

CYTOLOGICAL STUDY OF MALE STERILITY IN *BRASSICA JUNCEA* CV PUSA BOLD

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Research works were undertaken for introgression of 'OO' quality characters in *Brassica juncea* cv Pusa Bold. Plants of *Brassica juncea* (L.) Czern. vr Pusa Bold were crossed with *B. juncea* (L.) Czern. var. Heera with zero erucic acid. Progeny of this cross were self pollinated, harvested and screened for desired characters. In further selfing some male sterile plants were noticed. The aim of the present cytological study was, to compare microsporogenesis in fertile plants and different male sterile plants. During microsporogenesis in male sterile [MS], partly male sterile (PMS) and male fertile (MF) mustard plants, the development of archesporium, tapetum and meiotic division has been studied. Male sterility was variable in observed plants. In MS plants the anthers appeared completely desiccated and shrunken. The PMS plants sometimes produced microsporangia with functional archesporia but in many cases the nuclei of microsporoocytes shriveled and died.

Keywords : Cytological study; *Brassica juncea*; Male sterility.

Attempts are being made the world over to introgress 'OO' characteristic in *B. juncea*. This effort was made possible by the Canadian success story¹. During the experiments and further growth of progenies, some male sterile plants were observed. Although unplanned and spontaneous, this characteristic of male sterility is advantageous for the production of certified F₁ seeds. In addition to the male sterility, these are associated with other abnormalities like chlorosis, petaloid anthers, and reduction in the size of flowers and buds and reduction in the size of plants. The male sterile plants reported here were spontaneous and derived from progeny of Indian mustard (*B. juncea* cv Pusa Bold X *B. juncea* cv Heera²).

During microsporogenesis a co-ordination in the development of such tissue as archesporium and tapetum is desirable for the successful production of microspores. From the cytological study of Ogura³ and Bartkowiak-Broda *et al.*⁴, there was a conclusion that pollen degeneration occurred suddenly at the microspores stage and that this degeneration seemed to have relation with the early collapse of tapetum.

The objective of this study was to determine whether there was a co-ordination in the development of anther tissues and the stage at which microspore production was

aborted.

Material was procured from experimental fields of the Department. It was processed, sectioned and stained by the usual methods of embryology⁵.

In all male fertile (MF) plants the development of archesporium and tapetum was normal and the process of meiosis was found to develop normally. On the contrary, all male sterile (MS) plants manifested disturbances in the development of archesporium and tapetum. Only in single pollen chambers very thin layer of tapetum was observed. In many cases tapetal cells became enlarged and vacuolated. Pollen mother cells (PMC) did not pass through their meiotic division and they were not inside callose wall. The sporocyte nuclei shrink quickly and lead to complete abortion. At the stage equivalent to anthesis, sterile anthers were very narrow and short and they were always empty, without pollen grains (Fig. 1). Observation of anthers of partly male sterile (PMS) plants showed that the development of tapetum was normal. The development of archesporium was normal in early stage. Most of PMS developed without any disturbances and they passed through their meiotic division. However, some PMC started to die during I meiotic division and some of them died by the end of this process. PMS plants manifested irregularities during

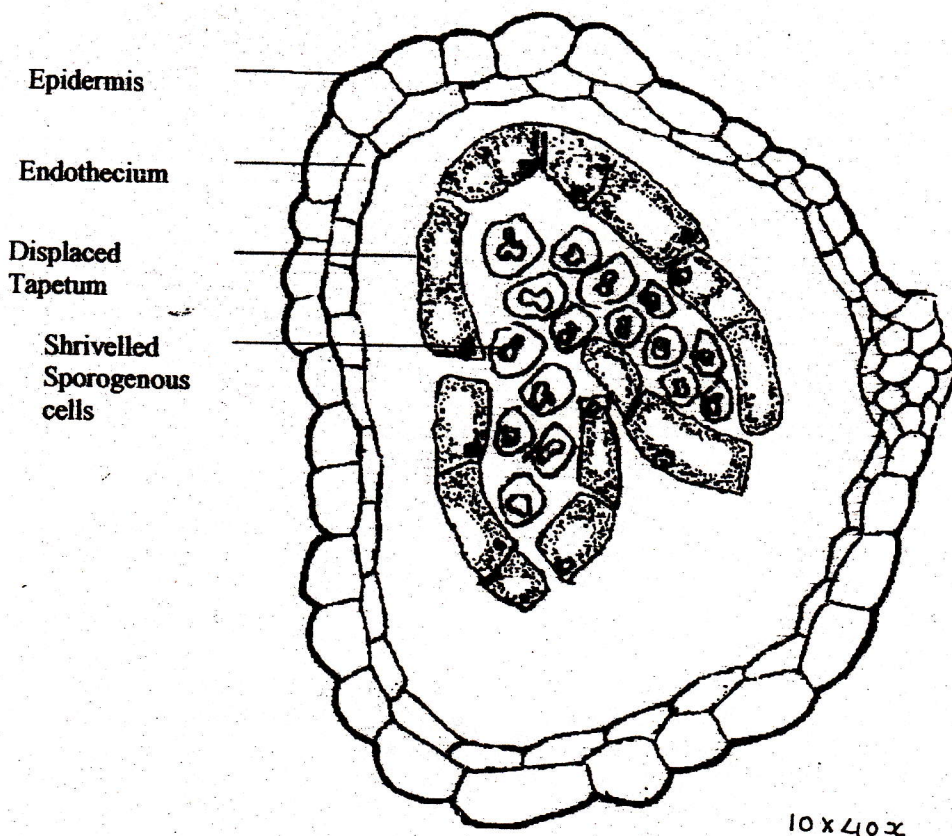


Fig.1. Single sporangia of tetrasporangiate anther of male sterile *Brassica juncea* var. *Pusa Bold*.

meiosis. At diakinesis and at metaphase I univalent were observed apart from bivalents. At the tetrad stage, sporocytes were with smaller numbers of spore (dyads and monads). The spores resulting from the meiotic division were frequently of various sizes and contrary to fertile anthers, the four microspores of the same tetrad occasionally did not break up and often continued to adhere to each other. In many instances the pollen chambers of PMS plants contained less pollen than it was observed in MF plants. Also pollen chambers were noted with microspores clustered in the middle of

chamber or the chambers completely devoid of pollen.

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