

Arbuscular Mycorrhizal Association In Some Medicinal Plants Found In Ahmedabad, Gujarat, India

Fulesh Kokni¹, Rupesh Maurya¹, Umerfaruq M. Qureshimatva¹, Hitesh A. Solanki²

Research scholar, Department of Botany, School of Sciences, Gujarat University, Ahmedabad, Gujarat, India¹

Professor, Department of Botany, School of Sciences, Gujarat University, Ahmedabad, Gujarat, India²

ABSTRACT: Arbuscular mycorrhizal (AM) Fungi Normally colonizes almost all tropical plants, However the incidence of mycotrophic in Medicinal plants is less Documented as compared to studies on forestry and crop species. The present study was undertaken to evaluate the association of AM fungi from Ahmedabad. The degree of AM Colonization varied in all the 5 Plants species. Maximum colonization was recorded in *Tinospora cordifolia*. The genus *Glomussp.*, *Acaulosporasp.*, *Scutellosporasp.*, *Gigasporasp.* etc was identified from rhizosphere.

KEYWORDS: AM fungi, medicinal plants, Ahmedabad.

I. INTRODUCTION

The demand for Medicinal plants is increasing with the rise in the consumption in India. There is steady increase in cultivation of medicinal plants to maintain a steady to support the increasing demand. Since last few decades the use of medicinal plants has been increased and is playing a very important role. Arbuscular Mycorrhizal Fungi (AMF), members of the Glomeromycota are the most widespread mycorrhizal fungi (Gupta and Mukherji, 2006) occurring in 80% of all plant species (Gerdemann and Nicolson. 1963.). morphologically, these fungi are a network of hyphae that grow within the roots of plants and extend out into the soil. AMF actually penetrate the walls of root cells and form intracellular structures. They mainly associate with plant roots forming a symbiotic relationship; with the plants providing sugars for the fungi and the fungi provides nutrients such as phosphorus, to the plants (Johnson et al. 2003). Mycorrhizal fungi can absorb, accumulate and transport large quantities of phosphate within their hyphae and release to plant cells in root tissue. They produce two distinct structures: Vesicles, which are mainly sac like and are thought to act as storage for lipids (Morton and Benny 1990) and Arbuscles, which are densely branched and acts as site of nutrient exchange between the plant and the fungus.

Plants which are used as ethno-medicinally by various tribes. These plants are selected due to their higher medicinal values.

Enumeration of plants with their medicinal use are given below:

1. *Ammannia baccifera* L.Sp. Pl. (ed. 2) 175. 1762

Annual herbs, 30-75cm tall. Leaves oblong, linear-lanceolate, glabrous, sessile or sub sessile. Flowers red, in dense, axillary clusters. Capsules minute, red, glabrous. Seeds minute, brown, obovate.

FLS & FRS: Throughout the year

Location: Gujarat University Campus

Medicinal uses:

The leaves are beneficial for removing phlegm from the lungs and trachea. According to Ayurvedic pandits, the herbal extract is a good remedy for tuberculosis and typhoid fever. The plant juice mixed with ginger extract is helpful for curing fevers. Tribal believes that the herb is an effective remedy for all blood diseases.

2. *Hygrophila auriculata*(Schum.) Heine in Kew Bull. 16:172. 1962

Armed, annual herbs or under shrubs, 30-60cm tall. Leaves elliptic-lanceolate, hispid, and sessile. Flowers bluish-purple. Capsule 0.6-1cm long, linear oblong, pointed, glabrous, 4-8 seeded.

FLS & FRS: September-March

International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 10, October 2015

Location: Gujarat University Campus

Medicinal uses:

Hygrophila stimulates the male genital system and is beneficial in the treatment of sexual debility, premature ejaculation and erectile failure. It is also a potent remedy for kidney stones. The leaves and roots of Hygrophila have diuretic properties. The herb is also useful in ailments of the urinogenital tract, like dysuria, urinary calculi and cystitis.

3. *Ipomoea aquatica* Forssk. Fl. Aegpt-Arab. 44. 1775

Perennial, glabrous herbs, rooting at nodes. Leaves broadly ovate-triangular, seldom almost linear. Flowers solitary or 3-4 in cymes. Capsule 0.6-0.8 cm long. Ovoid, apiculate, glabrous. Seeds microscopically hairy.

FLS & FRS: Throughout the year

Location: Gujarat University Campus

Medicinal uses:

Leaves are often used as vegetable in various countries because it has good medicinal value.

4. *Cocculus hirsutus* (L.) Diels in Pfreich. 46:236.1910

Perennial, dioecious herb, softly villous in younger parts. Leaves alternate and glabrous. Flowers greenish-yellow in axillary, cymosely cluster. Drupes deep-purple when ripe.

FLS & FRS: November-April

Location: Gujarat University Campus

Medicinal uses:

The roots are bitter and are used for various diseases like leprosy and skin disease. The fruit also yield a dark colour purple ink which is also used as a medicine.

5. *Tinospora cordifolia* (Willd.) Miers ex Hk. F. & Th. Fl. Ind. 184. 1855

Extensive, deciduous twiners. Bark greyish-white, lenticellate, grooved. Leaves membranous, broadly ovate to ovate-triangular, glabrous, 5-7 veined petiolate. Raceme 2-7cm long, axillary or more commonly from leafless branches. Drupes 0.4-0.6 cm across, globose and deep red in colour.

FLS: December-May, **FRS:** January-June

Location: Gujarat University Campus

Medicinal uses:

Leaves are bitter and are useful in vitiated conditions of kapha and vata, poisonous bites, leprosy, skin diseases. The stem of these particular climbers is widely used for quering fever. Roots are helpful in quering cough and cold.

II. MATERIAL AND METHODS

A) Collection of the sample:-

The roots and rhizospheric soil samples of medicinal plants were collected from study area Gujarat University Campus during Dec.-Jan. 2014-2015. At least five different medicinal plants were screened for Mycorrhizal colonization. The plants along with roots were removed from the soil with the help of digger and collected roots and soil sample in different collection bags. The collection bags were closed air tight to maintain the moisture and freshness of the plant. All the collection bags were labelled mentioning name of plant, date, time, place and other important information.

B) Processing of the sample in the lab for observation:-

The plant roots were washed in running tap water and they were cut in to small pieces of around 1cm in length. Then these cut roots were treated with 10% KOH solution and autoclaved at 15 lbs. for about 1 hour. Autoclaved pieces were neutralized with 10% HCL solution. Neutralized pieces were kept for staining in lacto aceto phenol blue for around 24 hour. After 24 hours the extra stain was removed with the help of lacto phenol and the samples were ready to screen under microscope.

C) Colonization Pattern and Percentage:-

Root pieces were taken on slide for screening of colonization pattern of AM Fungi. These were done for all the five plants selected for the colonization pattern study. More than 100 slides were prepared for every plant species for studying the presence of Vesicles, Hyphae and Arbuscules. After observation photographs were taken from different view. Same way the treated root piece were put on slide with mounting medium lacto phenol and covered with cover slip and this prepared slide was then screened under microscope for the calculation of colonization percentage (Phillips, J.M. and Hayman D.S.) 1970.

International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 10, October 2015

$$\% \text{ Root Colonization} = \frac{\text{Number of infected segments}}{\text{Total number of segments observed}} \times 100$$

III. RESULT AND DISCUSSION

IV.

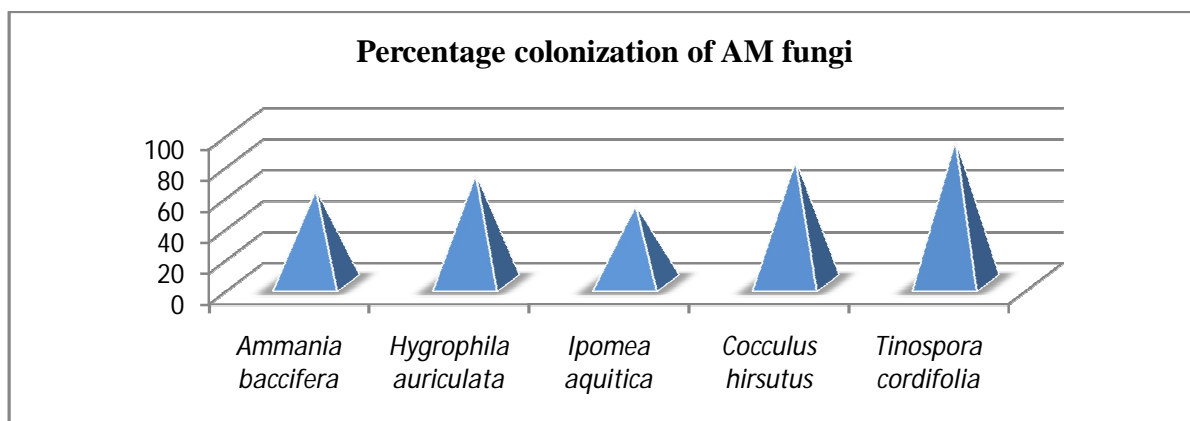
The occurrence of AM fungi was found to be Moderate in *Ammannia baccifera*, *Hygrophila auriculata* and *Ipomoea aquitica* where else in *Cocculus hirsutus* and *Tinospora cordifolia* it was Excellent.

Table 1- Occurrence intensity of AM fungi association with five different medicinal plants

Sr.No.	Medicinal plants	Occurrence intensity of AM fungi		Percentage colonization (%)
		Vesicles	Arbuscles	
1	<i>Ammannia baccifera</i>	++	-	60.23%
2	<i>Hygrophila auriculata</i>	+++	-	72.4%
3	<i>Ipomea aquitica</i>	++	+	56.12%
4	<i>Cocculus hirsutus</i>	+++	++	79.1%
5	<i>Tinospora cordifolia</i>	++++	++	92%

(++=25-50%: Good; +++=50-75%: Moderate; ++++=more than 75%: Excellent; -= absent)

GRAPH: 1. Percentage colonization of AM fungi in five medicinal plants.



Arbuscular Mycorrhizal colonization pattern was recorded in selected five medicinal plant species. These was characterised by Arbuscules or Vesicles and intraradical Hyphae. The extent of Root Colonization pattern of Arbuscular Mycorrhizal fungi varied from 56%-92%. Maximum root colonization pattern of AM fungi was observed in *Tinospora cordifolia* 92% and the minimum root colonization pattern of AM fungi was observed in *Ipomoea aquatica* 56.12%. Variation of colonization pattern was observed. Similar observation was recorded earlier by (Taber and Trappe 1982). Some AM Fungi were identified up to genus level they are as under *Glomus* Sp., *Acaulosporasp.*, *Scutellosporasp.*, *Gigasporasp.* Among all these *Glomus* showed the high occurrence.

International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 10, October 2015

V. CONCLUSION

Maximum colonization is observed in *Tinospora*. *Tinospora cordifolia* was earlier done by (Koul. 2012) he has reported 75 Percent colonization from Gwalior Chambal Region. I came across 92 percent colonization from Gujarat University campus which was excellent. Arbuscular mycorrhizal (AM) fungi plays symbiosis relation with the host plant by nutrition uptake in restoration and sustainability in agro ecosystem. It will play an important role in cultivation of plant species.

VI. ACKNOWLEDGEMENT

The authors are thankful to Dr. A.U. Mankad, Head, Department of Botany, Gujarat University, Gujarat, Ahmedabad helping and supporting this research work.

REFERENCES

1. Gupta R. and Mukherji K.G. (2006) Vesicular arbuscular mycorrhiza in some weeds belonging to Compositae and Graminae in Mycorrhiza (Eds) A. Prakash, Mherotra V.S. *Scientific Publication. India*, 161-163.
2. Gerdemann, J.W. and Nicolson T.H. (1963) Spores of Mycorrhizal Endogone extraction from soil by wet sieving and decanting. *Trans. Brit. Mycol. Soc.* 46: 235-244.
3. Johnson N.C., Graham J.H., Smith F.A. (1997) Functioning of mycorrhizal associations along the mutualism–parasitism continuum. *New Phytology* 135:575–586.
4. Morton J.B, Redecker D. (2001) Two new families of Glomales, Archaeosporaceae and Paraglomaceae, with two new genera Archaeospora and Paraglomus, based on concordant molecular and morphological characters. *Mycologia*. 93:181–195.
5. Singh R., Pandya R.K. (1995) The occurrence of vesicular-arbuscular mycorrhiza in pearl millet and other hosts. Proceedings of the Third National Conference on Mycorrhizae, (Eds.) Adholeya A, Singh S *Mycorrhizae; Biofertilizers for the future*. 56-58.
6. Phillips J.M., and Hayman D.S. (1970) Improved procedure for clearing roots and staining parasitic and staining parasitic and vesicular-arbuscular mycorrhizal fungi for rapid assessment of infection. *Trans. Br. 1. Mycol.Soc.* 55:158-161.
7. Taber R.A. and Trape, J.M. (1982) Vesicular arbuscular mycorrhiza in rhizomes, scale like leaves, roots and xylem of ginger. *Mycologia*, 74: 156-161.
8. Koul K.K., Agarwal S. and Rafiq L.(2012) Diversity of Arbuscular Mycorrhizal Fungi Associated With the Medicinal Plants from Gwalior-Chambal Region of Madhya Pradesh-India. *American-Eurasian J. Agric. & Environ. Sci.* 12 (8): 1004-1011.