pores. Embryos light-red in colour. Ancestrula with five very small spines (Fig. 1, c). Length of zooecium 395 μ and breadth 220 to 255 μ.

Morphological Notes.—Numerous colonies of this species were examined and it was noticed that except some variation in the occurrence and number of avicularia in all other characters there was a fair degree of constancy.

Secondary calcification may obscure many of the zooecial characters and the zooecia may assume the shape of calcareous swellings with marginal pores. Umbonate processes are noticed even in young zooecia. In older colonies the ancestrulæ do not possess the spines which evidently are lost as the colony attains age.

Ecological Notes.—*S. cohinensis* breeds during February and March. Maximum settlement of larvæ occurred during these two months. This typically marine and stenohaline species failed to settle on substrata where silting was considerable. Although distributed at all levels within the harbour area, this species settled maximum at sub-tidal level. Experiments on growth showed that this species attains very large size (964 sq. mm. in 45 days) and the colonies attain sexual maturity within 21 days after settlement. This species possesses lecithotrophic larvæ and these larvæ did not settle at the upper reaches of the estuary.

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EMBRYONAL HAUSTORIUM OF *CYCAS CIRCINALIS* L.

WHILE examining the micro-preparations for selecting the post-fertilization stages in *Cycas circinalis* L., the author came across a preparation showing an archegonium with peculiar outgrowth. The archegonium is an old one, having already developed an embryo with a long and tortuous suspensor, pushing the embryo down the archegonium into the endosperm. At this stage the archegonial cavity comes to be filled up with large cells with poor contents having connection with the suspensor at their lower end. At the upper end, this tissue sends out through the neck of the archegonium, a bundle of elongated cells with contents and pominent nuclei. These elongated cells break through the archegonial jacket at its thinner spot which is adjacent to the neck of the archegonium and come to lie in the archegonial chamber spread out in a fan-wise manner. Such a growth appears to be rather r a r e and requires thorough investigation (Figs. 1-2).

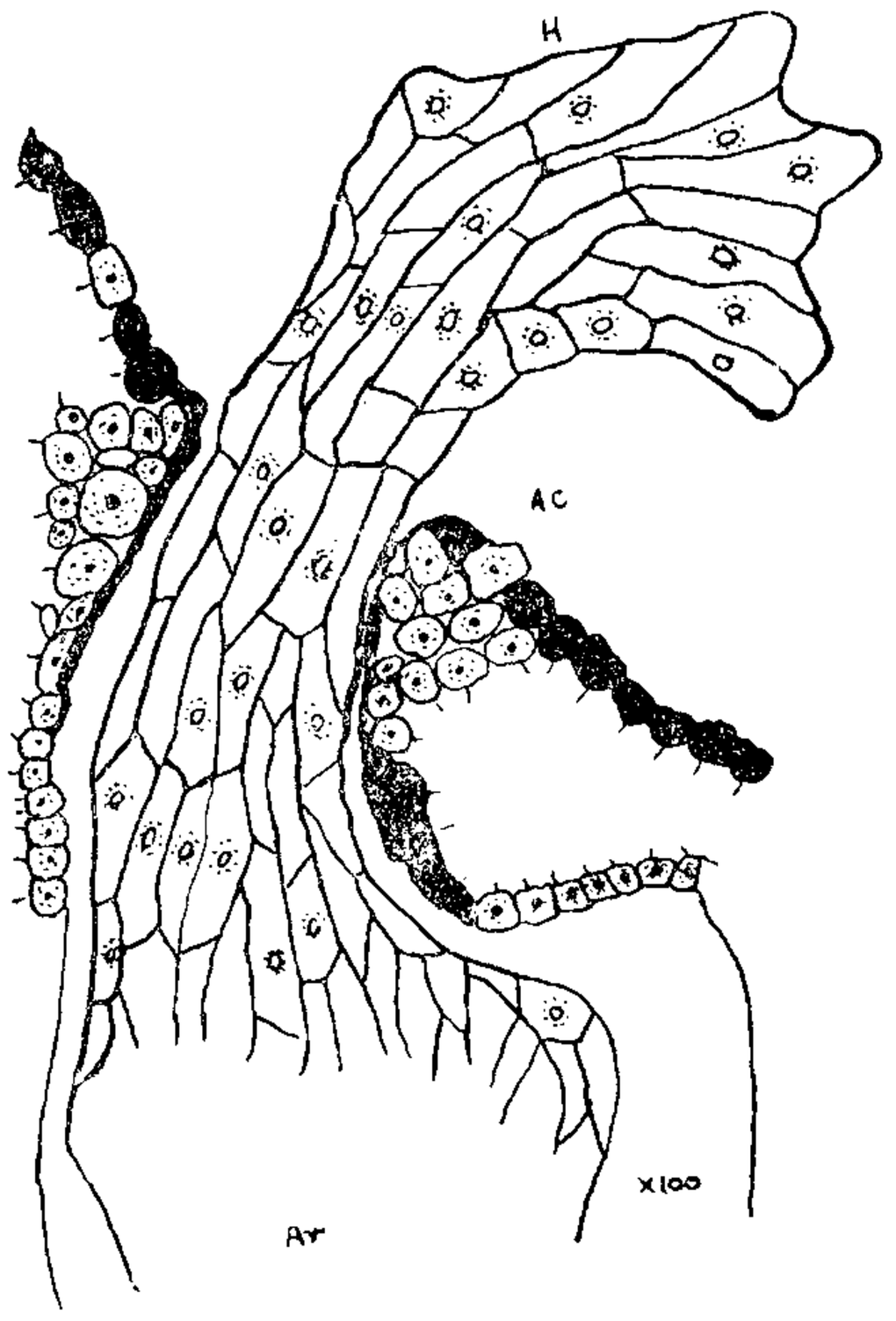

FIG. 1. *H* = Haustorial growth; *Ac* = Archegonial chamber; *END* = Endosperm; *Ar* = Archegonial cavity.

The large cells in the archegonial cavity no doubt form part of the proembryo and they send out the bundle of cells at their upper end. Hence the morphology of these cells is clear and they belong to the 2 x generation. Their entry into the archegonial chamber which appears to be empty at this stage of development of the *Cycas* ovule and their function appear to be baffling. One possibility is that this bundle of long cells may act as haustorial cells of the proembryo and try to acquire nutrition from the tissue it comes in contact with. It is well known that the floor of the archegonial chamber is paved with resistant cells and Tannin cells, except the necks of the archegonia. Even the neck region, at this stage is occluded and does not afford any soft landing. The roof of the archegonial chamber is

formed by the dried up and papery tissue of the nucellar beak offering very little or no nutritive material. Hence the fan-wise spread out cells ultimately dry up inside the archegonial chamber.

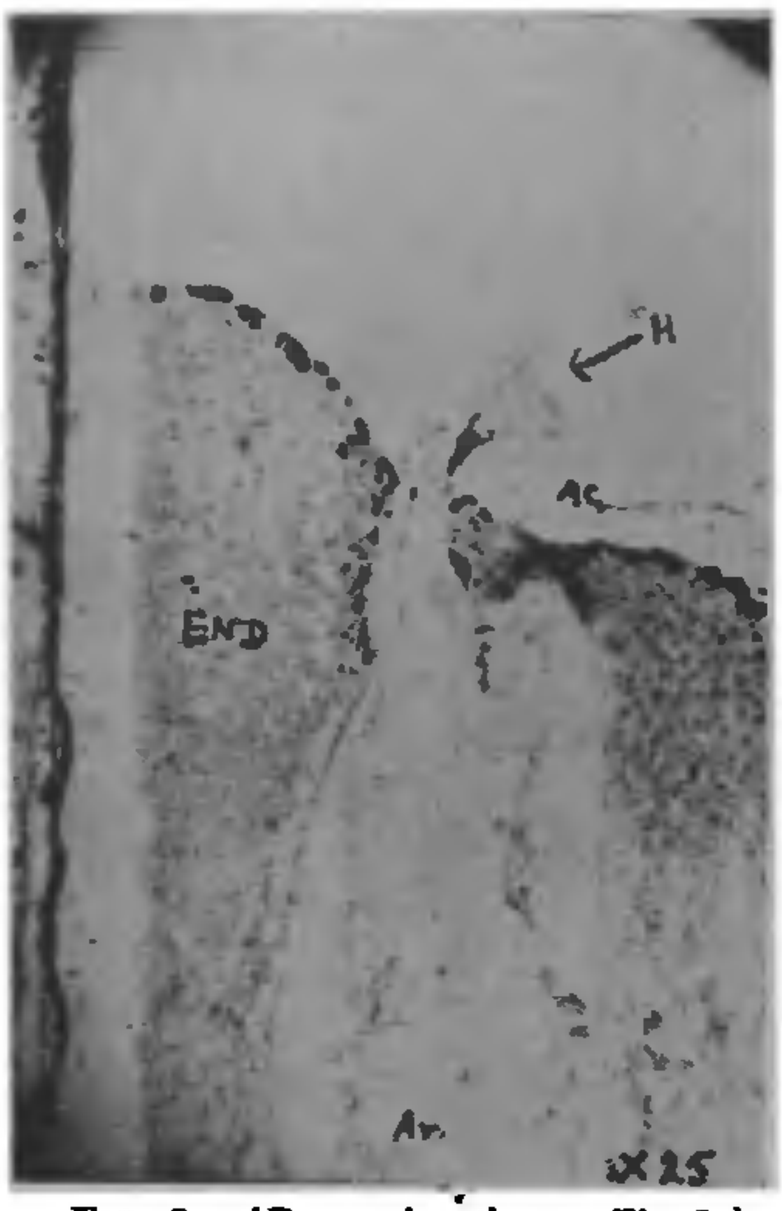

FIG. 2. (For explanation *see* Fig. 1.)

The very fact that cells at the upper end of the archegonium are elongated and grow out of the archegonial cavity shows that there is not enough nutritive material supplied to them from the surrounding endosperm as it is done to the growing suspensor and the embryo proper. At the lower end, the suspensor and the embryo digest the cells studded with starch by aggressive activity and push themselves deeper into the endosperm. Such destarched clear region seen surrounding the embryo and suspensor is not found at the upper region of the archegonium. It is clear, therefore, that the growth of these cells constitutes a case of haustorium of the proembryo which having failed in coming in contact with a rich source of food supply, grow for some time and perish ultimately.

Proliferations of the embryo or its parts inside the female gametophyte are common among gymnosperms; but such a growth outside the endosperm is not known among the gymnosperms though it is common among the angiosperms.

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QUALITATIVE CHANGES IN THE AMINO-ACID CONTENTS OF HYPERTROPHIED ORGANS IN MUSTARD DUE TO *ALBUGO CANDIDA*

Albugo candida (Lev.) Kunze, the fungus that causes white rust of mustard, has been found to be a serious disease of this crop in Haryana and Punjab, if the atmosphere is humid during the flowering season. This pathogen is a big hazard to the crop as in the infected plant the seed-setting is completely or partially hampered. The present study is concerned with the qualitative changes of amino-acids in peduncle, floral buds and mature flowers of mustard under the influence of *A. candida* which induces hypertrophied growth.

For the analysis of amino-acids the alcoholic extracts of healthy and abnormal plant organs were prepared. The qualitative analysis was carried out by two-dimensional descending chromatcgraphic technique on Whatman filter-paper No. 1, using conventional methods. The solvent system used for the development was *n*-butanol-water-acetic acid (4 : 1 : 5) in the first direction and phenol (distilled)-water (4 : 1) in the second direction. The duration of development was 16–19 hours. The dried chromatograms were sprayed with 0·5% acetone to give colour visibility to the amino-acid spots which were then identified by calculating the R_f values and comparing the same with chromatograms run simultaneously. The results are represented in Table I.

TABLE I

Sl. No.	Amino-acid		Peduncle		Buds		Flower	
			Normal	Infected	Normal	Infected	Normal	Infected
1	Arginine	..	+	+	−	+	−	−
2	Asparagine	..	−	−	−	−	+	−
3	B-alanine	..	−	−	−	+	−	+
4	Citrilline	..	−	−	−	+	−	+
5	Cystine	..	−	+	−	+	+	+
6	D-L-aspartic acid	..	−	−	−	−	+	+
7	Glutamic acid	..	−	−	−	+	−	−
8	Glutamine	..	−	−	−	+	+	−
9	Glycine	..	+	−	−	−	−	−
10	Histidine	..	−	+	−	−	−	+
11	Leucine	..	−	−	−	−	−	+
12	Phenyl alanine	..	−	−	−	−	−	+
13	Proline	..	−	+	+	+	+	−
14	γ-Aminobutyric acid		+	−	−	−	−	−
15	Serine	..	−	+	+	−	+	−
16	Threonine	..	+	−	+	−	+	−
17	Tryptophan	..	−	+	−	−	+	−
18	Tyrosine	..	+	+	+	−	+	+
19	Valine	..	+	+	+	−	+	+