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# Mycorrhizal association with relationship of tomato in Aird and semi-arid zone of Rajasthan

**Rakesh Pipralia and Anil Vyas**

**Abstract**
Tomato is scientifically known as *Lycopersicon esculentum* which belongs to family Solanaceae. It is most cultivated in the region of desert soil, which is deficient in its nutrients value. The present study describe the field survey report of various abiotic factor associated with the most cultivated region of crop and will be useful to evaluates its dependency and adaptations to them either as synergistically or mitigating, like Mycorrhizae play a critical role in nutrient capture from soils. AM fungi are the most important mycorrhizae in the agricultural and natural ecosystem as well-developed mycorrhizal symbiosis may enhance the survival of plants in polluted areas by better nutrient acquisition, water relations, pathogenic resistence, phytohormone productions where this not only benefits Tomato but in retunrs it also get benefited since The bidirectional exchange of nutrients is the basis of the arbuscular mycorrhizal symbiosis.

**Keywords:** AM fungi, root colonization, spore population, tomato

## Introduction
Tomato is a herbaceous, Dicots, and grows as series of branching stems with a terminal bud at the Tip that does the actually growing. The Tip eventually stops growing because of Flowering. The plant is widely grown throughout the world for its Edible fruit and many other uses for human consumption like plup use in face packs etc. The plant has strong aroma which repal insects from nearby plants. It is a perennial, often grown outdoors in temperate climates as an annual. requires a rich well drained soil in a warm sunny position for ripening and high yield. The pH value 5.5 -7.5 is suitable for best grow.

Western Rajasthan is characterized by nutrient deficient sandy soil with poor water holding capacity and scarcity of water, high temperature etc. due to these adverse climatic conditions vegetation of this Western Rajasthan is very poor. In Western Rajasthan it is cultivated normally at the advent of winter season upto the springs (Al-Karkari & Hammad, 2001) [2].

Arbuscular Mycorrhizal (AM) fungi are ubiquitous in distribution. Improved biomass production, nutrient uptake, moisture retention (Auge *et al*, 2001) [3, 4], etc., in different plant species by AM fungi under arid and semi-arid conditions have been reported. Different species of AM fungi occur in arid and semi-arid regions of India. Due to their manifold beneficial effects AM fungi, which also name as "Biofertilizer" (Gaur *et al*, 2000) [6], are now a days being frequently used in agriculture (Ryan *et al*, 2002 and Muchovej, 2001) [8, 12] and forest besides their ability to improve survival and estabilishment of plants under arid and semi-aris regions. Prior to exploiting the biofertilizer potential of AM fungi it is necessary to examine the occurrence and distribution of these microbes in soil. Keeping this in mind the present investigation was undertaken to study the occurrence, distribution and association (Bouamri *et al*, 2006, Sharif *et al*, 2006 and Mathur *et al*, 2004) [13, 9, 15] of AM fungi in the mycorrhizosphere of Tomato plant in Western Rajasthan.

## Material and Methods
The western rajasthan comprises 60% of the Indian Thar Desert, incorporating with arid and semi -arid regions. Out of which some area were taken in to consideration of Tomato plant samples along with rhizosphere soil, namely, (1) CAZRI (2) Mandore (3) Tinwari (4) Chokha (5) Osian (6) Mathania

In each case soil sample (adhering to the roots) from 15-20 cm depth was dugout along with the root samples. The soil samples were processed by wet sieving and decanting technique of Gerdmann & Nicholson (1963) [7] to obtain spores. The soil and root samples were placed in an insulated carrier for transport and immediately refrigerated at 4 $^0$C.

The roots were processed immediately. All the soil samples collected from rhizosphere of the plant species were homogenized replication wise before processing by sieving to remove stone, plant material and coarse roots. Sub-sample of each soil was dried and used for estimation of various physio-chemical properties and to establish successive pot cultures.

To determine the percent root colonization root samples were washed in tape water and staining was done with Lactophenol containg Trypan blue (Giovannetti & Mosse, 1980) [1] for rapid assay mycorrhizal association. The root samples were cut in to pieces of 1cm length and placed in 10% KOH solution, which was kept at boiling point for about 10 min (depending upon the hardness of the root samples) Soil texture was estimated gravimetrically by hydrometer method. Soil sample were analysed for pH and electrical conductivity on 1:2.5, soil: water suspention. Organic carbon was calculated by using 1N potrated with Potassium dichromate and back titrated with 0.5 N ferrous ammonium sulphate solution. Available Phosphorus in soil was calculated by extraction with 0.5 M Sodium bicarbonate for 30 min different species of AM fungi were identified on the basis of extramatrical spores present in the soil following the key of Morton & Benny (1990) [14].

**Observations and Discussion**

The Tomato plants examined from all the localities showed AM fungi namely, *Glomus fasiculatum, G. mossae, G. macrocarpum, Gigaspora margarita, Scutellospora calospora, Acaulospora sp.* were collected from different localities from rhizosphere soil of which *Glomus fasiculatum* and *Glomus mossae* were most common. The occurrence of other four fungi varied from one region to other.

The soil pH, organic carbon and soil moisture content at the localities are presented in Table 1. Soil pH at all the localities varied from 6.5-8.5, total P varied from 3-9 ppm, organic carbon varied from 0.10-0.20% and soil moisture varied from 5-9% at different localities.

**Table 1:** Analysis of tomato plantation at various localities in arid and semi-arid regions of Western Rajasthan

| Collection Site | Ph | P (Ppm) | Organic Carbon (%) | Soil Moisture (%) |
|---|---|---|---|---|
| CAZRI | 8.5 | 6 | 0.10 | 5.0 |
| Mandore | 8.2 | 5 | 0.14 | 7.0 |
| Tinwari | 8.1 | 6 | 0.15 | 7.0 |
| Chokha | 8.1 | 6 | 0.12 | 9.0 |
| Osian | 8.0 | 3 | 0.18 | 7.5 |
| Mathania | 7.9 | 9 | 0.20 | 8.0 |

The root colonization by the AM fungi was found to be quit good varying from 45-55% at various localities (Table 2).The mycorrhizal colonization was found to be unaffected by AM spore population in the rhizosphere soil.

A plant is considered mycorrhizal when its roots contain characteristic structures like internal hyphal system, intracellular arbuscules and vesicles. During the present investigation the root segments showed formation AM hyphae both on internal as well as external surface of the host root (figA).

**Table 2:** AM spores and percentage root colonization by AM endophytes at different localities in the rhizosphere of tomato plant

| Collection Site | Am Fungal Spore Population/Gm Soil | Percentage Root Colonization |
|---|---|---|
| 1 | 35 | 55 |
| 2 | 35 | 50 |
| 3 | 30 | 45 |
| 4 | 38 | 52 |
| 5 | 40 | 45 |
| 6 | 36 | 55 |

The internal hyphae showed frequent formation of vesicles of varied size and shapes. The formation of arbuscules were also observed very frequently in the root samples. The oldest arbuscules were found on the intercellular hyphae nearer to the original entry points.

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