MEIOTIC GIANT CELLS IN INBRED RYE

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INTRODUCTION

Meiotic giant cells in plants have been reported in several occasions, for example by P e t o (1933) in *Festuca-Lolium* hybrids, J o h n s s o n (1944) in inbred *Alopecurus*, R e e s (1955) in inbred rye, D a m o n (1961) in cytoplasmic malesterile sorghum. We have observed this kind of giant cells in an inbred line («Riodeva») of rye (*Secale cereale* L.) and in the F_1 and F_2 of the cross between this line and the inbred line of the same species «Villarrob'edo». Both inbred lines were obtained by se'f pollination during 20 generations at the experimental Station of Aula Dei (CSIC, Zaragoza, Spain).

This comunication deals with the meiotic behaviour and the possible origin of these cells.

THE MEIOTIC BEHAVIOUR

Giant cells were present in the microsporogenesis with an average frequency of one cell per anther, in spite of what it could be observed the majority of their meiotic stages. These cells appeared as polynucleated during prophase I *(figure 1)*, being the number of nuclei present in these up to 16. This represents

a degree of ploidy up to 32 × (224 chromosomes). In metaphase I these nuclei converge forming only one metaphase plate (*figure 2*). From this moment the meiotic behaviour of giant cells is the expected in mononucleate cells of a high ploidy level: in all cases only two poles were present at anaphase I (*figure 3*), only one cell wall was formed at telophase I (*figure 4*), and four cells appeared after telophase II (*figure 5*).

From these facts it can be deduced that during each meiotic division only one spindle per cell is formed. This phenomenon is different of that observed in mitotic polynucleate cells in which, in most cases, a different spindle per nucleus is formed (González-Fernández et al., 1964).

The elevate number of chromosomes makes meiosis very inaccurate, leading to the appearance of several micronuclei in each cell of a tetrad (*figure 5*), as well as in the pollen grains subsequently formed (*figure 5*). On the other hand the duration of meiosis of giant cells seems to be longer than that of normal cells, since they are in an earlier phase than diploid cells appearing in the same anther.

THE POSSIBLE ORIGIN

Cell wall failures in premeiotic divisions seems to be the origin of giant cells since they appear as polynucleated during prophase I. This same origin has been attributed to giant cells observed by other authors (Peto, 1933; Johnsson, 1944; Rees, 1955; Damon, 1961). In all cases including the present one, the appearance of giant cells is associated with genetic unbalance, suggesting that this phenomenon is subject to genetic control. It is worthy of mention that the occurence of giant cells both in F_1 and F_2 plants seems to corroborate the existence of this genetic control.

Now, if these cells have a syncytic origin, an interesting question arises: if premeiotic divisions, as well as meiosis, occur simultaneously in all nuclei of a syncyte, why only at meiosis all nuclei converge forming a unique metaphase plate?

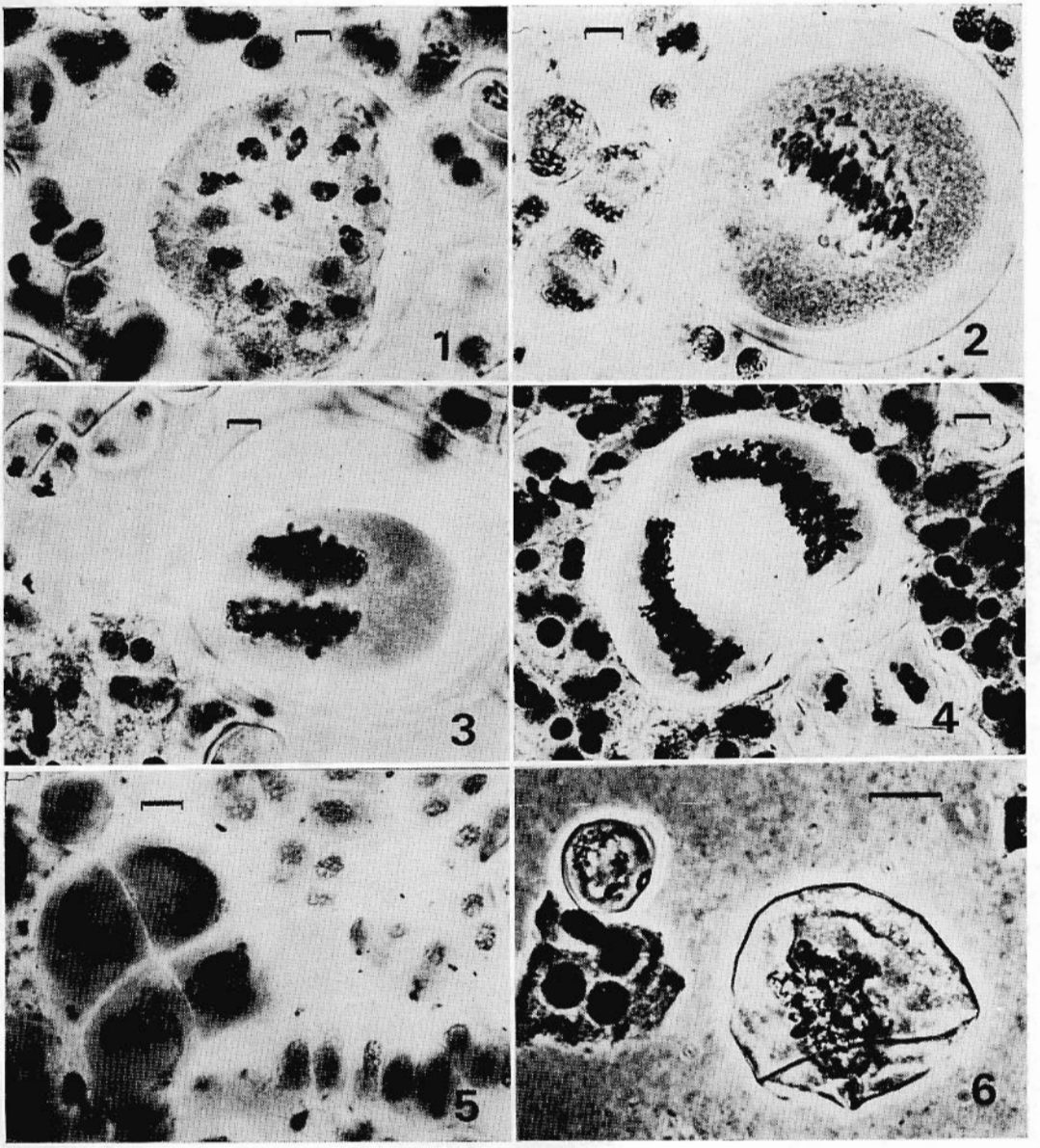

Figure 1. Giant cell at dip'otene-diakinesis. Note the presence of different nuclei in the same cell. Figure 2. Giant cell at metaphase I. Note that only one metaphase plate is formed. Figure 3. Giant cell at anaphase I. The chromosomes move towards two poles. Figure 4. Giant cell at prophase II. Figure 5. Giant tetrads. Note the presence of micronuclei. Figure 6. Giant pollen grain. Figures 1-6). Note that giant cells are at an earlier phase than normal cecs appearing in the same anther. The bars represent 20 μm

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ABSTRACT

Giant pollen mother cells with a high ploidy level were found in an inbred line of rye (*Secale cereale* L.), and in the F_1 and F_2 of a crossing between this line and another inbred line of the same species. These giant cells were able to accomplish the two meiotic divisions and form giant pollen grains. The possible origin of these cells is discussed.

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