Table 2 *Effect of different quality of light on initiation of sex organs and sporophyte*

Light quality	Antheridia days	Archegonia days	Sporophyte days
White	12	17	24
Red	11	16	24
Blue	18	23	29

The results presented represent the mean of 3 experiments.

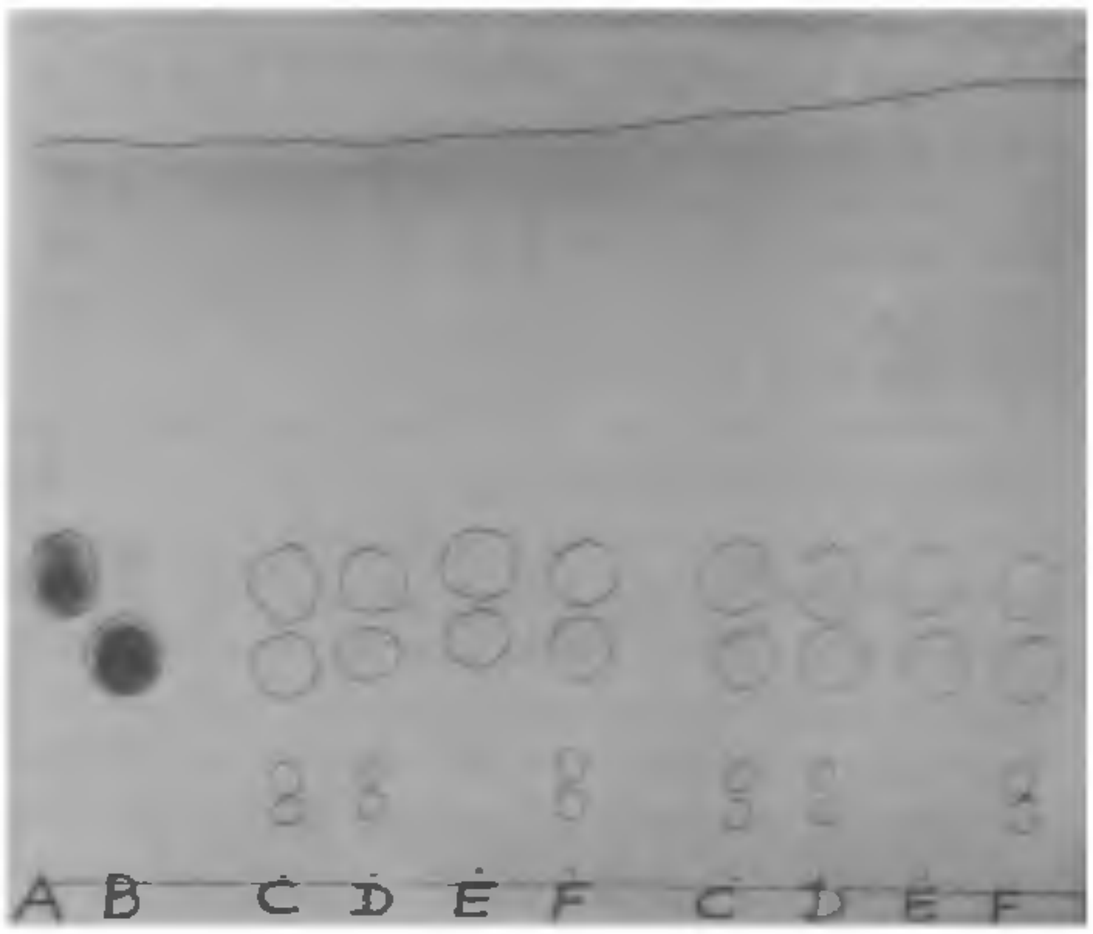

Figure 1. TLC of soluble aminoacids **A.** Glutamic acid (reference spot); **B.** Glutamine (reference spot); **C.** 1-D, stage; **D.** 2-D, stage; **E.** –N medium, (1-D stage); **F.** 3-D, stage.

showed a gradual increase in nitrate reductase activity (NRA) from germination to 3-D stage formation whereafter it started decreasing as the cordate prothallus matured and sex organs appeared, minimum activity being reached at the initiation of sporophyte. Since NR is the key enzyme in nitrogen metabolism when NO_3^- is the sole source of nitrogen, the above observations suggest that a decreased nitrogen metabolism perhaps triggers the reproductive phase initiation in *C. farinosa* gametophytes under culture condition. There are earlier reports that nitrogen deficiency in the substratum causes the liverwort, *Riccia* to form sex organs[4] and also that induction of flowering in a short day species of *Lemna* sp. by suppression of nitrogen metabolism[5]. The experiment with different quality of light also suggested a probable role of NR in switching over to reproductive phase. While red light had no visible effect, blue light definitely delayed the process by about a week, without affecting the periods required for initiation of either archegonia or sporophytes, initiation of both of which are almost rhythmic once the antheridia are formed. This shows that blue light delayed the change over to reproductive phase. *In vitro*, blue light has been found to enhance NRA[6] so also *in vivo* in ferns (unpublished data from this laboratory). However, at this stage of our experimentation it is not possible to suggest unequivocally the role played by blue light though our results could be taken as indirect evidence supporting the contention that reduced NRA is a probable prerequisite for antheridia initiation in *C. farinosa* .

The TLC of soluble aminoacids showed constant presence of glutamic acid and glutamine in all the three stages, 1-D, 2-D and 3-D suggesting the presence of GS/GOGAT pathway of assimilation of ammonia, the ultimate product of NO_3^- assimilation.

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VESICULAR-ARBUSCULAR MYCORRHIZAL FUNGI IN ROOTS AND SCALE-LIKE LEAVES OF *ACORUS CALAMUS* LINN. AND *COLACASIA ESCULENTA* LINN.

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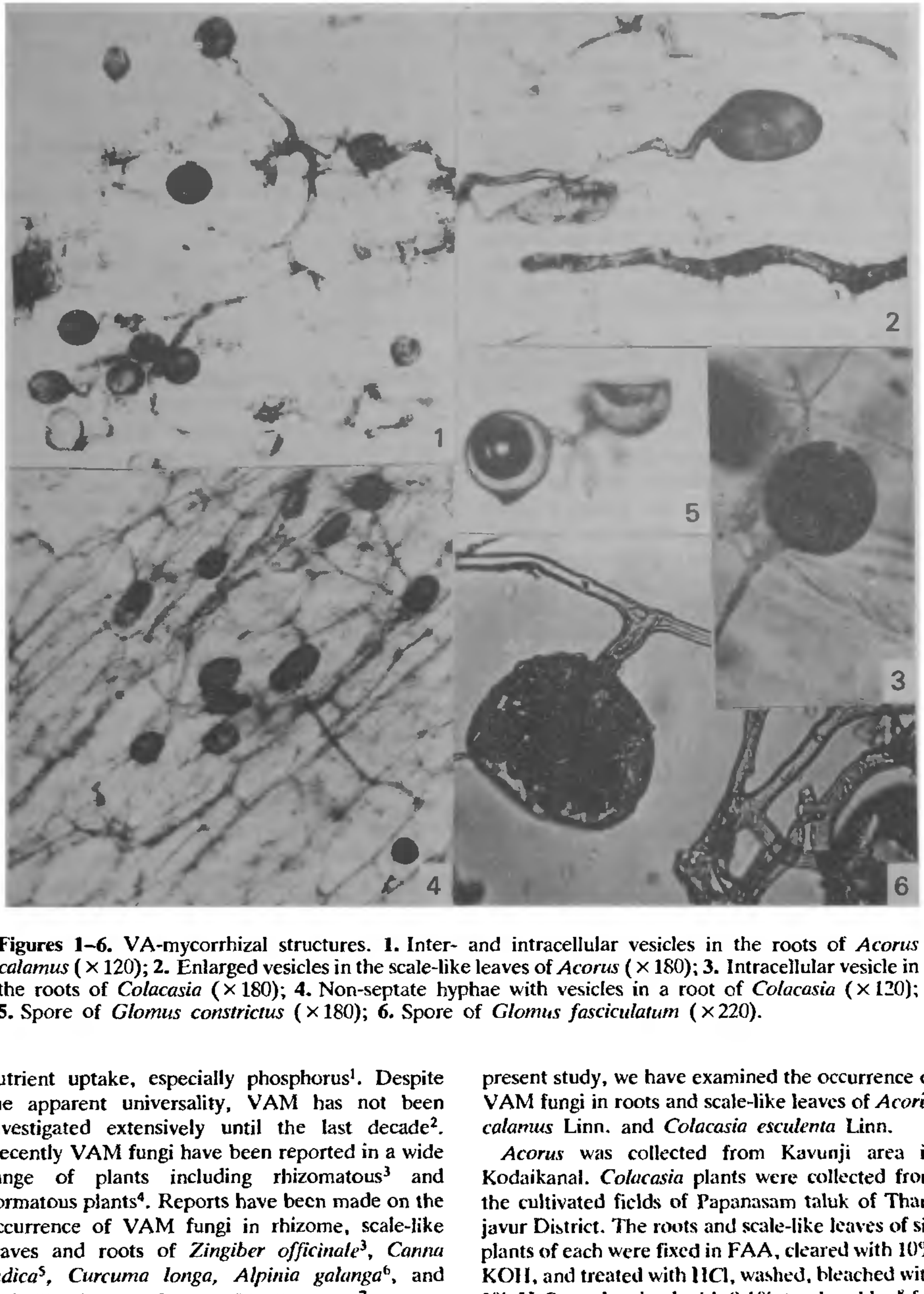
VESICULAR-ARBUSCULAR mycorrhiza (VAM) occur on almost all tropical crop plants and are known to enhance the plant growth by augmenting the



Figures 1–6. VA-mycorrhizal structures. **1.** Inter- and intracellular vesicles in the roots of *Acorus calamus* (×120); **2.** Enlarged vesicles in the scale-like leaves of *Acorus* (×180); **3.** Intracellular vesicle in the roots of *Colacasia* (×180); **4.** Non-septate hyphae with vesicles in a root of *Colacasia* (×120); **5.** Spore of *Glomus constrictus* (×180); **6.** Spore of *Glomus fasciculatum* (×220).

nutrient uptake, especially phosphorus[1]. Despite the apparent universality, VAM has not been investigated extensively until the last decade[2]. Recently VAM fungi have been reported in a wide range of plants including rhizomatous[3] and cormatous plants[4]. Reports have been made on the occurrence of VAM fungi in rhizome, scale-like leaves and roots of *Zingiber officinale*[3], *Canna indica*[5], *Curcuma longa, Alpinia galanga*[6], and scale-like leaves of some Zingiberaceae[7]. In the present study, we have examined the occurrence of VAM fungi in roots and scale-like leaves of *Acorus calamus* Linn. and *Colacasia esculenta* Linn.

Acorus was collected from Kavunji area in Kodaikanal. *Colacasia* plants were collected from the cultivated fields of Papanasam taluk of Thanjavur District. The roots and scale-like leaves of six plants of each were fixed in FAA, cleared with 10% KOH, and treated with HCl, washed, bleached with 3% H_2O_2 and stained with 0.1% tryphan blue[8] for

assessing the degree of infection. Root bits (1 cm) were mounted on slides and the length of the piece containing the endophyte was recorded[9]. The VAM spores were isolated from rhizospheric soil by sucrose density gradient centrifugation method[10]. The spores were identified using the keys of Gerdemann and Trappe[11], and Trappe[12].

VAM association was very prominent in both the roots and scale-like leaves. The infection was greater in thin roots as compared to thick roots. The vesicles and arbuscules were well pronounced in the roots and scale-like leaves of *Acorus*, but arbuscules could not be observed in the roots of *Colacasia*. In *Acorus*, the vesicles were comparatively larger in size and were formed both inter- and intracellularly (figures 1 and 2). The size of the vesicles varied between 120 and 140 μm. In *Colacasia*, vesicles were always intracellular (figure 3) and the size varied between 50 and 60 μm. The vesicles were globose to subglobose and the subtending hyphae were simple (figure 4). The fungus conformed to the descriptions of *Glomus caledonius* Trappe & Gerd. in *Acorus* and *Glomus fasciculatum* Gerde & Trappe in *Colacasia* and resembled the type description of Gerdemann and Trappe[11]. The rhizospheric soil contained the spores of *Glomus caledonius*, *Glomus fasciculatum* (figure 6) and *Glomus constrictus* Trappe (figure 5) and resembled the type description of Trappe[12].

Mycorrhizal associations are of particular importance to plants in nutrient-poor soils or at high elevations[13,14]. It has been reported that VAM infection has some relationship with the predisposition of the plant to disease. The VAM symbiosis with *Acorus* and *Colacasia* are under further investigation.

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ASSOCIATION OF VESICULAR-ARBUSCULAR MYCORRHIZAL FUNGI WITH THE ROOTS OF DIFFERENT CULTIVARS OF BARLEY (*HORDEUM VULGARE*)

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VESICULAR-ARBUSCULAR mycorrhizal (VAM) fungi are known to improve the nutrient uptake, particularly phosphorus of crop plants in phosphorus-deficient soils[1–3]. Beneficial response of barley to inoculation with VAM fungi in P-deficient soil has also been reported[4]. Since barley is grown mainly as a poor man's crop, under low input conditions this finding is significant and needs more detailed study regarding the colonization of native VAM fungi in roots of different cultivated varieties of the host. With the recent emphasis over the production of hul-less barleys by the breeders[5], this information is essential for achieving higher yields in these types.

Seven varieties of barley (table 1) used in the present study were grown during the winter season of 1985–86 in replicated experiment in pot cultures under the same agronomic conditions of normal cultivation. The soil used was unsterilized and deficient in available P content (4 μg/g soil by Olsen's method). Soil (10 kg) was distributed in 30 cm dia pots and the plants were grown in a glass house receiving sunlight for 10 hr each day and were irrigated with tapwater. The temperature in the glass house during the experiment ranged between 4°C (min.) and 30°C (max.). Four plants were allowed to grow in each pot, and each treatment was replicated four times.

The percentage of mycorrhizal infection was determined after 60 days from the time of seed