

Asplenium × helii Lusina the valid name for the hybrids between *A. petrarchae* (Guérin) DC. and *A. trichomanes* L. (Aspleniaceae, Pteridophyta)

I. Nomenclatural notes

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Abbreviations for Herbaria follow HOLMGREEN et al. Ind. Herb. I, 7th ed. Utrecht 1981. All new cytological counts by H. RASBACH. For the full article with figures see Bennert et al. (1989).

Asplenium petrarchae (Guérin) DC. is an aggregate species comprising a rare diploid and a more common tetraploid cytotype. *A. trichomanes* L. is also a complex of which two diploid, two tetraploid cytotypes as well as a rare hexaploid one were reported for Europe (see review in REICHSTEIN 1981 and addenda 1982). These cytotypes are usually treated as subspecies. The first hybrid between members of the two complexes was collected by G. Lusina, 27 August 1935 in the Island of Lussino (= Lošinj, now Yugoslavia, Archipelago Quarnero, Adriatic Sea), described as *Asplenium helii* Lusina (1943) and correctly interpreted as hybrid *A. glandulosum* Loisel. (= *A. petrarchae*) × *A. trichomanes*, quoted by PICHI SERMOLLI et al. Ind. Fil. suppl. IV: 28 (1965). This name has obviously been overlooked by other workers and also in the review by REICHSTEIN (1981).

A hybrid collected by A. and Chr. Nieschalk, 27 April 1962 on limestone rocks near Villefranche (Alpes-Maritimes, France) and brought to Berlin (B) was described as *A. × nieschalkii* by D. E. Meyer (1963). The author claims to have counted the chromosomes in the root tips of this plant and to have found $n = 144$ (tetraploid stage). This statement is unfortunately erroneous (see below) as is MEYER's interpretation that *A. × nieschalkii* is the hybrid between tetraploid *A. petrarchae* subsp. *petrarchae* and tetraploid *A. trichomanes* subsp. *quadrivalens* D. E. Meyer.

A triploid hybrid (of which W. Bennert on 10 April 1971 collected 3 specimens in Mallorca) was described as *A. × litardierei* by Bennert and Meyer (1974). They reported the correct ploidy level ($2n = 108$) as well as precise results on chromosome pairing in meiosis (det. P. J. Brownsey); also their interpretation as hybrid between *A. petrarchae* subsp. *petrarchae* and the rare calciphilous *A. trichomanes* subsp. *inexpectans* Lovis was correct. The latter could later be found (by T. R.) in Mallorca at the locus *classicus* of *A. × litardierei* (see Bennert et al. 1989).

We know today that two different hybrids between members of the *A. petrarchae* and the *A. trichomanes* complex do exist in nature. The triploid is, as mentioned, well described as *A. × litardierei*. The tetraploid has no valid name yet. It has, however, been collected by A. and Ch. *Nieschalk*, 8 June 1971, on limestone rocks near Benaoján, Prov. Málaga (S. Spain) kept alive and brought living to Basel; it was cultivated as TR-3226. Its morphology, chromosome number and precise pairing behaviour in meiosis was reported in REICHSTEIN (1981: 126) still under the wrong name *A. × nieschalkii*. Two experienced workers (J. D. Lovis, Leeds, and G. VIDA, Budapest) found independently $n = \text{ca. } 30^{\text{II}} + 84^{\text{I}}$ in many cells.

On 18 April 1988 three of us (W. B., H. R. and K. R.) revisited the rocks near Benaoján. They were able to find there not only the tetraploid ($n = 32^{\text{II}} + 80^{\text{I}}$) but also the triploid hybrid (found $n = 27-34^{\text{II}} + 54-40^{\text{I}}$) and beside of tetraploid *A. petrarchae* several members of the *A. trichomanes* group, important for judging the ancestry of the hybrids. The following plants of the *A. trichomanes* complex were partly fixed in the field and collected: subsp. *inexpectans* (Ras-629-A = TR-7004-A, $n = 36^{\text{II}}$); subsp. *quadrivalens* (common, some collected e.g. Ras-628 = TR-7003, $n = \text{ca. } 72^{\text{II}}$); the triploid hybrid of subsp. *inexpectans* × subsp. *quadrivalens* (Ras-625, $n = \text{ca. } 32-36^{\text{II}} + 44-36^{\text{I}}$) and one plant of the rare hexaploid cytotype (Ras-629-B = TR-7004-B, $2n = \text{ca. } 205$). This hexaploid has so far been reported for Europe (Belgium, France) only by BOUHARMONT (1968), it will be described later.

With the cytologically checked material we could establish the three characters (Table 1) to distinguish the triploid from the tetraploid hybrid.

Table 1. Three characters for distinguishing the triploid from the tetraploid hybrid. The hairs on the rachis are well visible with a hand lense if not lost by handling. Even in such cases their bases are usually still visible under a binocular lens.

	Tripl. hybrid	Tetrapl. hybrid
1. Length of green tip of the rachis	ca. 20-22 mm	ca. 10-14 mm
2. Pinnae-margins, particularly at the anterior (acrosopic) side	usually incised, incisions ca. 0.5-2 mm deep	entire or slightly wavy
3. Glandular hairs on the rachis	ca. 0.25 mm long, dense	only few

Using these characters we were able to identify both *A. × helii* as well as *A. × nieschalkii* with the triploid hybrid. A few other specimens in herbaria under *A. × nieschalkii* belong to the same triploid. The tetraploid hybrid has to be given a new name. According to the new rules for nomenclature of hybrids (Code 1983 and 1988) the following name is valid for the triploid hybrid:

Asplenium × helii Lusina (1943) nothosubsp. *helii*

= *A. × nieschalkii* D. E. Meyer (1963)

= *A. × litardierei* Bennert and Meyer (1974)

= *A. × nieschalkii* nothosubsp. *litardierei* (Bennert and Meyer) Muñoz Garmendia. An. Jard. Bot. Madrid 42: 257 (1985).

The parentage of this triploid hybrid is *A. petrarchae* subsp. *petrarchae* × *A. trichomanes* subsp. *inexpectans* as given under *A. × litardierei*.

We designate the tetraploid hybrid as

Asplenium × helii Lusina nothosubsp. *alberti-nieschalkii* Bennert et al. (1988).

Typus: Ras-624-B, 18 April 1988, leg. W. Bennert, H. Rasbach and K. Rasbach; Holotype B (T. Reichstein no. 7001-B after cultivation in Basel). Single pressed fronds as Isotypes will be sent to BM, FI, G, RO and L. Topotype A. and Ch. Nieschalk, 8 June 1971 in the same locality, T. Reichstein no. 3226 after cultivation in Basel.

Locus: Spain, Prov. Málaga, limestone rocks near Benaoján, ca. 670 m alt.

Derivatio: Named after the late Albert Nieschalk who found the first specimen of this very rare hybrid and other valuable plants.

Diagnosis: Differt ab *A. × helii* nothosubsp. *helii* pinnis plus minusve integris, scilicet haud vel vix incisis, parte apicali rhachidis breviore (circ. 10–12 mm) et pilis glandulosis rhachidis parentibus vel perpaucis. Numerus chromosomatum somaticus 2 n = 144, meiosi paribus circ. 30 et univalentibus 84.

This tetraploid hybrid has so far been assumed to be the cross of *A. petrarchae* subsp. *petrarchae* and *A. trichomanes* subsp. *quadrivalens*. These are the most common representatives of both complexes. Such a hybrid would have the genome formula (PePeTrTr) in which Pe stands for one genome of *A. petrarchae* and Tr for one genome of *A. trichomanes*. A hybrid of such a parentage should, however, show the phenomenon of delayed allopolyploidy (Lovis 1977: 365–371; see review in REICHSTEIN 1981: 100) and produce a very high number of bivalents (sometimes reaching the maximal possible level of n = 72^{II} + 0^I) while nothosubsp. *alberti-nieschalkii* always gave much less (ca. 30^{II} + 84^I). We therefore believe that the tetraploid hybrid is a cross of diploid *A. petrarchae* subsp. *bivalens* and the rare hexaploid cytotype of *A. trichomanes*. The hybrid would then have the formula (PeTrTrTr) which would perfectly explain its morphology and its pairing behaviour in meiosis. We therefore were rather grateful for the luck in finding the hexaploid *A. trichomanes* growing in close proximity to the hybrid. We intend to search for the still missing diploid *A. petrarchae* in the same area in the near future. It is known to grow near Grazalema, not too far off from Benaoján.

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