

adjacent stelar parenchyma. Therefore, the galls were cut into bits and macerated. The giant cells were dissected out. It was observed that they bear various kinds of irregular haustorial appendages, often with pointed ends (Figs. 3, 6). The appendages are intercellular and so densely protoplasmic that with haematoxylin, the nuclei and protoplasm take such a deep stain that the nuclei are hardly visible (Figs. 1, 2).

Some giant cells contain a large number of nuclei (Fig. 5) but others have a few of them (Figs. 2, 6). A giant cell shows some nuclei larger than others (Fig. 6).

We are thankful to the Head of the Department of Botany, University of Rajasthan, for facilities.

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Jaipur-4, July 17, 1976.

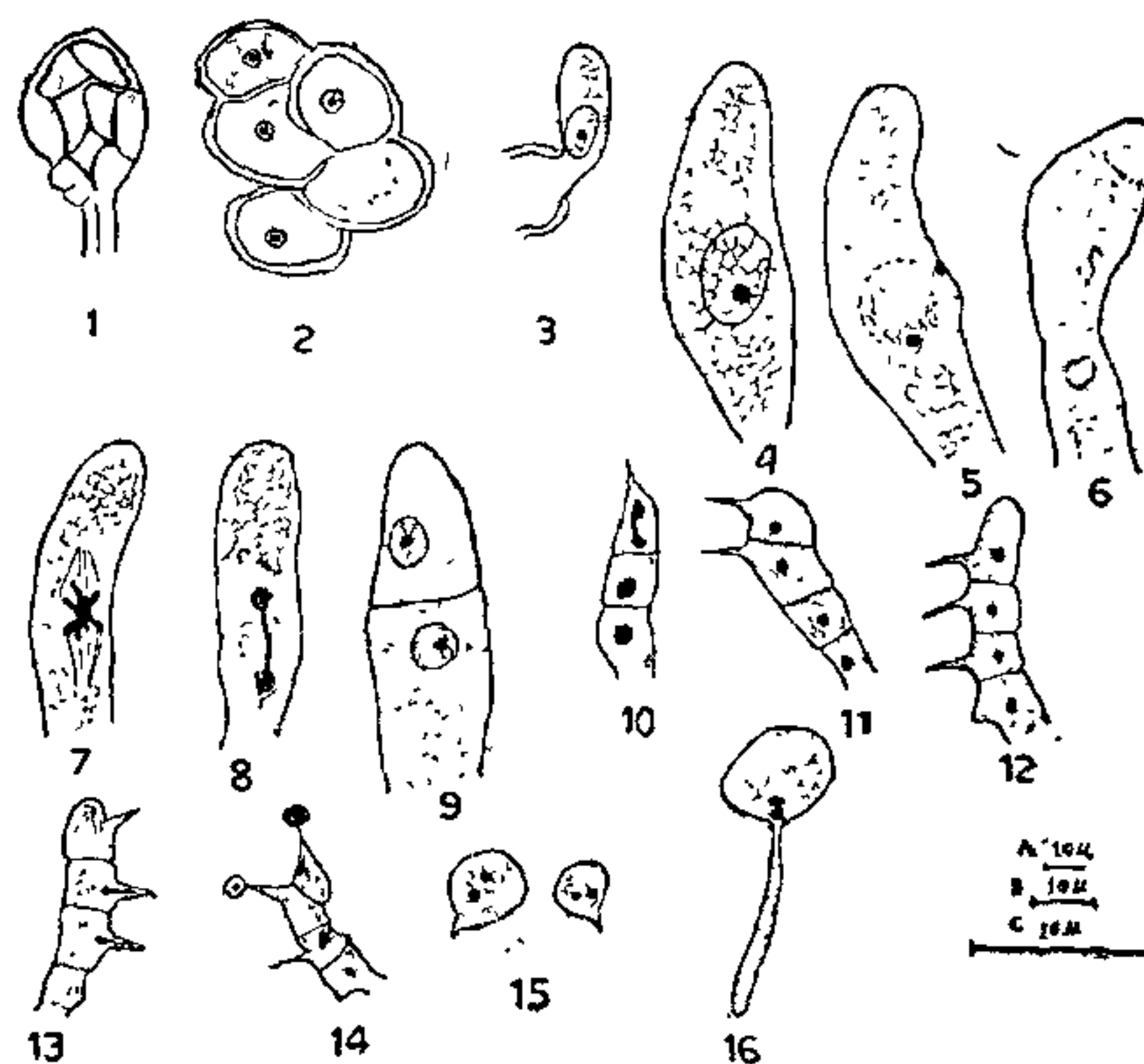
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CYTOLOGICAL STUDIES IN THE GERMINATING TELIOSPORES OF *RAVENELIA ESCULENTA*

DETAILED observations on the behaviour of the diploid nucleus in the germinating teliospores of *Ravenelia esculenta* Naras. and Thirum., an autoecious rust, which parasitizes *Acacia eburnea* Willd. have been made. The telial material was collected near Nipani (Karnataka State) and the teliospores were germinated by hanging drop method. The spores germinated within 5 to 7 hours at room temperature without any resting period and remained viable for more than 10 days. Germinating teliospores were fixed at different stages of development in Allen's modified Bouin's fixative and stained in Heidenhain's haematoxylin and counterstained with Orange G. 1% acetocarmine stain also yielded satisfactory results.

The teliospore head consists of 4 to 12 spores grouped irregularly. The pedicel is compound and composed of 2 to 3 hyphae. There is a pendent cyst at the base (Fig. 1). In most of the cases more than 3 spores germinated from the spore head. Under excess moisture conditions, prolongation of germ tubes and sterigmata occurred. Each teliospore cell contains one diploid nucleus (Fig. 2). The teliospore cell germinates by giving rise to a papilla which elongates rapidly. The diploid nucleus migrates into the promycelium (Fig. 3).

The migrating nucleus has a clear nuclear membrane with chromatin reticulum. Nuclear division commences when the interphasic nucleus approaches the middle part of the basidium (Fig. 4). At a later stage the nuclear membrane starts disappearing while the nucleolus and splitting reticulum move towards the periphery (Fig. 5). In the late prophase I the chromosomes spread out into two groups forming Diakinesis (Fig. 6).



FIGS. 1-16. Fig. 1. Teliospore head with pedicel, cyst and irregularly arranged spores. Fig. 2. Mature teliospore with diploid nucleus. Fig. 3. Migrating nucleus. Fig. 4. Nucleus in the middle of the Basidium. Fig. 5. Disappearing nuclear membrane with peripheral nucleolus and reticulum. Fig. 6. Diakinesis. Fig. 7. Metaphase I. Fig. 8. Anaphase I. Fig. 9. Late telophase I. Fig. 10. Division II, Anaphase II, upper nucleus. Figs. 11 and 12. Formation of sterigmata. Fig. 13. Migration of nuclei in the sterigmata. Fig. 14. Basidiospores on the sterigmata. Fig. 15. Binucleate basidiospores. Fig. 16. Germinating basidiospores.

(Magnifications : A—Fig. 1, B—2, 3, and 10 to 14, C—4-9 and 15 & 16).

During metaphase I, the chromosomes are at their shortest length. In the metaphase plate the chromosomes are arranged very compactly. Orientation of the metaphase spindle is rather indistinct with ill-defined fibres (Fig. 7). In anaphase I, the spindle contracts and the fibres coalesce into a single strand (Fig. 8). In telophase I the daughter nuclei are quite prominent and are separated by first cross wall formation (Fig. 9). A resting phase does not seem to occur as the first meiotic division is immediately followed by a second division (Fig. 10). The nuclear behaviour in the second division is of a short duration as it is an equational one.

Even before the completion of the second nuclear division sterigmata are formed (Figs. 11, 12) which,

in turn, bear the terminal basidiospores (Fig. 14). The nuclei and much of the cytoplasm migrate into the developing basidiospores through sterigmata (Fig. 13). The young basidiospore is uninucleate (Fig. 14) while the mature one contains two nuclei as a result of third nuclear division (Fig. 15). The basidiospores germinate sooner or later after detachment from the sterigmata.

In this rust the fusion nucleus undergoes three successive divisions instead of two (which is normal for most rust fungi) the first two occurring in the basidium followed by the third in the basidiospore. Allen¹ and Ashworth² have independently reported similar results with *Puccinia malvacearum* Burt.

Grateful thanks are conveyed to Dr. G. V. Joshi, for laboratory facilities.

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OCCURRENCE OF E-TYPE BRIDGES IN *ALOE BARBADENSIS* MILL.

Aloe barbadensis Mill. (*A. perfoliata* var. *vera* L., *A. vera* Auth. non Mill.) is known for its medicinal properties. While working out the details of its meiosis, E-type bridges have been recorded in a few pollen mother cells (Fig. 1). The bridge is formed during anaphase-I and assumes the appearance of a capital E, hence the name E-type.

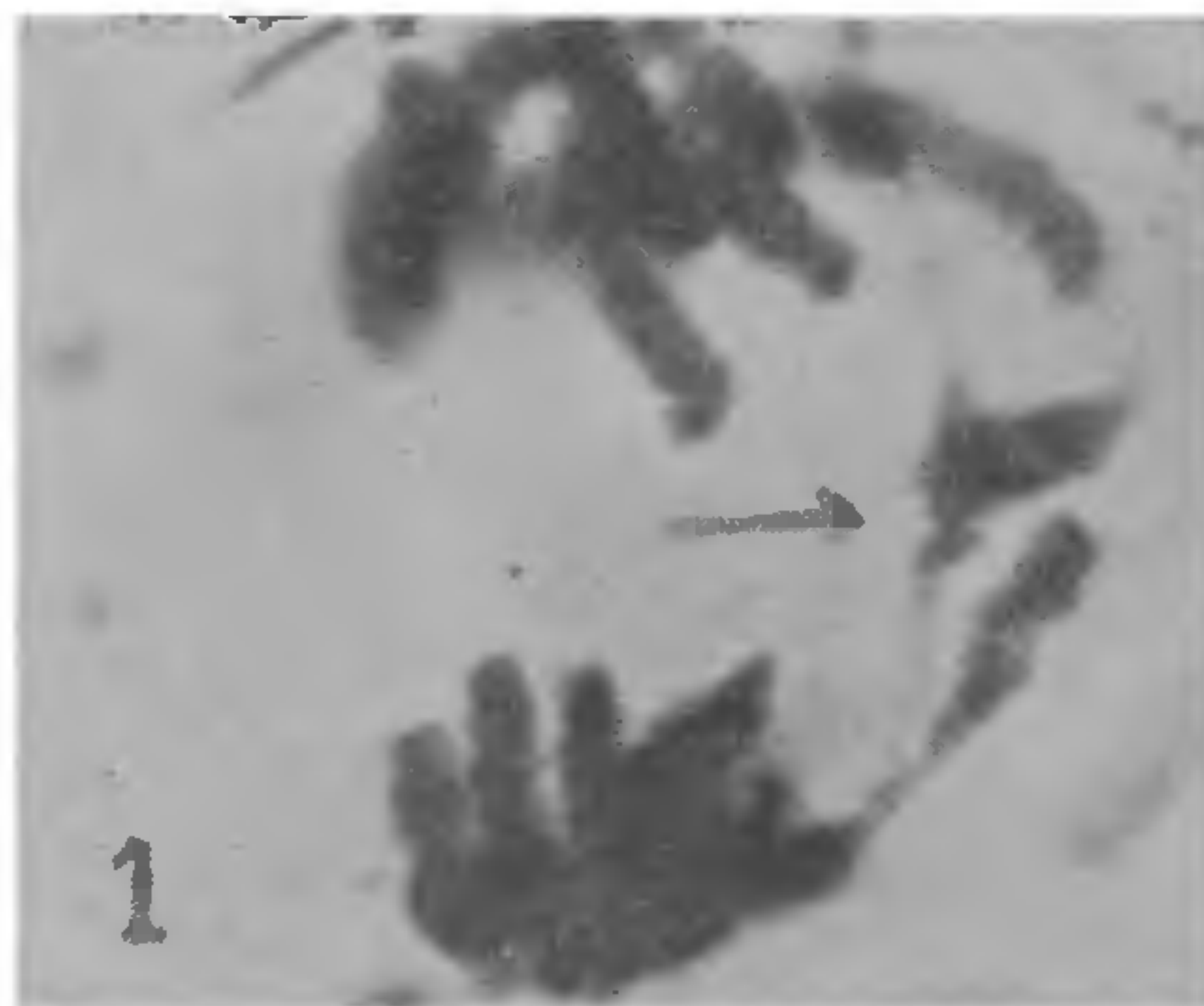


FIG. 1. Late anaphase showing formation of E-type bridge, X 1,650.

Occurrence of E-type bridges, a little known meiotic event, has been reported earlier^{1,3}, but it was Brandham⁴ who, for the first time, logically explained the formation of E-type bridges in the tribe Aloineae of Liliaceae. Bivalents involved in the formation of such bridges are heterocorphic with regard to the relative lengths of the long and the short arms. A pericentric inversion followed by a paracentric inversion results in the formation of heteromorphic homologues. Single crossover involving a segment in the long arm of normal chromosome pairing, with its homologous segment situated in the short arm of the inverted homologue, results in the formation of an E-type bridge and a large acentric fragment in anaphase-I; the latter may get lost sooner or later. High incidence of such bridges suggests interspecific hybridity.

Grateful thanks are extended to Prof. K. B. Deshpande for facilities, to Dr. P. E. Brandham, Royal Botanic Gardens, Kew, England, for confirming chromosomal configurations, and to U.G.C. for partly financing the scheme—'Cytological Studies in the Tribe Aloineae'.

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NEW CYTOPLASMIC MALE STERILE LINES OF SUNFLOWER

SUNFLOWER hybrids in comparison with the open pollinated varieties were reported to exceed standard varieties by about 54% in seed yield¹ and 34% in oil content² in addition to being more uniform with regard to maturity, plant height and vigour. Consequently a number of hybrids using self-incompatibility and male-sterility were produced and are in cultivation in France, Rumania, U.S.A. and Canada^{3,4,5}.

As self-incompatibility in sunflower is not complete, in the production of hybrid using this mechanism, selfed seeds upto 35% have been recorded in S_3 - S_4 inbred lines used as female parents⁶. Thus the full use of heterosis cannot be made. On the other hand, due to inbreeding, the production of highly self-incompatible lines and their maintenance would be difficult. The genetic male sterility due to a recessive gene linked with green colouring in seedlings requires seeding at high rates and increased cost of labour for the removal of anthocyanic male fertile plants. It was also found that genetic male sterility could be