

## DISTRIBUTION OF VESICULAR ARBUSCULAR MYCORRHIZAE (VAM) IN THE SANDY BEACH SOILS OF MADRAS COAST

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### ABSTRACT

A survey of plants growing along the Madras sea coast revealed that most plants harboured VAM fungi. The VAM species were *Entrophospora schenckii*, *Glomus claroideum*, *G. clarum*, *G. intraradices*, *G. microcarpum*, *G. monosporum*, *G. occultum*, *G. pubescens* and *G. pustulatum*. Soil temperature and moisture status of the soil influenced the infection of VAM fungi in the coastal soils.

### INTRODUCTION

SAND dunes on the coasts are the natural defence structures against soil erosion by the action of wind and waves. A few perennial grasses and other plants occurring in the dunes play a major role in stabilizing the coastal sand dunes<sup>1</sup>. For rapid growth of plants in the dunes, beneficial micro-organisms especially VAM fungi play an important role<sup>2</sup>. The occurrence of VAM fungi in sand dunes of Lake Huron<sup>3</sup>, New England shore<sup>4,5</sup>, Australia<sup>6</sup>, Scotland<sup>7</sup> and Italy<sup>8</sup> has been recorded. According to Foster and Nicolson<sup>9</sup>, the hyphae of VAM fungi may bind sand grains into aggregates and bind the fine soil particles besides improving the plant growth. Surprisingly, this aspect has been neglected in India. We investigated the occurrence of VAM fungi in the soils of Madras sea coast and report our findings.

### MATERIALS AND METHODS

The Madras coast between Ennore to Enjambakkam, covering a distance of 36 km was surveyed. Plants with roots and soil samples were collected from January to November 1986 and screened for VAM association. Six collections were made and at least 4 plants of each species and rhizosphere soils were collected.

The pH of the soils varied from 7.8 to 8.1. The mean values of nutrients are: N 5.68 mg/100 g<sup>10</sup>, P 18.77 mg/100 g<sup>11</sup>, K 5.43 mg/100 g<sup>10</sup>, Zn 2.14 ppm and Mn 1.32 and Fe 6.04 ppm<sup>12</sup>.

Spores were separated from the soil samples by wet sieving and decanting methods<sup>13</sup> and root colonization by VAM fungi was ascertained<sup>14</sup>.

### RESULTS AND DISCUSSION

A total of 53 plant species from 30 families were screened for VAM association. Of this, 35 species

had mycorrhizal infection. Mycorrhizal infection was recorded in *Justicia prostrata* Gamble (Acanthaceae); *Gomphrena celosioides* C. Mart. (Amaranthaceae); *Calotropis gigantea* (L.) R.Br. (Asclepiadaceae); *Launaea sarmentosa* (Willd.) Schultz., *Tridax procumbens* L. (Asteraceae); *Cassia auriculata* L. (Caesalpiniaceae); *Cleome viscosa* L. (Cleomaceae); *Evolvulus nummularius* L., *Ipomea pes-caprae* (L.) R.Br. (Convolvulaceae); *Coccinia indica* Wight & Arn. (Cucurbitaceae); *Cyperus stoloniferus* Retz. (Cyperaceae); *Acalypha indica* L., *Agyneia bacciformis* Adr. Juss., *Croton bonplandianus* Baill., *Euphorbia rosea* Retz., *Euphorbia hirta* L. (Euphorbiaceae); *Geniosporum prostratum* Benth. (Lamiaceae); *Abutilon indicum* G. Don, *Sida cordifolia* L. (Malvaceae); *Mollugo pentaphylla* L. (Molluginaceae); *Boerhavia diffusa* L. (Nyctaginaceae); *Crotalaria prostrata* Roxb., *Indigofera linnaei* Ali, *I. tinctoria* L., *Tephrosia purpurea* (L.) Pers. (Papilionaceae); *Pandanus odoratissimus* Roxb. (Pandanaceae); *Pedaliium murex* L. (Pedaliaceae); *Cynodon dactylon* (L.) Pers. *Spinifex littoreus* Merv. (Poaceae); *Borreria articularis* (L.) F.N. Williams (Rubiaceae); *Solanum trilobatum* L., *S. xanthocarpum* Schrad & Wendl. (Solanaceae); *Clerodendrum inerme* (L.) Geertner, *Phyla nodiflora* (L.) Greene and *Tribulus terrestris* L. (Zygophyllaceae).

All the infected plant roots showed typical vesicular or arbuscular and inter- and intra-cellular hyphal infection. The extent of infection substantially differed from species to species. Shape of the spores isolated from soil samples varied from spherical to elliptical and a few were irregular in shape.

Generally, the number of spores was low in the samples collected during April and July 1986 compared to those collected during January and November 1986 which exhibited good infection by VAM fungi. Presumably, temperature influences the num-

ber of spores and infection, as between April and July, the temperature was around 37°C but in November, it was only 26–29°C.

No VAM association was recorded in the roots of *Achyranthes aspera* L., *Aerva lanata* (L.) Juss. (Amaranthaceae); *Catharanthus roseus* (L.) Don, (Apocynaceae); *Aristolochia bracheolata* L. (Aristolochiaceae); *Parthenium hysterophorus* L. (Asteraceae); *Coldenia procumbens* L. (Boraginaceae); *Opuntia stricta* Haw. (Cactaceae); *Casurina equisetifolia* Forster & Forster. (Casurinales); *Cleome angustifolia* A. Rich (Cleomaceae); *Citrullus colocynthis* (L.) Schrader (Cucurbitaceae); *Kyllinga brevifolia* Rottb. (Cyperaceae); *Sesamum prostratum* Retz. (Lamiaceae); *Glinus lotoides* L. (Molluginaceae); *Portulaca oleracea* L. (Portulacaceae); *Oldenlandia aspera* (Roth.) DC., *O. umbellata* L. (Rubiaceae); *Datura metel* L. (Solanaceae) and *Waltheria indica* L. (Sterculiaceae). These plants were examined on several occasions but no infection was noticed.

Surprisingly, the rhizosphere soils of all the plants contained VAM spores. It is possible that insufficient nutrients and unfavourable conditions for infection prevented the spores from infecting plants at certain sites in the coast<sup>15</sup>. Spores of *Entrophospora schenckii* Sieverding & Toro, *Glomus claroides* Schenck & Smith, *N. clarum* Nicolson & Schenck, *G. intraradices* Schenck & Smith, *G. microcarpum* Tul. & Tul., *G. monosporum* Gerd. & Trappe, *G. occultum* Walker, *G. pubescens* (Sacc. & Ellis) Trappe & Gerd. and *G. pustulatum* Koske, Friese, Walker et Dalpe were recovered and identified<sup>16</sup>.

The variation in spore population and quantum of root colonization was recorded. This fluctuation might be due to the influence of different environmental factors on VAM sporulation and infection<sup>17</sup>.

Soil samples aggregated in the rhizosphere of VAM associated plants. Coastal areas are thus benefitted by the spread and establishment of VAM fungi. Clearly, the distribution, survival and establishment of VA mycorrhizae in Indian coasts de-

serves detailed study and promising plant—VAM association may be developed not only to control soil erosion but to evolve a green cover on the coast.

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