CYTOLOGICAL STUDY OF MALE STERILITY IN *BRASSICA NAPUS* L.

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ABSTRACT

Research works were undertaken to synthesize artificial winter oilseed rape (*B. napus* L.). Attempts were made to introduce male sterility into oilseed rape via interspecific crosses of selected forms of *B. campestris* and *B. oleracea*. As a result of *B. campestris* x *B. oleracea* cross combinations hybrids were obtained and in F_9 progeny male sterile plants were selected.

The aim of the present cytological study was, to compare microsporogenesis in normal fertile plants and different male sterile plants. During microsporogenesis in male sterile (MS), partially male sterile (PMS) and male fertile (MF) rapeseed plants the development of archespore, 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 archespore but in many cases the nuclei of microsporocytes shriveled and died.

INTRODUCTION

For the production of certified F_1 seeds, it is advantageous to utilize male sterility. In *Brassica napus* such different types of male sterility as *nap, mur, ogu* (Shiga 1980) and *pol* (Fan & Stefansson 1986, Fu et al 1987) have been reported. The male sterile plants reported here were derived from F_9 progeny of artificial rapeseed (*B. campestris* ssp. *chinensis* x *B. oileracea* var. *gemmifera*)

(Wojciechowski 1993).

During microsporogenesis a co-ordination in the development of such tissue as archespore and tapetum is desirable for successful production of microspores. From the cytologic study of Ogura (1968) and Bartkowiak-Broda et al (1979) there was a conclusion that pollen degeneration occurred suddenly at the microspore 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 microspores production was aborted.

EXPERIMENTAL

In all MF plants the development of archespore and tapetum was normal and the process of meiosis was found to develop normally. On the contrary, all MS plants manifested disturbances in the development of archespore and tapetum. Only in a 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 shrinkel 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.

Observation of anthers of PMS plants showed that the development of tapetum was normal. The development of archespore was normal in early stage. Most of PMC 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 meiosis. At diakinesis and at metaphase I univalents were observed apart from bivalents. At the tetrad stage, sporocytes were observed to have normal number of spores, besides sporocytes with smaller numbers of spores (dyads and

monads). The spores resulting from the meiotic division were frequently of various size 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 the chamber or the chambers completely devoid of pollen.

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