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RESEARCH PAPER

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Intercellular Chromatin Migration during Microsporogenesis in Advanced (F_9) Autotetraploid Hybrid Fenugreek (*Trigonella foenum-graecum*)

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ABSTRACT

Through the phenomenon of intercellular chromatin migration during microsporogenesis (cytomixis) was not observed in autotetraploids of Trigonella foenum-graecum but its intervarietal hybrid (Sel.3 x Sel. 4) showed it. Occurance of cytomictic events in F_9 plants with regular meiosis, increased pollen and seed fertility as compared to their parents, leads to the conclusion that cytomixis in F_9 Trigonella foenum-graecum may by genetically controlled. It does not have any serious repercussions on the viability of gametes. Interaction between genes of parental varieties may be responsible for the induction of cytomixis in hybrids.
Key Words: Cytomixis, Autotetraploid, Trionella and Aneuploid.

INTRODUCTION

Trigonella foenum-graecum commonly known as fenugreek is an economically important crop of the country from different angles therefore; genetic improvement of the crop was carried out. In an attempt to improve the fertility of artificially induced auto-tetraploids of *T. foenum-graecum,* intervarietal hybridization was carried out at tetraploid level taking all the 4 varieties (selections) namely sels, 1,2,3 and 4 in a diallel manner. Out of different cross combinations, sels (3x4) was of great importance because of transmission of 'bipodded trait' from dwarf sel.4 (male parent) to tall, more vigorous and single podded sel. 3 (female parent). Judicious selection was carried out over succeeding generations. During meiotic analysis of the hybrid population in F_1 and F_9 generations, cytomixis was observed inspite of more meiotic stabilization in F_9 progeny than either of their parents. The present paper embodies the result of the same.

MATERIAL AND METHODS

Plants of F_9 *T. foenum-graecum* (2n=4x=32) were grown in natural agroclimatic conditions. For meiotic analysis flower buds of appropriate size from different plants were fixed separately in 1:3 acetic alcohol fortified with iron. After 48 hours of fixations they were transferred to 70% ethanol. The slides were analysed invariably before making them permanent. 20 plants from F_9 population and 130-150 PMCs per plant were randomly analysed in different stages of meiosis. i.e. from early prophase to telophase. II. Microphotographs were taken and slides were made permanent by ethanol-butanol schedule, Pollen fertility was studies by using same stain and non-sustainable pollen grains were considered as sterile.

OBSERVATIONS

This phenomenon was first observed in F_1 progeny of cross between sels. (3x4) but detailed studies were made in F_9 population. Percentage of cytomictic plants in F_9 population was 15 and mean percentage of cytomictic PMCs in cytomictic plants was 13.7.

Though this phenomenon was frequently observed at prophase I but chromatin migration was observed at various other stages also up to the telophase II (Figs. 1-4). Derangement chromosome number was seen in most of the cytomictic PMCs due to partial migration of chromatin material. Chromatin migration takes places though cytoplasmic bridges which are more prominent at certain stages particularly at prophase. The adjacent PMCs in general were seen to be involved in pairs in cytomixis (Fig.2).

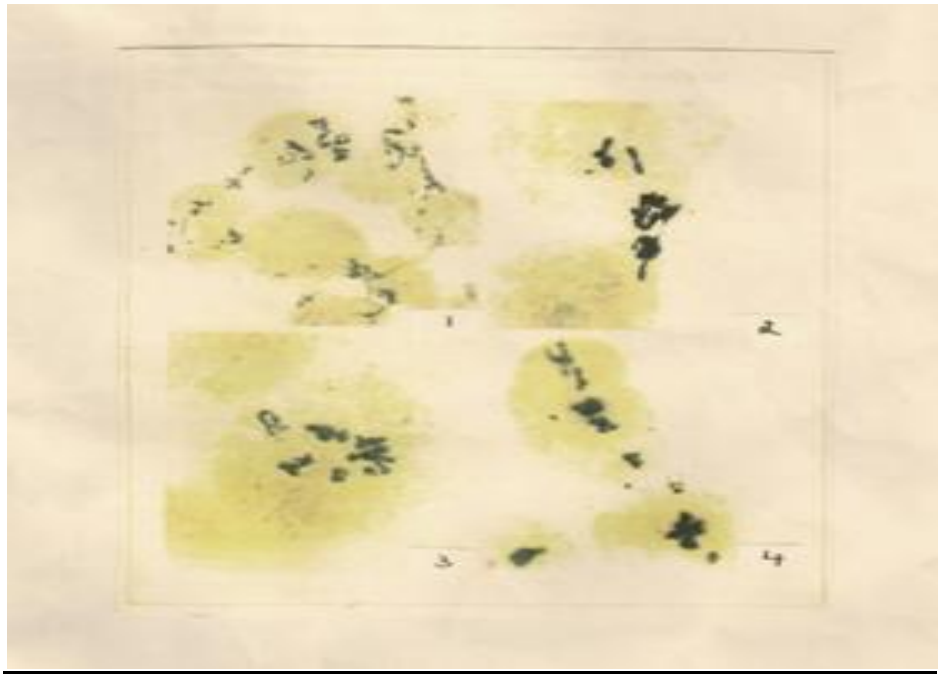

Figure 1. Number of PMCs involved in cytomixis at prophase I.
Figure 2. PMCs invdved in cytomixis at metaphase I.
Figure 3. PMC at Metaphase I with extra chromatin material.
Figure 4. Two aneuploid PMCs after cytomixis.

The formation of cytoplasmic channels among a series of cells were also observed and further through such cells, a continuous flow of chromatin was seen. In such PMCs, cells with lesser or greater chromatin content than normal were noticed (Fig.1). Transfer of nucleolus along with chromatin material was frequent.

Cytomixis was not observed in either of its parents, i.e. Sel. 3, and Sel. 4. Inspite of occurrence of cytomixis, the F_9 hybrid population displayed more uniformity in their meiotic behaviour as compard to their parent (Sels. 3 and 4). Quadri-, tri-and univalents were rare and bivalents were common in hybrids. Pollen fertility was also highest in the case of hybrids.

DISCUSSION

Gates (1911) defined cytomixis as the migration of chromatin from one cell to another. This phenomenon is commonly observed in hybrids, apomicts and chemically treated plants (Morriset 1978, Sparre 1976, Lakshmi & Raghavaiah 1981), besides its reports from normal plants (Bariar 1985, De & Sharma 1983). Although cytomixis has been reported from a large number of genera, its cytogenetical causes for occurrence and significance are still unexplained. Several interpretations like, due to change and disturbances in hydrostatistical state of sporogenous tissue (Cebotarev 1978), due to disturbances in the nucleo-cytoplasmic relationships (Bobak & Herich 1978), due to mutagenic treatment resulting in the production of stickly chromosomal bridges during meiotic anaphase (Kaul 1971) or due to certain unknown physiological disturbances (Tai & Vickery 1972), have been advanced. However, a number of cytogenetists are of the view that certain genetic factors are responsible for the cytomictic events (Brown & Bertke 1974, Omara 1976, De & Sharma 1983, Bariar 1985). In the case of present study increased pollen fertility and normal meiotic behaviour of advanced population as compared to its autotetraploid parents leads to the conclusion that this phenomenon may be associated with certain genetic factors which does not have any serious repercussions on the viability of gametes.

Occurrence of derangement in chromosome number due to partial chromatin migration may be a way for the occurrence of aneuploidy (Cheng *et al.* 1975, Omara 1976). Presence of more or less than 16 bivalents during microsporogenesis in the present material (Fig. 4) may be a factor for the production of aneuploid gametes. Thus cytomixis has a great significance in the variation and evolution of a taxon.

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