Figure 1. *a*, Cleared and stained root showing vesicles and hyphal network of endomycorrhizae. Scale bar, 50 μm. *b*, Chlamydospore of *Glomus fasiculatum*; outer wall is thicker than the inner. Note occulate opening at the attachment. Scale bar, 30 μm. *c*, Crushed azygospore of *Scutellospora calospora* showing wall layers and suspensor. Note the bulbous cell at the attachment. Scale bar, 50 μm.

VAM fungi, *G. fasiculatum* and *S. calospora* with *C. equisetifolia*. Except for a report on occurrence of *G. mosseae* in *Casuarina* growing in Australia[1], there has been no study on the association of VAM fungi with this taxon. The association of VAM fungi shows considerable promise for selection of suitable endomycorrhizae for improving the productivity of *Casuarina* species in alkaline soils.

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Anatomical observations on roots of finger millet colonized by VA mycorrhiza

D. Dyala Doss and D. J. Bagyaraj
Department of Agricultural Microbiology, University of Agricultural Sciences, GKVK, Bangalore 560 065, India

Anatomical observations on roots of finger millet colonized by vesicular-arbuscular mycorrhizae revealed, for the first time, the presence of the mycorrhizal fungus within lignified sclerenchymatous cells.

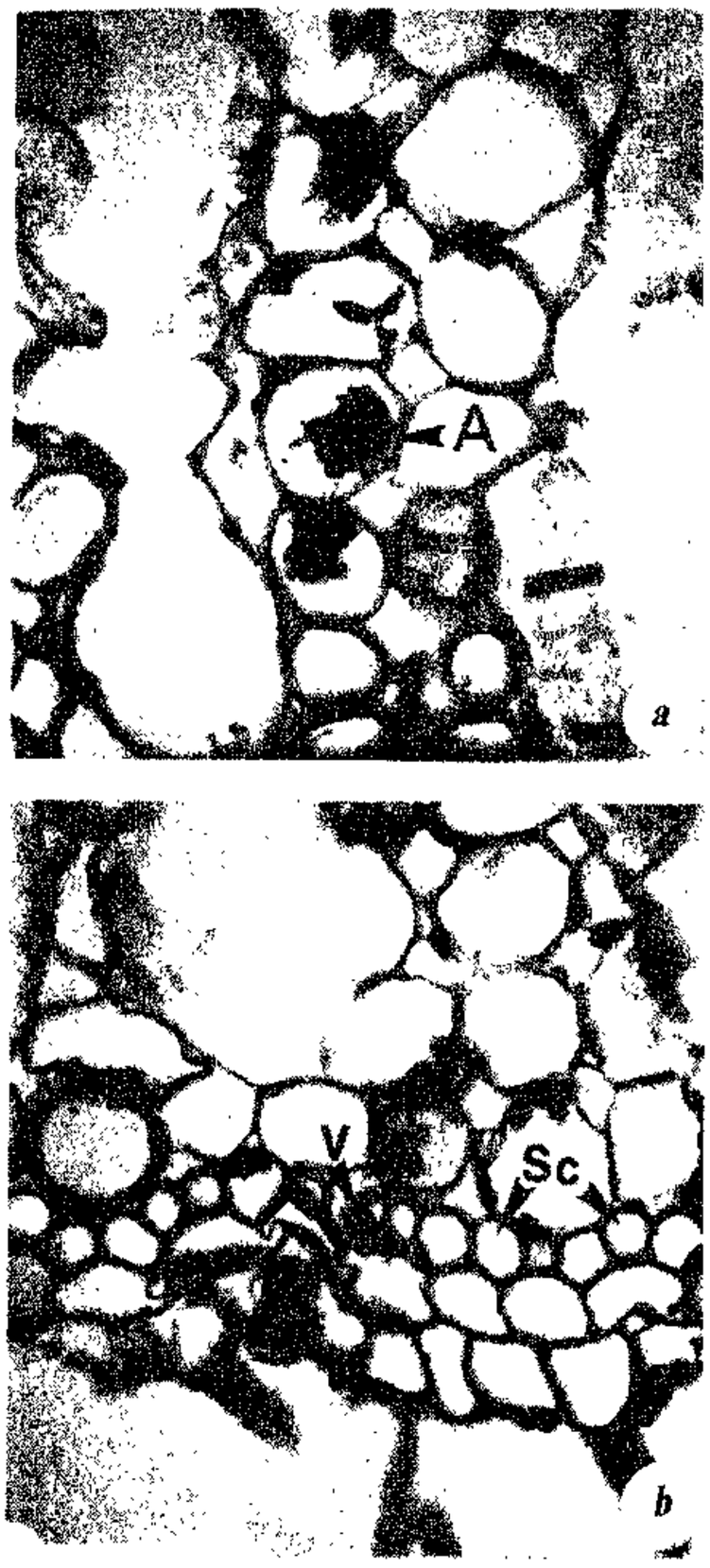
THE overall improvement in crop plants that can be brought about by vesicular-arbuscular (VA) mycorrhizal colonization has been well established. Research on beneficial aspects of VA mycorrhizae proved better uptake of minerals, resistance to water stress and synergistic interaction[1,2]. However, information about fine structure and anatomical changes due to VA mycorrhizal colonization in host is scanty[3].

Finger millet (*Elusine coracana* Gertn.) cv. Indaf-5 was grown on sterilized, phosphorus-deficient (3 mg available P/kg) red sandy loam soil. For mycorrhizal

inoculation sand : soil mixture containing root segments of *Panicum maximum* colonized by *Glomus fasciculatum* was used and uninoculated plants served as control. Plants were harvested on the 60th day. Root systems were rinsed with running water, fixed and processed for light microscopic observations. Thin sections (7 μm) were stained for polysaccharides by periodic acid Schiff's (PAS) method[4].

The fine structure revealed that the mycorrhizal root cells were large, well defined, and filled with arbuscules, the site of nutrient exchange (Figure 1*a*). During the process of digestion, the dichotomously branched arbuscules were slowly degraded leading to clump formation, which finally disappeared.

It was observed that the mycorrhizal roots were considerably large and the cells were densely PAS positive compared to non-mycorrhizal roots indicating higher polysaccharide deposition in the cell walls. The most interesting observation was the penetration of lignified sclerenchymatous exodermal cells by VA mycorrhiza (Figure 1*b*). As far as we are aware, this is the first report of such penetration. This suggests that mechanical barrier of the lignified sclerenchymatous cells does not interfere in the establishment of the endophyte, thus upholding the recent observation of VA mycorrhiza in the lignified xylem vessels of ginger[5].



rse section of the mycorrhizal root showing: ›uscules (A) (×400); and *b*, sclerenchymatous V) (×400).

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External adsorption of *Azospirillum lipoferum* strain D-2 to plant roots and its effect on plant growth

Babita Saxena, Anjana Desai and V. V. Modi
Department of Microbiology and Biotechnology Centre, Faculty of Science, M. S. University of Baroda, Baroda 390 002, India

Inoculation of a strain of *Azospirillum lipoferum* D-2, isolated from roots of *Digiteria*, on barley crop resulted in an increase in dry weight and grain yield of the barley crop. Levels of total nitrogen in different parts of the plant also increased in response to *Azospirillum* inoculation. Another strain of *Azospirillum lipoferum* M-2, isolated from maize, also showed similar response on barley crops suggesting non-specificity of strains for the host plants. Events leading to the colonization of *Azospirillum lipoferum* D-2 on wheat roots have been studied and described using scanning electron microscopy.

IN any given soil–plant environment, a particular type of microfloral population gets established by the compound(s) excreted by the roots, which serve as carbon and energy sources for these microorganisms. Soil is an extremely complex environment, making it very difficult to introduce and establish large numbers of laboratory cultured beneficial organisms. Some of the most promising organisms, capable of colonizing roots in large numbers and exerting beneficial effects on plants, belong to genus *Azospirillum*[1]. They colonize mainly forage and grain grasses and are readily isolated from the rhizosphere[2].

There are few indications for the type of factors contributing to plant–bacterium specificity in such associations[3,4]. Plant growth responses observed after inoculation of *Azospirillum* have been explained by