The experimental manipulation of ovule tissues

Edited by G.P. Chapman, S.H. Mantell and R.W. Daniels

Preface

The ovule is a receptive tissue whether of photo-assimilate or male gametes. Interpretation of its role as a megasporangium is both a fundamental concept and a recurrent stimulus to enquiry. For many biologists however, the preoccupation has recently been not with the female but the male part of the plant.

Since the papers of Guha and Maheshwari, nearly 20 years ago, the anther or microsporangium and especially its product, pollen grains or microspores have occupied experimental morphologists and plant breeders as a source of haploid plants. More recently, attempts to modify pollen DNA have shifted the emphasis of interest toward the tissue that is receptive to such modified pollen.

It is readily apparent that the ovule is a more complex tissue. Even its normal function is diversified throughout the Angiosperms and has generated an immense literature. The responses of the ovule to modified pollen, or in the absence of pollen, to other stimuli are now matters of great interest both theoretically and practically for plant improvement.

This volume brings together contributions some as reviews, some as experimental papers, from workers in tissue culture, genetics, plant breeding and biochemistry and relates to events before, during and after fertilization. The arrangement we have adopted is one that seeks, as far as possible, to integrate our understanding of how the ovule can be made to function. In so doing one aspect to emerge clearly is how the more ambitious objectives require complementary skills to accomplish them. Another aspect is the awareness of considerable potential in several directions such as the range of genetic expression that can be imposed, the scope for genetic analysis and the prospect of raising haploids where pollen has proved refractory and the extent to which wide hybridization can be extended.

Manipulation of ovule tissues is clearly an emerging area of technology, that is essential to increasing our understanding of the fundamental biological processes involved in meiosis, pollen

development, fertilization and embryogenesis. This volume provides a guide to what has already been accomplished and we hope a stimulus to further enquiry.

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Colour plates

Plate 1 (see p. 144). Distribution of ions within and around the oil palm embryo from Fig. 5 of Chapter 11, as visualized by X-ray Digimap analysis.

Plate 2 (see p. 146). Paired phase contrast (left) and fluorescence (right) micrographs of mature oil palm zygotic embryo sections stained with completed antisera raised against oil palm zygotic embryos (methods are described in 'Materials and methods', p. 136 of Chapter 11). Magnification x125

Plate 3 (see p. 146). Fluorescence micrographs of oil palm callus (left) and somatic embryo (right) stained with completed antisera raised against oil palm zygotic embryos (methods are described in 'Materials and methods', p. 136 of Chapter 11). Magnification x300

Plate 4 (see p. 45). Unfixed wheat embryo stained with DAPI to show the nuclei.

Plate 5 (see p. 189). Polytene nucleus from cultured *Pisum fulvum* cotyledon tissue squashed and stained with DAPI. Note the intensely stained foci. (Zeiss photomicroscope with fluorescence attachment using filter set number 2) (Bar = 10 μm)

Plate 6 (see p. 45). Triticale embryo sac isolated from an ovule three days after fertilization. After staining with the DNA specific stain DAPI the nuclei are clearly visible. The large antipodal nuclei have begun to degenerate and endosperm cellularization has commenced at the micropylar end. a = antipodal nuclei; ce = cellular endosperm; e = embryo; fe = free endosperm nuclei; p = pollen grain. Bar represents 100 μm

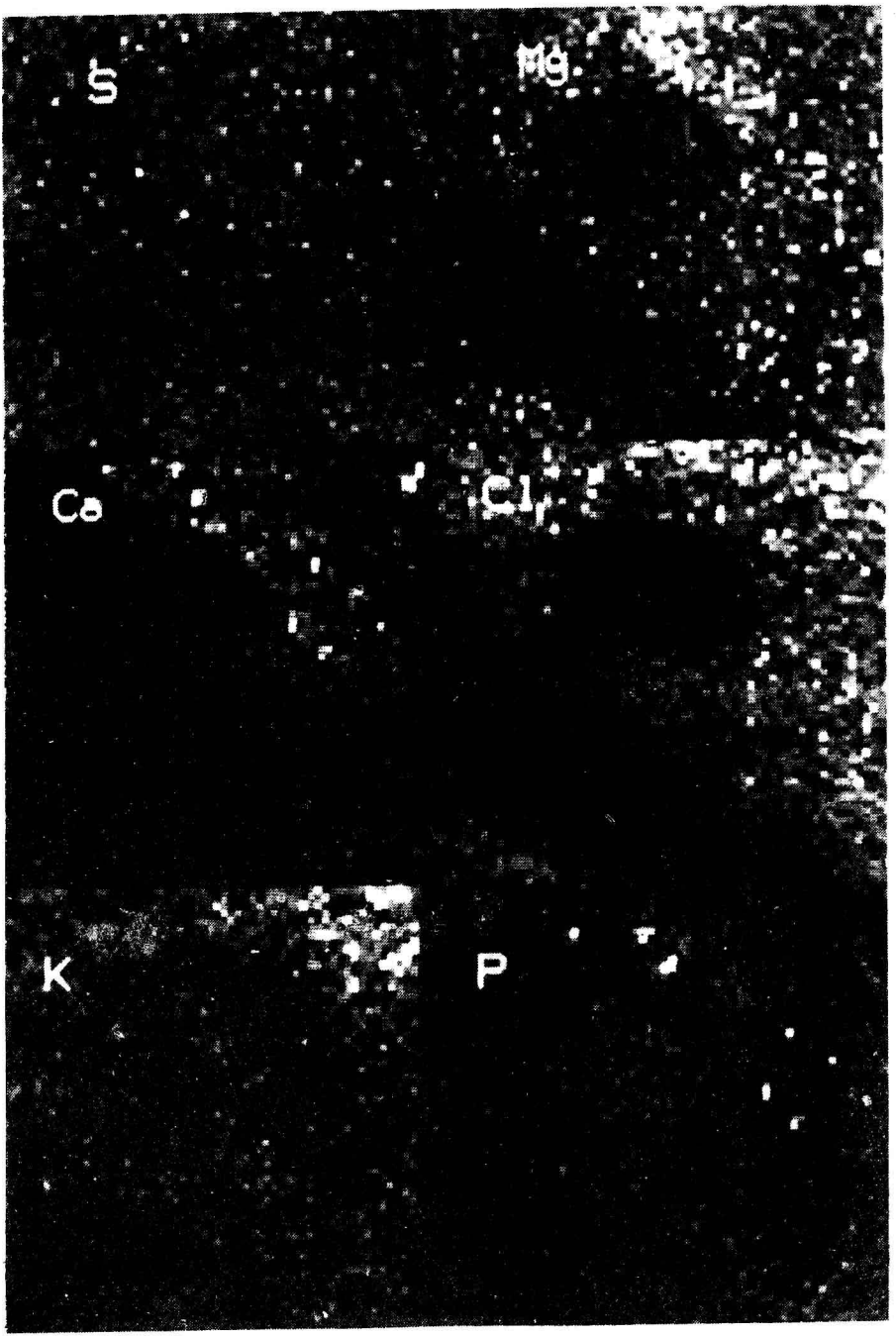
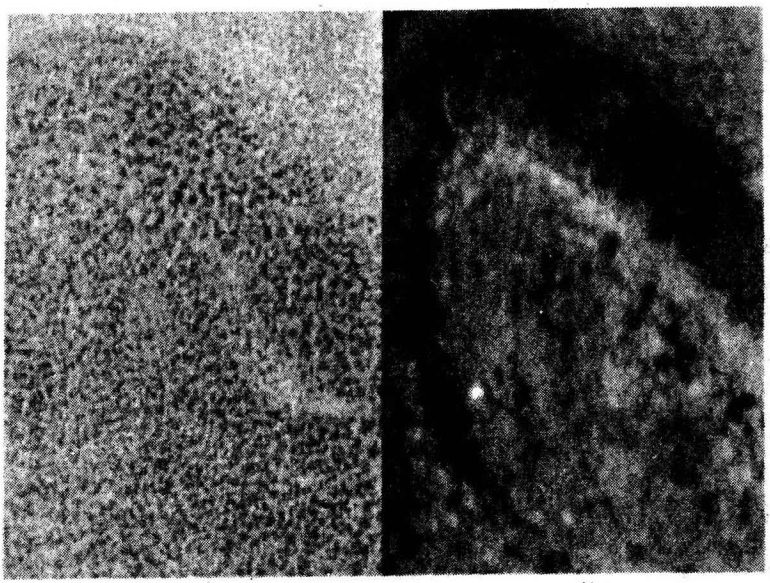


Plate 1



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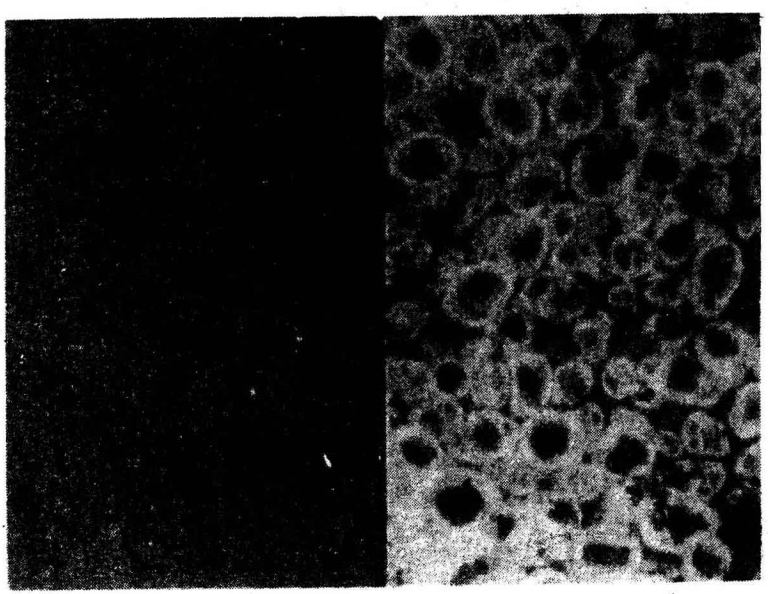

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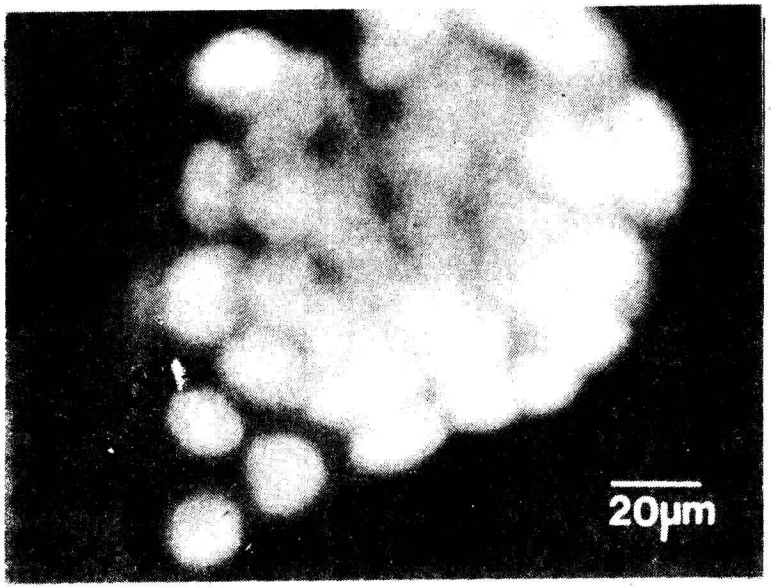

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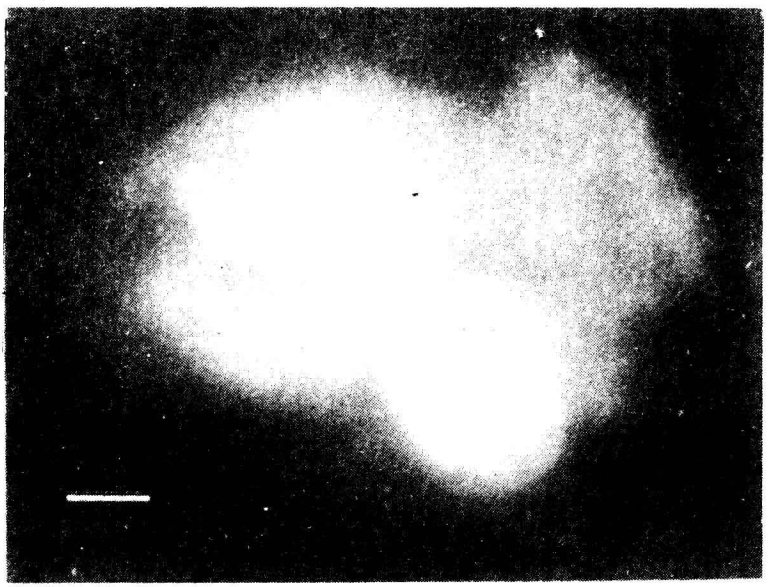

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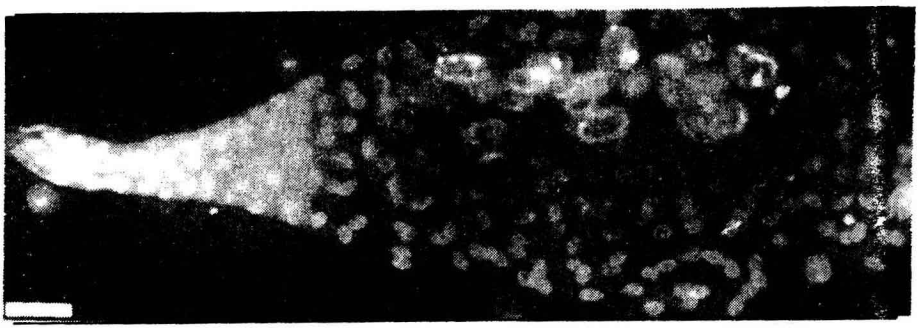

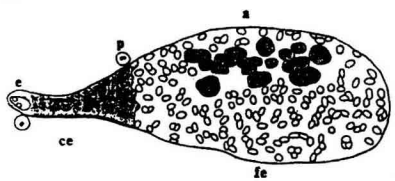

Plate 6

Contents

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