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# *Hectorella caespitosa:* Ultrastructural Evidence Against its Inclusion into *Caryophyllaceae*

By

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**Key Words:** *Centrospermae*, *Hectorellaceae*, *Caryophyllaceae*.—Sieve-element plastids, comparison of ultrastructure.

**Abstract:** The micromorphological structure of sieve-element plastids of *Hectorella caespitosa* HOOK. f., justifies its position within *Centrospermae*, but excludes its alignment with the family *Caryophyllaceae*. Both, its inclusion into *Phytolaccaceae*, or treatment as a separate family, *Hectorellaceae*, appear possible.

The monotypic genus *Hectorella* HOOK. f., endemic to the alpine regions of New Zealand, South Island, has doubtfully been assigned to *Portulacaceae* (BENTHAM & HOOKER 1865, PAX 1889) or to *Caryophyllaceae* (DIELS 1896, PAX & HOFFMANN 1934, ECKARDT 1964); HUTCHINSON (1969) even placed it into *Cruciferae*.

A first detailed morphological and anatomical description of flowers, axis, and leaves in *Hectorella caespitosa* HOOK. f., a comparison with the simultaneously investigated *Lyallia* and *Pycnophyllum*, and a discussion of relevant data from *Caryophyllaceae* and *Portulacaceae* was given in 1961 by SKIPWORTH. In consequence of the new results PHILIPSON & SKIPWORTH (1961) proposed a new family, *Hectorellaceae*, to include the two monotypic genera *Hectorella* and *Lyallia* (endemic to Kerguelen Islands). TAKHTAJAN (1973) recognizes the new family, alignes it among his order *Caryophyllales*, and mentions the very close relationships with *Portulacaceae*.

The original description of *Hectorellaceae* by PHILIPSON & SKIPWORTH (1961) did not include any reference to its probable ordinal association. However, new results on the placentation and the ovule and seed morphology of *Hectorella* (NG, PHILIPSON & WALKER 1975) are in favour of its inclusion into the *Centrospermae*. Since neither anthocyanins nor betalains were detected within *Hectorella caespitosa* (NG et al. 1975), phytochemical tests failed to indicate relationships

either with the anthocyanin containing *Caryophyllaceae* or with the betalain family *Portulacaceae*.

Another character helpful to the classification of *Centrospermae* is the ultrastructure of their specific P-type sieve-element plastids

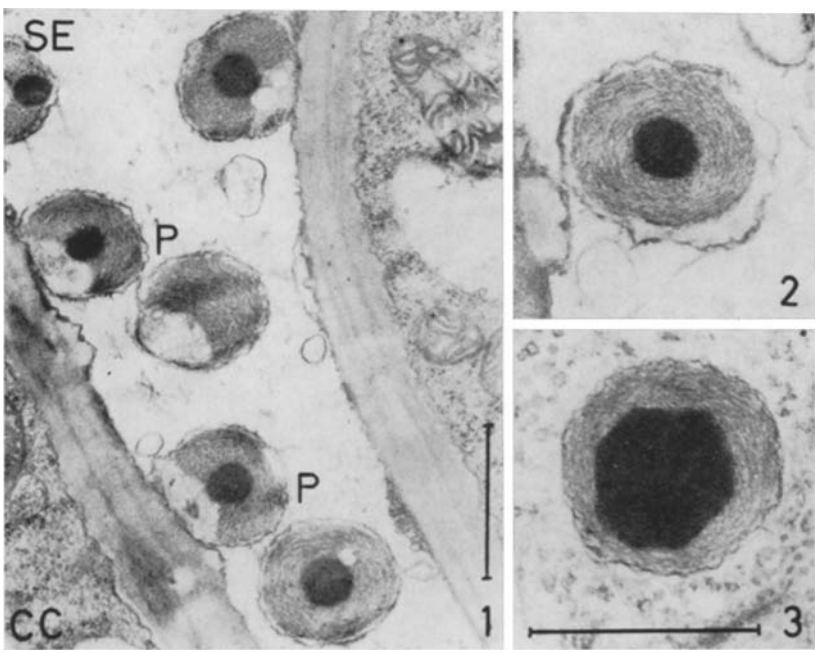


Fig. 1. Longitudinal section of leaf phloem in *Hectorella caespitosa*: many P-type plastids (P) in sieve-element (SE). CC = companion cell. ×20,000

Fig. 2. P-Type sieve-element plastid of *Hectorella caespitosa* with ringlike bundle of filaments and globular central crystalloid. ×30,000

Fig. 3. P-Type sieve-element plastid of *Saponaria officinalis (Caryophyllaceae)* with ringlike bundle of filaments and polygonal central crystalloid. ×30,000

(BEHNKE & TURNER 1971, BEHNKE 1974, 1975). It is the aim of the present report to discuss the fine structure of sieve-element plastids of *Hectorella* with regard to the systematic position of the genus.

*Hectorella caespitosa* HOOK. f. was collected by W. R. PHILIPSON (1975-01-23) at 6,500 ft on Temple Peak, Canterbury (New Zealand), sent to Heidelberg and grown in a greenhouse of the Zoological Institute I (Heidelberg). Leaf- and stem parts were fixed in formaldehyde/glutaraldehyde followed by 1% osmic acid, dehydrated in an acetone series, and embedded and polymerized in an Epon/Araldite mixture. Ultrathin sections were cut with a diamond knife and viewed and photographed with a Siemens Elmiskop 101.

The micromorphological structure of the plastids in the sieve-elements of *Hectorella* (Fig. 1 shows a longitudinal section through the phloem of a leaf vein) is in general agreement with the formula P: g/pC. rbF characteristic for all *Centrospermae* (BEHNKE 1975). A closer inspection reveals that, besides a ringlike bundle of protein filaments (F), of the two alternatives, globular or polygonal central crystalloid (gC or pC), the first one is represented in *Hectorella* (Fig. 2). Since former studies have shown that the central inclusions have some importance as family characters within *Centrospermae* — e.g. no crystalloids in *Amaranthaceae* and *Chenopodiaceae* (BEHNKE 1974), polygonal crystalloids (Fig. 3) in *Caryophyllaceae* (BEHNKE 1975) — the presence of a globular central crystalloid leads to the following conclusion: 1. *Hectorella caespitosa* is not likely to be a member of the *Caryophyllaceae*, which unanimously show polygonal crystalloids in their sieve-element plastids. 2. A decision in favour of a separate family *Hectorellaceae* or an alignment of *Hectorella* with *Portulacaceae* cannot be reached on the basis of plastid ultrastructure. Sieve-element plastids of *Portulacaceae* contain the same globular crystalloids as shown for *Hectorella* as well as some other families of *Centrospermae*. No further specific ultrastructural characteristics have been found for these taxa.

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