STUDIES ON BRITISH POPPIES
III. A NOTE ON STERILITY IN *PAPAVER RHOEAS* L.

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ABSTRACT

Varying degrees of sterility are encountered in populations of *Papaver rhoeas* and are shown to be due to structural heterozygosity. Complete sterility may be associated with vegetative abnormalities and it is suggested that plants showing these features are sometimes confused in the field with interspecific hybrids between *P. rhoeas* and *P. dubium*.

HISTORICAL

Some previous evidence of sterility in *Papaver rhoeas* resulting from cytological aberrations has been reported by Newton (1929) and Philp (1933). The former worker observed frequent irregularities in reduction division in this species and the production of non-viable gametes with aberrant chromosome complements. Philp observed that the condition of partial or complete male-sterility may vary even in one plant, and noted that inbreeding for a few generations is usually accompanied by general sterility.

OBSERVATIONS

The examination of pollen samples of *Papaver rhoeas* for use in breeding experiments and the observation of male-sterility in natural populations supports the previous reports that partial or complete sterility is quite common in this species. Thus among 290 plants grown in field trials from seed collected from wild populations, four were completely male-sterile, and the examination of pollen from 16 pot-grown plants showed only five to have completely well filled and presumably viable pollen. Of the rest, seven had shrivelled sterile grains accounting for up to 5 per cent. of the total, three had 5–20 per cent. non-viable grains and one was male-sterile. Preparations of pollen mother cells from plants in the two latter groups showed the sterility to be associated with the presence of anaphase bridges at both the first and second meiotic divisions. In addition to the complete or ruptured bridges, acentric fragments were present in some of the cells (Fig. 1). These formations are most likely to arise from cross-overs within a paracentric inversion and so it seems possible that the affected plants are inversion heterozygotes. None of these plants showed any obvious vegetative abnormalities.

Numerous meiotic irregularities were also seen in two plants whose vegetative growth was visibly abnormal and which proved to be completely sterile. Both plants were appreciably smaller than normal plants of the same age. One had thickened dark green and rather distorted leaves; the foliage of the other was bluish-green with acute leaf serrations, each one terminated by a strongly developed hair. In both plants many of the buds failed to open properly. These malformations are strikingly similar to those observed in artificially-raised hybrids between *P. rhoeas* and *P. dubium* (McNaughton & Harper 1960). The assumption of hybridity in the field is usually based on failure to set seed, on a capsule form superficially intermediate between that of the putative parents, or on abnormality in leaf form. It can be seen from the foregoing account that failure to set seed and foliage abnormalities may be shown by plants of *P. rhoeas* which are structural heterozygotes. The apparently intermediate capsule form in such plants would result from the shrivelling of the capsule consequent upon the failure to set seed, this shrivelling being more apparent at the base of the capsule than at the top where the shape is maintained by the stigmatic disc.

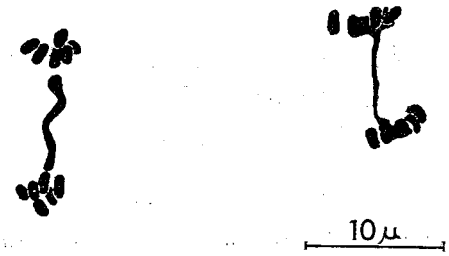

Fig. 1. Anaphase bridges at the first meiotic division in pollen mother cells.

The presence of chromosomal aberrations in *Papaver rhoeas* combined with its rigorous outbreeding results in the occurrence of sterility to the extent of 1–2 per cent. in many populations. While similar structural variations may occur between homologous chromosomes in the other British species, the self-compatability and consequent degree of inbreeding of these species will result in structural heterozygosity and meiotic irregularity appearing less frequently.

REFERENCES

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