islandica* | 1 | + |
| *Phyteuma hemisphaericum* | + | + | *Cladonia* sp. | 1 | 2 |
| *Aster alpinus* | 1 | – | *Lichenes* div. | 1 | 1 |

ing the involucre. As far as the length of the pappus is concerned, the hybrid plants represent an intermediate type between *Antennaria carpatica* and *A. dioica* (Fig. 2).

The above description is based chiefly on the material from l'Etherolla, Pennine Alps (female plants) and Oberaarsee, Bernese Alps (male specimens) which should be considered as the type localities of the new hybrid. Besides, it was found in the following habitats: Mt. Rouge, Pennine Alps; Col du Restefond, Maritime Alps; Col de la Cayolle, Maritime Alps.

The hybrid plants appear in rare and isolated Alpine localities, at 2350 to 2500 m a.s.l., within the *Elynetum* (Br.-Bl. 1913). They were always found together with the two parent species. The floristic composition of the representative stands with *A. carpatica* × *A. dioica* may be exemplified by two phytosociological records (Table 1) taken on l'Etherolla and Oberaarsee by Prof. Dr. E. Landolt. The author is greatly obliged to Professor Landolt for his valuable remarks.

Comparative studies of the experimental hybrids revealed their notable similarity to the Alpine plants (Fig. 3). They had a similar type of rhizomes,


Fig. 3. *Antennaria carpatica* × *A. dioica:* left—plant from the natural habitat; right—the experimental hybrid. The intervals of the scale comport 1 cm.

shape of the basal leaves, colour of the phyllaries and of the pistillate florets, as well as length of the pappus (Fig. 2). On the other hand, the two types differed from one another in respect of pubescence of their basal leaves and shape of the pappus bristles. In addition, some differences of a quantitative character e.g. size of the resp. plants were noted.

The present investigations show that the hybrids between *Antennaria carpatica* and *A. dioica* combine the characters of the parent species, exhibiting a predominance of features of *A. carpatica* both in the natural conditions and in the experiment (Table 2). This is due evidently to the numerical prevalence of the chromosome sets of the octoploid *A. carpatica* versus those introduced by the tetraploid *A. dioica.*

A few words should be added in respect of some diversity observed within the hybrid plants. It refers chiefly to size of the basal leaves and their shape (from lanceolate to oblanceolate). Also the middle part of the phyllaries was more or less intensively brown-coloured in the resp. specimens. A more pronounced deviation found in a single habitat consisted in the white-yellowish colour of the pistillate florets, whereas in most studied plants they were purplish, approaching *Antennaria carpatica* by this detail. On the whole, however, the hybrids manifested a rather low degree of diversity.

No mature seeds were found in the hybrid plants. However, a correct estimation of this fact presents serious difficulties. Male hybrid plants are exceedingly rare in the Alps—we have found only two small populations, in two habitats out of five studied. It should be noted that in one plant an apparently normal meiosis was observed. Accordingly, highly regular pollen grains were found just before anthesis. Preliminary studied on the ovules point also to a rather normal development of the female gametophyte. In view of this fact, detailed investigations in the embryology and biology of reproduction of the hybrid plants are required.

The work was begun at the Geobotanical Department, Swiss Federal Institute of Technology, Zürich, and was completed at the Institute of Plant Anatomy and Cytology, Jagellonian University, Cracow. I am very much indebted to the authorities of Swiss Federal Institute of Technology who enabled me to carry out these studies. My sincere thanks are due especially to Professor Dr. E. Landolt, Head of the Geobotanical Department, by whom both the facilities and the laboratory equipment of the Department were put kindly at my disposal.

I wish also to express my gratitude to Professor Dr. M. Skalinska and Doc. Dr. E. Pogan, Jagellonian University, for constant interest, stimulating discussions and criticism during the preparation of the manuscript.

Table 2. Characters of *Antennaria carpatica*, *A. dioica* and of the hybrids.

| | *A. carpatica* 2n = 56 | *A. dioica* 2n = 28 | Natural hybrids 2n = 42 | Experimental hybrids 2n = 42 |
|---|---|---|---|---|
| Vertical rhizomes | + | — | + | + |
| Runners | — | + | — | — |
| Basal leaves | oblanceolate | spathulate | oblanceolate | oblanceolate |
| Nervation | trinervate | non evident | trinervate | trinervate |
| Colour of phyllaries: | | | | |
| lower part | green | green | green | green |
| middle part | dark brown | pale brown and somewhat pinkish | pale brown and somewhat pinkish | pale brown and somewhat pinkish |
| upper part | scarious, brown or blackish | scarious, white or pink | scarious, white | scarious, white |
| Colour of pistillate florets: | | | | |
| corolla | purple | white-yellowish or pink | purplish, rarely white-yellowish | purplish, rarely white-yellowish |
| stigma and style | brown | pale brown | brown, rarely pale brown | brown |
| pappus | white or yellowish | white | white | white |

*Summary*

A new interspecific hybrid: *Antennaria carpatica* × *A. dioica* (Latin diagnosis see p. 21) is described. It was found recently in the Alps as the hexaploid type with 2n = 42. This chromosome number was to be expected in the immediate cross-product between the octoploid *Antennaria carpatica* and the tetraploid *A. dioica.*

The newly found plants combine the morphological characters of the two *Antennaria* species exhibiting a predominance of features of *A. carpatica.* This is due evidently to a numerical prevalence of the chromosome sets of this species.

Notable similarity between the experimental hybrids *Antennaria carpatica* × *A. dioica* and the Alpine hexaploids supports the opinion concerning their hybrid origin.

*Zusammenfassung*

Ein neuer Bastard von *Antennaria (A. carpatica* × *A. dioica)* wird beschrieben (lateinische Diagnose siehe S. 21). Er wurde in den Alpen gefunden und ist hexaploid (2n = 42). Diese Chromosomenzahl war als Folge der unmittelbaren Kreuzung zwischen der oktoploiden *A. carpatica* und der tetraploiden *A. dioica* zu erwarten.

Die neu entdeckten Pflanzen vereinigen morphologische Merkmale von beiden *Antennaria*arten, wobei Merkmale der *A. carpatica* vorherrschen; dies entspricht der höheren Zahl der Genome dieser letzteren Art.

Die weitgehende morphologische Ähnlichkeit der in den Alpen gefundenen Hexaploiden mit experimentellen Bastarden *Antennaria carpatica* × *A. dioica* unterstützt die Ansicht einer hybridogenen Entstehung.

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