

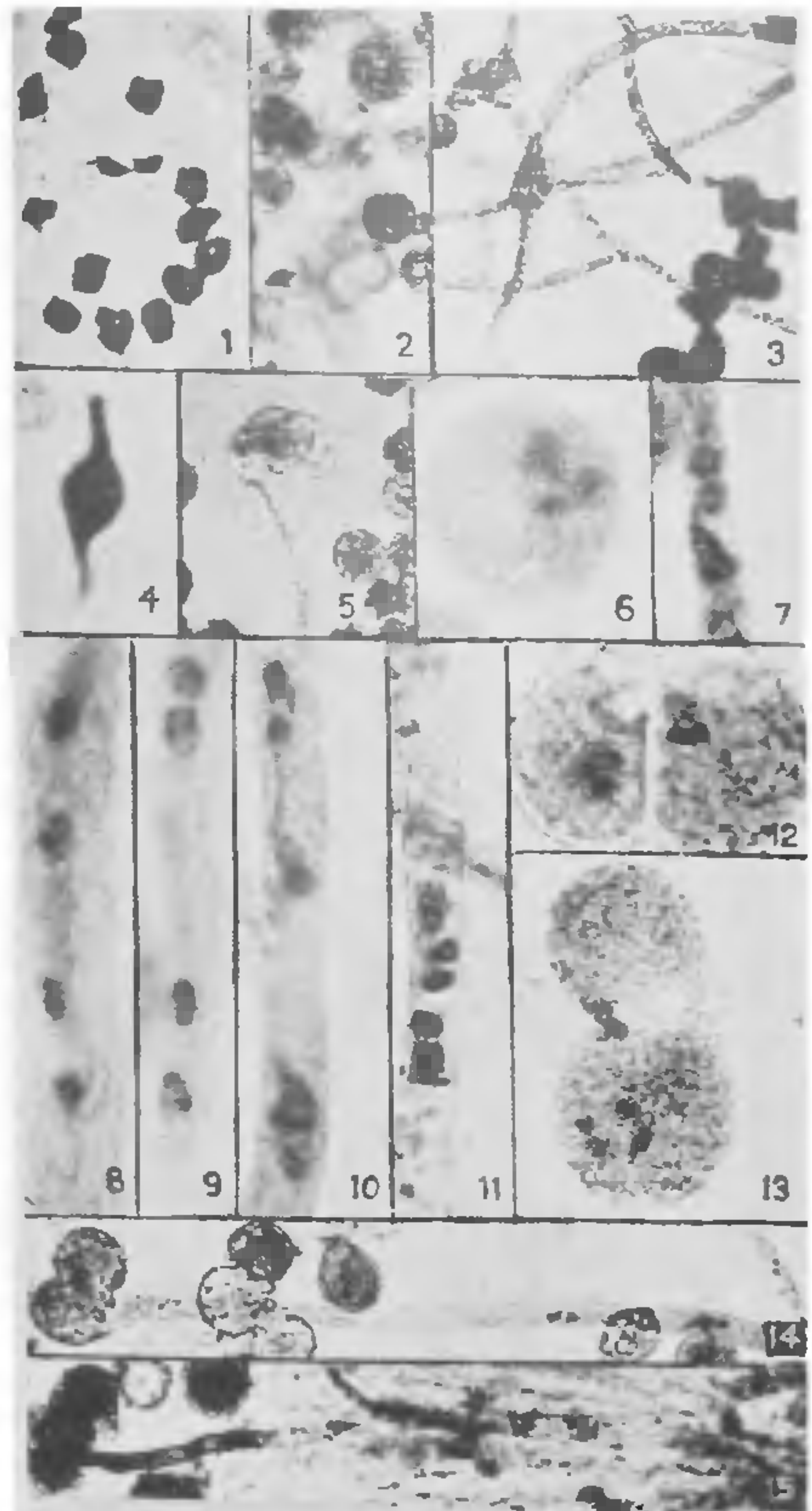
SUPERNUMERARY GAMETES IN THE POLLEN TUBE OF *COLOCASIA*

Colocasia esculenta commonly known as taro is an important tuber crop consumed as vegetable in India and S.E. Asia. Because of its inherent nature of vegetative multiplication and high sterility, the extent of genetic variation is rather limited. Though a number of varieties are being reported from different parts of the country, many of them are found to be one and the same bearing different names. A variety named 'Narkattia' collected from Andhra Pradesh, showed partial pollen sterility and high female sterility. The pollen grains were further grown in culture medium to determine the pollen fertility. The present communication describes the occurrence of more than two gametes in the pollen tubes.

'Narkattia' was diploid with 14 bivalents at MI in the PMCs (Fig. 1) and showed a pollen fertility of only 34.9% (Fig. 2). Among the pollen grains more than 10% were dyads and occasionally tetrads were also present. Even though a lower sucrose concentration was recommended for optimum pollen germination and tube length in *Colocasia*¹, 'Narkattia' responded favourably at 3% sucrose + 200 ppm boric acid (Fig. 3). Though about 0.5% germinating pollen were bisiphonous (Fig. 4), a few pollen grains with 3 pollen tubes were also noticed; however, among them, one pollen tube dominated (Fig. 5).

At the time of anthesis the fertile pollen grains were trinucleate (Fig. 6). Normal pollen tubes had two gametes and a vegetative nucleus (Fig. 7). A number of pollen tubes showed 4 gametes in each (Figs. 8, 9). The position of the vegetative nuclei varied. The vegetative nuclei were present between two pairs of gametes (Fig. 10) or the four gametes were present between the two vegetative nuclei (Fig. 11). The variation in the position of vegetative nucleus reinforces the conclusion that it is a vestigial structure without any important function in the growth of the pollen tube^{6,7}.

The presence of dyads among the pollen grains is of further interest in this context. The dyads were either well defined or partially fused. In the well defined dyads, the individual pollen grains were completely separated by a cross wall and each contained a vegetative nucleus and two gametes (Fig. 12). However, in the partially fused dyads the gametes and vegetative nuclei from the adjacent pollen grains were found mixed (Fig. 13). When such partially fused dyads germinated more than two gametes were present in the pollen tube (Fig. 14). The germination of partially fused dyads *in vitro* on the stigmatic surface accompanied by penetration was also noticed



FIGS. 1-15. 1. MI with 14 bivalents, $\times 1,000$. 2. Fertile and sterile pollen, $\times 170$. 3. Pollen germination, $\times 170$. 4. Bisiphonous pollen, $\times 170$. 5. Pollen grain with three pollen tubes, $\times 170$. 6. Trinucleate pollen, $\times 800$. 7. Normal pollen tube with a vegetative nucleus and two gametes, $\times 800$. 8, 9. Pollen tube with 4 gametes, $\times 800$. 10. Two vegetative nuclei between two pairs of gametes, $\times 600$. 11. Four gametes flanked by two vegetative nuclei, $\times 600$. 12. Well defined dyad, $\times 300$. 13. Partially fused dyad, $\times 300$. 14. A dyad showing pollen tube with 4 gametes and vegetative nuclei, $\times 200$. 15. A germinating dyad on the stigma, $\times 200$.

(Fig. 15). The occurrence of polyspermy due to additional divisions is already reported in different plant species¹⁷. The presence of supernumerary sperm cells in the pollen tubes has also been attributed to the germination of double, triple or quadruple pollen grains formed by incomplete cytokinesis in *Ficus*³ and *Tulipa*². The occurrence of supernumerary

gametes in *Colocasia* is being reported for the first and the origin of polyspermy is presumably due to the partial fusion of individual pollen grains in the dyad.

In *Colocasia esculenta*, there is a wide prevalence of triploid forms having 42 chromosomes⁵ and the studies have already established the autotriploid nature. The presence of more than two gametes in the pollen tube implies that the fusion of the two gametes with the egg might have involved in the resulting triploidy.

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CHEMOTAXONOMY OF A FEW TAXA OF PEDALIACEAE

THE family Pedaliaceae comprising 14 genera and 220 species (Airy Shaw¹) includes medicinally important plants like *Martynia* and *Petalium* and economically important plants like *Sesamum*. While the family has received attention from disciplines as anatomy, embryology, palynology, the information on the chemotaxonomy of the family is meagre. The systematic position of *Martynia* is doubtful. It was placed in Pedaliaceae by Bentham and Hooker². Airy Shaw¹ and Hutchinson³ separated it into an independent family, Martyniaceae on the basis of parietal placentation and absence of glands at the base of the flowers. The present study on the chemotaxonomy of *Martynia annua* L., *Petalium murex* L., *Sesamum indicum* L. and *Sesamum laciniatum* Klein has been undertaken with a view to seeing how far chemical data together with the information from other disciplines would support the separation of *Martynia* from Pedaliaceae.

The materials of *Martynia annua*, *Sesamum indicum* and *S. laciniatum* were collected locally and *Petalium*

murex was collected from Rudraram, a village near Siddipet, Medak District, Andhra Pradesh. Using fresh materials of stems, leaves, flowers and fruits, Siringin test, Maul's test, HCl/Methanol test 'A', Cigarette test, Hot water test, Leucoanthocyanin test 'A', Juglone test 'A', HCN test and Aurone test 'A' (Gibbs⁶) were carried out. Tests for carbohydrates (Molisch test), saponins, tannins, free sugars, flavonoids, alkaloids, phenols, indoles (Ehrlich test), leucoanthocyanins, triterpenoids (Noller's test), triterpenoids/steroids (Liebermann Burchard test) and Badouni's test and Labat test were carried out using 80% methanol extracts of entire plants at the time of flowering and fruiting. The results of the tests are presented in Table J.

TABLE J

Tests	<i>Martynia annua</i>	<i>Petalium murex</i>	<i>Sesamum indicum</i>	<i>Sesamum laciniatum</i>
Cigarette test	+	+	+	+
Hot water test	+	+	+	+
HCl/Methanol test (Gibbs)	—	—	—	—
Siringin test	—	?	—	—
Maul's test	+	+	+	+
Leucoanthocyanin test 'A' (Gibbs)	+	—	—	+
Juglone test 'A'	—	—	—	—
Aurone test 'A'	—	—	—	—
HCN test	+	—	—	—
Molisch test	+	+	+	+
Saponins	—	—	?	—
Tannins	?	—	—	?
Noller's test	—	—	—	—
Alkaloids	—	—	—	—
Phenols	+	+	+	+
Ehrlich test	—	—	—	—
Flavonoids	+	+	+	+
Leucoanthocyanins	+	—	—	—
Liebermann Burchard test	—	—	+	+
Free sugars	+	+	+	+
Badouni's test	+	+	+	+
Labat test	+	+	+	+

In all the species the reactions for carbohydrates, flavonoids, phenols, free sugars, Maul's test, Cigarette test, Hot water test, Badouni's test and Labat test were positive while for triterpenoids, alkaloids, indoles, Aurone test 'A', HCl/Methanol test 'A', and Juglone