nigrum, they are designated as 'big fruited hexaploid *S. nigrum*'. They are fertile and breed true and resemble, *S. scabrum* in both morphological and cytological features. It is suspected that they are closely related to each other and a programme of investigations has therefore been initiated. The present paper deals with the origin and evolution of *S. scabrum*, and its relationship with the Indian hexaploid *S. nigrum*.

A stock of *S. scabrum* Mill. was raised from seed supplied by Dr. J. M. Edmonds, Cambridge University Botany School, Cambridge, England. The 'big fruited hexaploid *S. nigrum* L.' was grown and the two species were hexaploids ($n=36$) and resembled each other in several morphological features. These were tall and erect with thick, ovate-elliptic leaves, and bore several large, globose, purplish blue fruits with many viable seeds. The pollen fertility was about 83%.

The reciprocal cross pollinations between the two species were successfull; the reciprocal hybrids were morphologically alike and fertile, and bore large purplish blue fruits with viable seeds. The hybrids resembled the parents in morphological characters including the colour and size of berry. The pollen fertility was 82.9%. The hybrids were hexaploids with $n=36$ chromosomes.

S. scabrum and the "big fruited hexaploid *S. nigrum*" showed normal meiosis with 36 bivalents. However, at metaphase I, in 8% of the cells of *S. scabrum*, 2 univalents were invariably seen. At metaphase I, the mean pairing of chromosomes, per cell, was $35.83_{II}+0.34_{I}$. The frequency of chiasmata, per bivalent, was 1.19, while in the latter it was 1.22.

The meiotic chromosome behaviour of the hybrids, at metaphase I, was mostly normal with 36 bivalents; occasionally 2 univalents were observed. The mean pairing of chromosomes per cell was $35.70_{II}+0.60_{I}$. The frequency of chiasmata per bivalent was 1.2. The subsequent stages of meiosis were normal.

The identical cytomorphological features of the parents, and their ready crossability with each other producing fertile hybrids with as many as 36 bivalents at metaphase I, may indicate the homology of genomes of the two parents. This is further corroborated by the comparable frequencies of chiasmata, per bivalent at metaphase I of the hybrids with those of the parents. Since no multivalents were observed in the parents and hybrids, the pairing of chromosomes in the latter was most likely to be due to allosyndesis. The occasional presence of univalents at metaphase I of the hybrids, could be due to precocious separation of chromosomes of a bivalent. Since in pollen mother cells of the hybrids the typical meiotic configurations as observed in structural hybrids could not be detected, the precocious separation of chromosomes of a bivalent is most likely to be due to some degree of genic differences in architecture of the two chromosomes. The genic differences of the parents appear not significant enough, to induce either morphological differences between the parents or effect the frequency of chiasmata per bivalent or pollen fertility of the hybrids.

The close similarity of cytomorphological features of the "big fruited hexaploid *S. nigrum*" and *S. scabrum*, and their ready crossability with each other producing fertile hybrids indicate that *S. scabrum* might have originated and evolved as mutant of the hexaploid *S. nigrum*.

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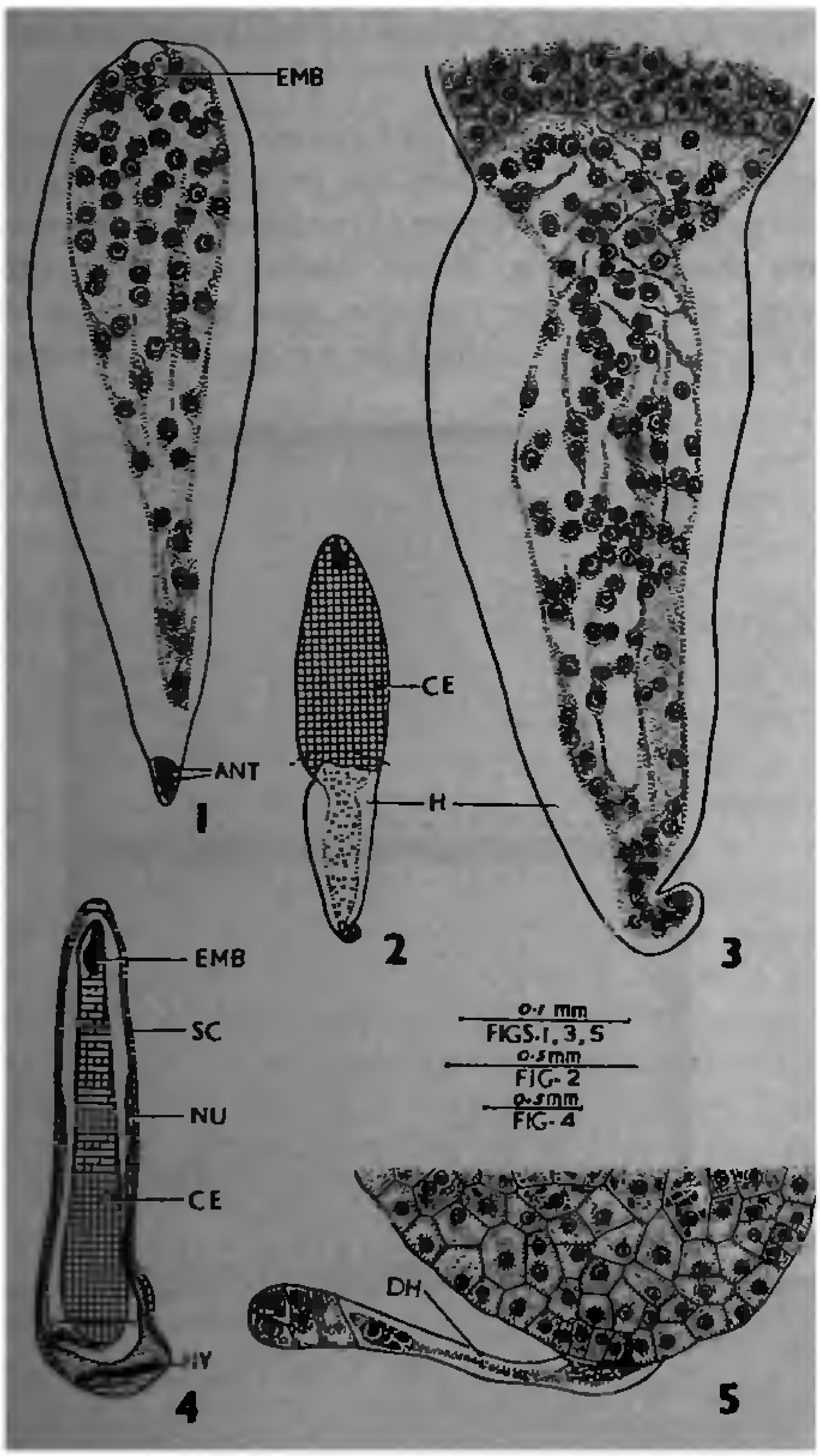
OCCURRENCE OF ENDOSPERM HAUSTORIUM IN *RHYNCHOSPORA CORYMBOSA* (L.) BRITTON, (CYPERACEAE)

B. H. M. Nijalingappa and D. H. Tejavathi
Department of Botany, Bangalore University,
Bangalore 560 056, India.

For long it was believed that endosperm in the Cyperaceae is nonhaustorial. Nijalingappa and Devaki[1] reported the occurrence of both the micropylar and chalazal haustoria in *Scleria foliosa* for the first time in the family. The following account presents some of our findings concerning the development and organization of endosperm haustorium in *Rhynchospora corymbosa* (L.) Britton.

The endosperm is *ab initio* Nuclear. The primary endosperm nucleus divides earlier than the zygote and produces a large number of nuclei. The free nuclear endosperm enlarges and grows towards the chalaza. At the 64-nucleate stage the zygote divides producing a two-celled proembryo and the antipodal cells remain healthy (figure 1). When the proembryo attains the quadrant-stage, wall formation begins in the endosperm at the micropylar region and extends gradually towards the chalazal part leaving a third of the region coenocytic (figure 2) which functions as an haustorium. The endosperm, thus differentiates into a massive cellular endosperm proper and a coenocytic chalazal haustorium (figures 2–3). This downward tapering coenocytic region reveals the characteristic haustorial congfiguration. Grouping of nuclei and accumulation of dense cytoplasm at places are commonly observed (figure 3).



Figures 1–5. Development of endosperm in *Rhynchospora corymbosa* (L.) Britton. 1. Wholemount of 64-nucleate endosperm with bicelled proembryo and antipodal cells. 2. Wholemount of endosperm at globular stage of proembryo showing cellular and free nuclear zones. 3. Haustorial part marked in figure 2 enlarged. 4. L. S. seed showing advanced stage of endosperm. 5. Lower part marked in figure 4 enlarged to show the multicellular haustorial tip. (ANT, antipodal cells; CE, cellular endosperm; DH, degenerating haustorium; EMB, embryo; H, haustorium; HY, hypostase; NU, nucellus; SC, seed coat).

During the later stages of development the endosperm proper grows enormously at the expense of adjacent nucellar cells and eventually fills the entire cavity in the seed and establishes direct contact with the seed coat (figure 4). However, only a small extent of nucellus persists at the chalazal part which lodges the hypostase. Even here the nucellar cells present a depleted appearence indicating an aggressive haustorial activity. By about the late globular stage of the embryo the tip of the coenocytic haustorium becomes cellular, the cells including one or more nuclei. In the rest of the haustorial tube the nuclei begin to degenerate (figure 5). At maturity of the seed, the entire haustorium degenerates and disappears.

Among the Cyperaceae, *Rhynchospora* (present work) and *Scleria*[1] appear embryologically unique in having the haustorial endosperm. The sharing of this character which is unusual for the family brings these two genera embryologically closer. Furthermore, the present embryological findings provide an additional evidence in favour of Koyama's opinion of linking the tribe Rhychosporeae with Sclerieae[2].

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QUERCETIN-3-RUTINOSIDE AND NARINGENIN 7-RHAMNOGLUCOSIDE IN *MARSILEA* SPOROCARPS

S. D. Lal, V. M. Gupta and R. K. Garg*
Department of Biology, R. K. S. D. College, Kaithal 132 027, India.
*Department of Chemistry.

Marsilea quadrifolia is an aquatic species of the fern family marsileaceae. This species has been worked out morphologically[1,2], as well as biochemically[3,4]. Ferns are least infected by pathogens and other organisms, due to the occurrence of a large percentage of phenolic compounds in them[5] and many of them possess therapeutic values[6]. A preliminary study of the chemical constituents of sporocarps of *M. quadrifolia* has therefore been made. Literature survey reveals that