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ORIGIN AND DEVELOPMENT OF EMBRYOS PRODUCED FROM SOMATIC TISSUES OF CUMIN

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To know the origin and ontogeny of the embryoid initials leading to maturation and then differentiation, cumin tissues were studied histologically. The developmental course of the somatic embryos was similar to that of a normal zygotic embryo with globular, heart, torpedo and dicotyledonary phases. However, the origin of somatic embryos was observed to be from the pre-embryonal mass of cells, i. e. a group of cells was responsible for the formation of an embryo rather than a single cell as usually observed.

Keywords: Cumin; Histology; Somatic embryos.

Introduction

Cumin (*Cuminum cyminum* L.), an Apiacean member is popular because of its economic importance as a spice and also for its medicinal properties. Tissue culturing of cumin has been restricted to its morphogenetical response in relation to various hormonal inter actions[1-3]. However somatic embryogenesis leading to plantlet formation has not been reported in cumin[4] which has been focussed histologically under the present investigation.

Meterials and Methods

Various developmental stages, i. e. from the initiation of embryos, leading to their maturation and differentiation were fixed in Formalin aceto-alcohol (FAA), dehydrated, embedded and microtomed (10 µm) by usual methods[5]. Sections were stained with safranin.

Microphotography was done with Nikonoptihot camera, with micro photography unit and filter on 'Nikon' binocular microscope.

Results and Discussion

From the sections cut through the tissues, it was observed that the cells preparatory to form pre-embryonal mass arose from the superficial cells of the experimental tissue which were rich in cytoplasm, as they took deeper stain than the interior cells which remained vacuolated. The superficial cells got enlarged containing starch grains and dense nuclei and acted as embryoid initials (Fig. 1A). The proembryogenic mass in some cases was found to be isolated from rest of the tissue. Embryos were released from the parent tissue either after complete maturation or sometimes during their developmental stages. Fig. 1B shows development of globular shaped embryoid attached to the parent body and sequentially it was detached after complete development. Heart shaped embryoid is detached from rest of the tissue (Fig. 1C) and after maturation of the embryos their distinct root and shoot poles were clearly observed (on reaching torpedo shape) However, some embryoids showed abnormal course of development differentiating from the heart stage, eliminating the torpedo stage (Fig. 1D). After maturation of the embryos there was no vascular connection with the parent tissue whether they were attached or detached to that.

In the present work, the callus was heterogenous containing large vacuolate and fast growing cells and smaller cells containing dense cytoplasm packed with starch grains. The latter type of cells could be assumed to give rise to proembryogenic cell masses, which were usually found at the periphery of the

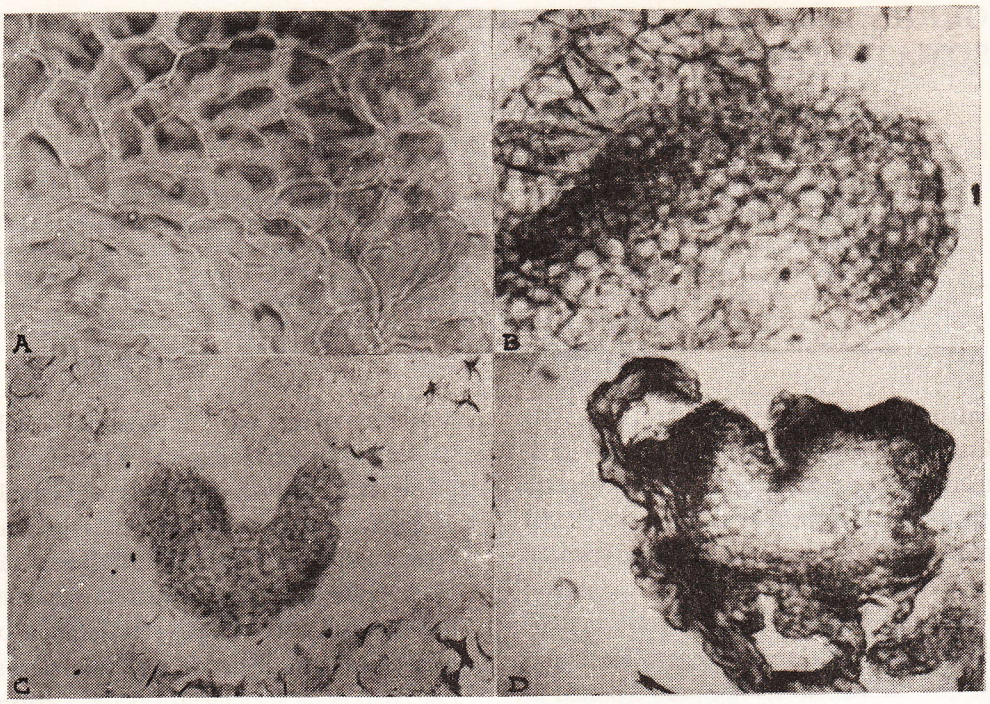

Fig. 1. A. Proembryonal cells on the periphery are deeply stained containing starch grains and dense nuclei; B. Globular shaped embryo attached to parent body; C. Heart shaped embryo detached from rest of the tissue; D. Differentiation of cotyledons from embryo.

callus tissue. Such cells containing dense cytoplasm and large nuclei acted as embryoid initials containing several small vacuoles, a large nucleus, a single nucleolus, higher density of ribosomes, numerous profiles of rough endoplasmic reticulum, normal mitochondria, spherosome like vesicles, higher dehydrogenase activity and prominent amyloplasts. Tetu *et al*[6]. made a similar observation.

It was suggested that the embryos originated from single cells and that the isolation of a cell from its neighbouring cells or tissue was necessary for it, to develop into an embryo.[7] However, Street and Withers[8] reported that although embryos originate from single cells, they remain in cytoplasmic continuity with the adjacent cells, during the induction and early stages of embryogeny.

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