APOMIXIS IN *CENCHRUS CILIARIS*: A PRELIMINARY STUDY

THE genus *Cenchrus* has two important species, *viz.*, *C. ciliaris* and *C. setigerus*. In *C. setigerus*, three chromosome races ($2n = 34$, 36, and 54) have been isolated; whereas in *C. ciliaris*, as many as eight forms ($2n = 32$, 34, 36, 38, 40, 52, 54 and 56) are known (Ramaswamy *et al.*[1]). Although apomixis in *C. setigerus* has been demonstrated (Fisher *et al.*[2]) no

attempts seem to have been made to find out the mechanism of apomixis in *C. ciliaris*. The list of apomictic grasses presented by Brown[3] did not include *C. ciliaris*. However the studies undertaken in the past suggested the presence of apomixis in this species. Such a suggestion was based on cytogenetic and breeding studies. Positive evidence for the presence or absence of apomixis can only be obtained from laborious and time-consuming studies of megaspore, embryo sac and embryo development. Due to the availability of squash technique now (Bradley[4]), this task of detection of apomixis in grasses has become easier.

During a recent cytological survey of grasses from Western Uttar Pradesh, three collections of *C. ciliaris* were studied from Meerut and Hastinapur. All of them showed irregular meiosis. The irregularities included the presence of univalents and multivalents at metaphase I, lagging chromosomes at anaphase I and anaphase II and the presence of micronuclei at dyad and quartet stages. In collection No. 667 where apomixis was worked out using squash technique, chromosome associations were worked out at metaphase I ($n = 18$) and the results are presented in Table I.

TABLE I

Chromosome associations at metaphase I

	I	II	III	IV	Xta/cell
Range ..	0– 2	6–18	0– 1	0– 6	31–38
Mean ..	0·24	10·68	0·16	3·48	34·64

At anaphase I, 86·25% cells and at anaphase II 86·50% cells were normal, the remaining cells showing laggards and bridges. The meiotic irregularities suggested that apomixis may be common in the species. An attempt was, therefore, made to study the embryo sacs and the embryo development. Since section cutting is a time-consuming process, a modified Bradley's squash technique, suggested by D'Cruz and Reddy,[5] was followed.

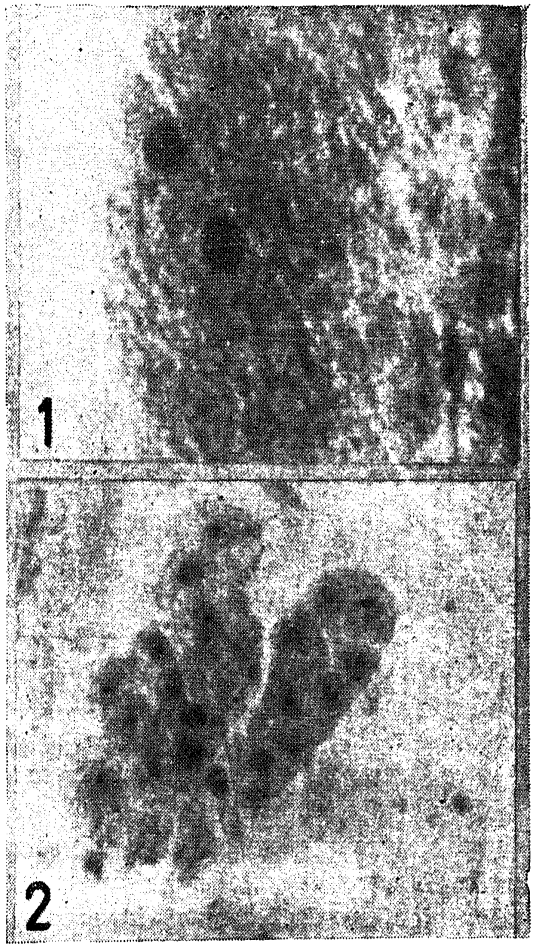
The presence of multiple embyo sacs and multiple embryos was found to be common feature. From a total of 26 ovules studied, 17 showed the presence of multiple embryo sacs. Frequency distribution of the ovules having different numbers of embryo sacs is given in Table II. Most of these embryo sacs were not mature and were found in the form of initial cells or in the early stages of

TABLE II

Frequency distribution of ovules with varying number of embryo sacs

Number of embryo sacs	1	2	3	4	5	6	7
Frequency of ovules ..	9	6	8	..	1	..	2

the embryo sac development (Fig. 1). In no case more than two mature embryo sacs were observed in the same ovule. This suggested that most of the embyo sacs which start their development never reached maturity. The additional embryo sacs were presumably nucellar in their origin. Polyembryony was observed in some of the ovules studied. In ovules, where embryos were found in their later stages of development, more than one embryo were never observed in the same ovule. This may be due to the very small sample studied. When polyembryony was observed, multiple embryos were found in the form of bunches (Fig. 2) suggesting cleavage polyembryony or adventive embryony. It will be



FIGS. 1–2 Fig. 1. A two-nucleate young embryo sac from squash technique. Fig. 2. One of the several bunches of embryos squashed from the same ovule.

difficult to establish their exact mode of development, unless microtome sections are

used for study. Such a study is, however, underway.

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