acetate. One of the reasons for higher cys$^+$ revertants obtained in combination treatment of L-cysteine and azide could be the favourable condition available due to the presence of L-cisteine, a requirement of N-4 mutant and the cysteine may allow better conversion of azide into azide metabolite.

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IMPACT OF LACK OF CALLOSE ON POLLEN DEVELOPMENT IN *NAJAS MARINA* L.

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IN *Najas marina* L., the study of microsporogenesis reveals the absence of callose wall around the meiocytes and microspore tetrads, yet the microsporogenesis proceeds normally except that the mature pollen lacks exine. The present investigation suggests a correlation between the presence of callose and the development of pollen wall.

The pollen mother cells (PMCs) in the great majority of angiosperm taxa, are surrounded by deposition of callose which is a β-1,3 polyglucan composed of β-D gluco pyranose residues[1]. Callose is first deposited on the inner side of the PMC walls at the stage when the massive cytoplasmic connections between the PMCs are formed. But later, these connections are broken due to the additional deposition of callose. The following functions are attributed to callose: (i) It protects the differentiating sporogenous cells from harmful hormonal and nutritional influences of the surrounding vegetative cells[2], (ii) It functions as a molecular sieve to enable the autonomous development of the haploid pollen nuclei, independently segregated to their own cytoplasm[3], (iii) Callose supplies carbon compounds like glucose which furnish a basic framework of the future exine[4] and (iv) carries a template for the future exine establishments[5].

The present investigation was undertaken to study the development of pollen in the absence of callose around the meiocytes and their derivatives, *i.e.* dyads and tetrads. Anthers containing various developmental stages of pollen were collected from the greenhouse grown specimens of *Najas marina* L and were fixed in ethanol acetic acid (3:1 v/v). The material was sectioned on a rotary microtome and the sections were stained with periodic acid Schiff's and aniline blue reagents as suggested by Jensen[6]. The dehydrated pollen grains were examined under S4–10 Cambridge stereoscan electron microscope for their wall nature.

In *N. marina* the meiocytes (figure 1A), dyads and tetrads do not show the presence of callose deposition when stained with aniline blue and periodic acid Schiff's reagents.

Scanning electron microscopic examination of mature pollen reveals the absence of exine around them. However, evaginations on the pollen wall (intine) often give false impression of exine (figure 1C). These evaginations are formed due to the pressure exerted by the densely accumulated starch grains on the pollen wall from the inside (figure 1B). Furthermore, earlier reports also stress the fact that the pollen of *Najas* lacks a definite exine[7,8].

These observations appear to rule out the possibility of callose in protecting the developing sporogenous cells from harmful hormonal and nutritional influence of the surrounding vegetative cells and acting as a sort of blanket to enable the autonomous development of the haploid pollen nuclei in many plants as suggested by De Halac and Harte[2] and Heslop *et al*[3]. However, in *N. marina* callose is not necessary to meet these two

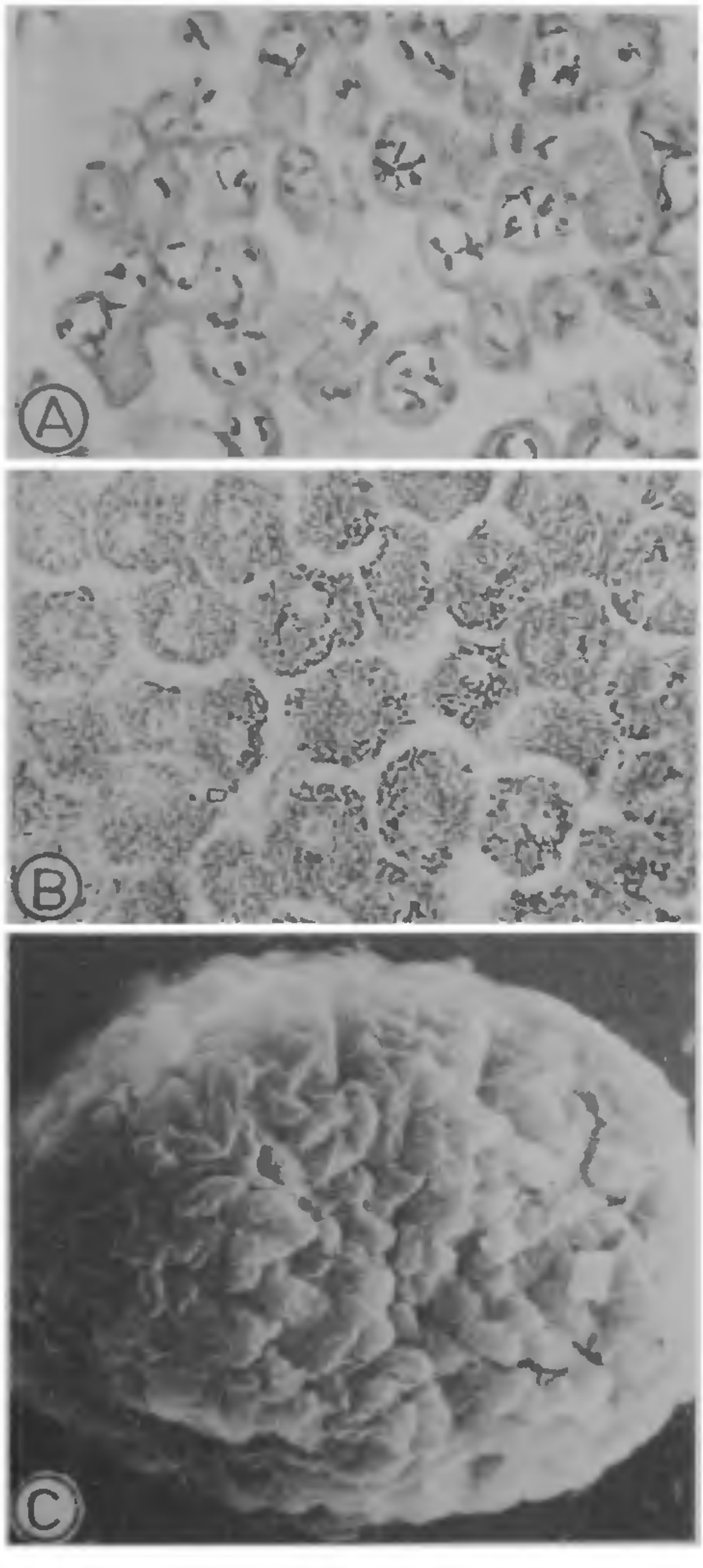

Figure 1 A–C. *Najas marina* L. A & B-Transections of portion of anther. A. Meiocytes stained with aniline blue. Note the absence of callose about meiocytes (× 450). B. Mature pollen grains stained for insoluble polysaccharides with PAS reaction. Note the abundant PAS-positive starch grains and unstained nuclei (× 450). C. SEM photograph of mature pollen grain showing many evaginations on the entire surface formed due to the pressure exerted by densely accumulated starch grains within (× 2000).

requirements since the microsporogenesis proceeds normally even without callose deposition.

Lack of callose around meiocytes and their derivatives and its correlation with the absence of exine in microspores and mature pollen grains support the earlier hypotheses[4,5] that callose serves to protect enzyme systems responsible for exine deposition and provides templates for the future exine establishments.

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IN VITRO PLANTLET FORMATION FROM COTYLEDONS, LEAF LAMINA AND MID-RIB OF CAULIFLOWER

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TISSUE culture techniques are used in clonal propagation[1,2] of elite genotypes. Propagation through explant culture has an advantage over callus and cell suspension cultures as cytological aberrations are