International Journal of Science and Research (IJSR)
ISSN (Online): 2319-7064
Index Copernicus Value (2013): 6.14 | Impact Factor (2013): 4.438

Arbuscular Mycorrhizal Status of *Vetiveriazizanioides* (L) Nash of Family Poaceae

R. M. Mulani[1], S. B. Wankhede[2]

UGC-SAP and DST-FIST sponsored school of life sciences, Swami Ramanand Teerth Marathwada University Nanded, 431606, Maharashtra India.

Abstract: ***Arbuscularmycorrhizal fungi play an important role in mobilization of nutrients and enhancing plant growth. It maintain the intimate link between the plant roots and soil the present investigation deals with Arbuscularmycorrhizal fungi status of Vetiveriazizanioides(L) Nash of family Poaceae with main emphasis on percent root Arbuscularmycorrhizal fungi colonization . Development of mycelia growth in the root tissue and the density and diversity of Arbuscularmycorrhizal spores in the rhizospheric soil of the plant. The roots and rhizospheric soil was collected from the botanical garden of Swami RamanandTeerthMarathwada University,Nanded and were analysed. The roots showed 90 % Arbuscularmycorrhizal fungi colonization with extensive mycelial growth in the cortical tissue . The coenocytic hyphae was observed in cortical tissue mainly and even in vascular tissue.The vesicles were mainly oval, round and elongated.The soil analysis show presence of240 resting spores in 100gm of soil and there is so much species diversity dominating mainly by Glomus, and important species are Glomusmosseae,Glomusmicrocarpum,Glomuspachycaulis.***

Keywords: Arbuscular Mycorrhizal Colonization ,*Vetiverazizanioides*(L).Nash.

1. Introduction

Mycorrhiza the term first referred by German Botanist Arber Frank in 1985 for symbiotic relationship between fungi and plant root. It is non-pathogenic association of fungi with roots of higher plants [12]. It perform important function in mobilising nutrients mainly uptake of phosphorus,inorganic and organic nitrogen and transport nitrogen and various organic material to the host plant [2].Provide sustainanae in drought condition to many herbaceous plant.[4,28].The ArbuscularMycorrhizal diversity in herbaceous vegetation medicinal plants,in halophytes plants have been investigated by many workers[3,11,13,14,16,17,18,19,21,26,29].

Vetiveriazizanioides (L)Nash is perennial grass locally called as Walla or *Khas-Khas* or *Vetiver* grass. It belongs to family Poaceae and occurring tropical climate worldwide mainly in Bangladesh, Burma, Ceylon,and spread South west Asia to tropical Africa.It grows Luxuriently along river bank and in marshy soil and even can with stand extreme drought condition.It is an important species which control soil erosion also grown as soil binder .It can grow in all types of soil with high variation of PH ranging from 4.0 to 9.6 but profusely grown in well drained sandy,loamy soil [1,6,25]. It grows about 1.5 meters high and grows in large clumps from number of branched spongy rootstocks [10]. The root system is mat like extensive ,fibrous and adventitious .The leaves are long,thin and rigid. The produces purple brownish flower.

The roots of *Vetiveriazizanioides* (L) Nash are refrigent, febrifuge,stomach and having immunogogue properties and essential oil extracted from the roots is used in perfumery and aroma theorpy [22].The roots have antiinflamotry,anticeptic, properties and used as tonic ,Cicatrisant, Nervine, sedative,[1].It is also used for many of their

oilments such as mouth ulcers, fever, boil epilepsy,snake bite,headache, rheumatism, burn,scorpion string.Paste of fresh roots applied on burns in santhal tribes of Bihar and west Bengal.The root ash issued from for acidity in organ tribes [5,9,24]. In various parts of India The roots are used as water flavouring agents and in North India is soft drink is prepared from fresh root.The roots are also used in preparation of mats or screens for windows, doors,desert cooler during summer month.[5,9,15,23,24].

2. Materials and Methods

2.1 Study Site

Botanical Garden of School of Life Sciences, Swami Ramanand Teerth Marathwada University Campus, Nanded

2.2 Root Collection

The roots and rhizospheric soil of *Vetiverazizanioids (L).*growing in Botanical garden of university campus was collected in month of August 2014, without damaging the root system. The collected plants along with root system were kept in beaker containing water for the removal of adhering soil and for separation of roots. Then the roots were washed under tap water. The young roots were cut into the small segments of 1 cm each. The Arbuscularmycorrhizal colonization was done using method suggested by [20] for the extent of mycorrhizal colonization of root segment. The root segments were kept in 10 % KOH in test tube and autoclaved at 15 lb pressure for 20 minutes. Then 10% KOH was removed. De-staining of roots were done by adding 10 drops of H_2O_2.Neutralization of root segments was done by adding 10 ml of 1N HCL. After 30 minutes cleared root segments were stained in cotton blue with lacto phenol and kept for 24hr, Next day root segments were observed under microscope, for ArbuscularMycorrhizal Colonization [20].

The occurance of arbuscules, mycelium, and Vesicle in the whole mount of roots were considered as positive root

colonization. Then the percentage of root colonization was calculated by using following formula. [8].

$$\text{Per cent of mycorrhizal colonization} = \frac{\text{Number of root segments colonized}}{\text{Total number of root segments examined}} \times 100$$

Simultaneously the rhizospheric soil collected was air dried and preserved for propagule studies. Spore isolate was done by using method of [7] with slight modification [17].in which 100 gmrhizospheric soil was dissolved in 1 liter of distilled water containing few drops of tween-20. The solution was stirred well by using glass rod and allowed to stand still for 15 to 20 minute.

The solution was then sieved through series of sieves i.e. 710mμ, 210mμ, 150mμ, 75mμ, 45mμ, and 25mμ respectively. Since the spore density was only found to be present on 75μm, 45mμ and 25mμ sieves, the debris of these sieves were collected and centrifuged in 1% sugar solution at 1000 rpm for 5 mines. The supernatant was poured into Petri dish containing Nylon mesh with 20mμ pore size for finding the spores were identified by using Manual for the identification of VA Mycorrhizal fungi suggested by[27].

3. Result and Discussion

The roots of *Vetiverazizanioids(L).*showed 90% ArbuscularMycorrhizal colonization. The vesicles were rounded, globular, elongated and prominent. The hypae are coenocytic, non-septate and branched. The rhizospheric soil analysis showed 240 spores/100gm of soil. The Arbuscularmycorrhizal genera recorded are *Glomusmicrocarpum,Glomusmosseae, Glomuspachycaulis.* The genus *Glomus* was dominant as compared to other genera of Arbuscularmycorrhiza.

Coenocytic hyphae, Vesicles are seen in root whole mount of *Vetiverazizaniodes* (fig-a,b) and Magnified view of rounded vesicles are seen in whole mount of root of *Vetiverazizaniodes*(fig-c,d,e). Arbuscles in whole mount of root of *Vetiverazizaniodes*are seen (fig- f,g,h). Different types of spores are seensuch as*Glomusmicrocarpum* - Chlamydospores with thick , laminate wall and subtending hyphae.(fig.i).*Glomusmosseae*-Walls of spores double with thin outer and thick inner layers.(fig.j).*Glomuspachycaulis*-Spores with shorter and thick walled attached hyphae radially arranged on a central plexus of hyphae.(fig. k).

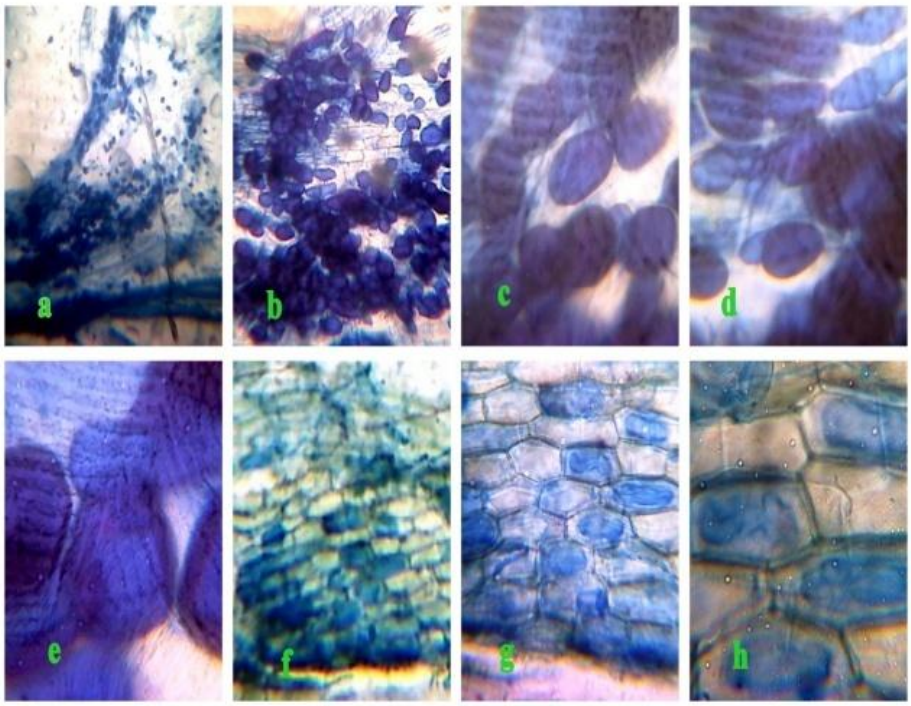

Figure 1: Root colonization of*Vetiverazizaniodes*(L). fromroots slides showing these structures: (a,b)Coenocytic Hyphae,Vesicles, are seen in root whole mount of *Vetiverazizaniodes* (10X,40X). (c,d,e)Magnified view of rounded vesicles are seen in whole mount of root of*Vetiverazizaniodes*(40X,100X).(f,g,h)Arbuscles are seen in whole mount of root of *Vetiverazizaniodes*(10X,40X,100X).

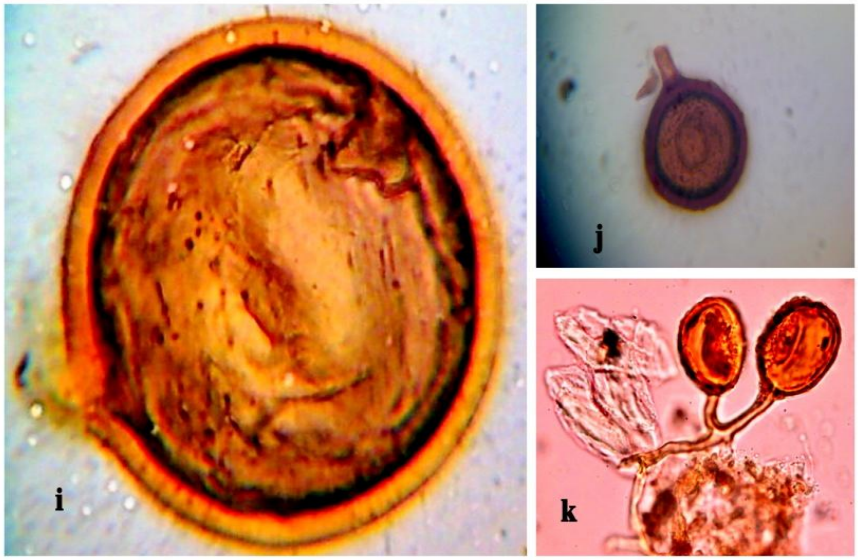

Figure-II: Isolated ArbuscularMycorrhizal fungal spores-(i) ***Glomusmicrocarpum***-Chlamydospores with thick ,laminate wall and subtending hyphae. **(j)*Glomusmosseae*-**Walls of spores double with thin outer and thick inner layers. **(k)** ***Glomuspachycaulis*-** Spores with shorter and thick walled attached hyphae radially arranged on a central plexus of hyphae.

References

[1] Anonymous.(1976) **The*Wealth of India, Raw Material.*I(10):**451-457.Council of Scientific and IndustrialResearch, Delhi.India.

[2] Atul-Nayyar A., Hamel C., Hanson K. and Germida J.(2009).The arbuscularmycorrhizal symbiosis links N mineralization to plant demand. ***Mycorrhiza.*(19):**239–246.

[3] Bagyaraj, D.J. (2014).Mycorrhizal fungi. ***Proc Indian NatnSci Acad.* 80(2):** 415-428.

[4] Bagyaraj, D.J. and Varma, A. (1995).Advances in Microbial Ecology. ***Academic Press,London* .14 :**119-142.

[5] Bhushan, B. Sharma, S. Singh,T.singh,L. and Arya,H. (2013). *Vetiverazizanioides* (linn).A pharmacological overview.***Int.Res.J.pharm.*4(7):**18-20.

[6] DeGuzman ,C. C. and Oyen, L.P.A. (1909) *Vetiveriazizanioides* (L.) Nash. In: Oyen LPA and Dung NX (eds) *Plant Resources of South-East Asia No*19. Essential oil plants, ***Backhuys Publishers, Leiden***.167-172.

[7] Gerdmann,J.W. and Nicolson,T.H.(1963).Spores of mycorrhizalEndogone species extracted from the soil by wet sieving and decanting .***Trans.Br.Mycol.Soc*.46**:235-244.

[8] Giovanneti,M.and Mosse,B.(1980).An evaluation of technique for measuring vesicular arbuscularmycorrhizal infection in roots. ***New phytol.* 84:**489-500.

[9] Jain, S. K.(1991). *Dictionary of Indian Folk Medicine and Ethno-botany*. ***Deep Publ., NewDelhi, India.***

[10] Khare,C.P. (2007).*Indian Medicinal Plants.* ***An Illustrated,Dictionary, Springer*,PMCid:PMC2705749.**

[11] Kannan, K. and Lakshminarashiman, C. (1988). Survey of VAM of maritime strand plants of Po Calimere. ***In-First Asian conference on Mycorrhizae, C.A.S. in Botany,Madras.*29(31):** 53-55.

[12] Kar , A.K. (1993) *College Botany II New Central Book Agency, Calcutta*.507.

[13] Kumar., A.Chhavi, M. and Aggrawal, A. (2013).Biodiversity of Endophyticmycorrhizal fungi associated with some medicinal plants of Himachal Pradesh. ***Asian J.of Adv.Basic sci.* 1 (1):**26-29.

[14] Mulla,R. M. and Kanade,A.M.(1994). VAM Mycorrhizalcolonization in grasses of Bombay.***J.RayatShikshanSansthaSatara*:**56-65.

[15] Mishra.,S.Sharma., S.Mohopatra,S. and Chauhan,D.(2013).An overview on *Vetiverazizanioides*. ***Research Journal Pharmaceutical,Biological and Chemical Sciences.*4(3):**777-783.

[16] Mulani.,R.M,Prabu, R.R. and Dinkaran,M. (2004).Occurance of vesicular ArbuscularMycorrhizaa (VAM) in the roots of phylanthusfrraternus Webster.***Mycorrhiza News.*14(2):**11-14.

[17] Mulani,R.M and Waghmare,S.S.(2012). Assessment of occurrence of Thermo tolerant ArbuscularMycorrhizal Fungi in the Roots and Rhizospheric spoil of *Aloevera*(L.)Burn.f.***Online international journal intterdisplinary research journal.*2(4)**:*22-27.*

[18] Mulani,R.M. and Prabhu,R.R.(2002).A seasonal variation in ArbuscularMycorrhizal (VAM) colonization in the roots of Dipcadisaxorum Blatt and clamydospores in the rhizosperic soil from *Mumbai*.***J.sol.Biol.& ECOL*.20(172):** 47-50.

[19] Parameswaran, P. and Augustine, B. (1988).Distribution and ecology of VAM in a scrab jungle. ***In-First Asian conference on Mycorrhizae,C.A.S.in Botany,Madras.*29(31):**91-9

[20] Phillips,J.M. and Hayman,D.S.(1970). Improved procedure for clearing roots and staining parasitic and vesicular arbuscularmycorrhizal fungi for rapid assessment of infection. ***Trans.Br. Mycol.* Soc. 55:** 152-160.

[21] Prabhu, R.R. (2002). Survey of soils of Mumbai and adjoining areas for native VAM, their multiplication and effect of their inoculation on local crops as

biofertilizers. A Ph.D. ***Thesis submitted to Mumbai University.***

[22] Rang., H. P. Dale., M. M. Ritter, J. M. (2007). Rang and Dale pharmacology.6thed Churchilllivingstone publication, London . 227-247.

[23] Rao., R. R. andSuseela, M. R. *Vetiveriazizanioides*(Linn.) Nash – A multipurpose ecofriendly.

[24] Singh, K. K. and Maheshwari, J.K. (1983).*Traditional Phytotherapy amongst the tribalsofVaranasi district U.P.* ***J. Econ.Tax. Bot. 4:****829-838.*

[25] Sreenath., H.L.Jagadishchandra, K. S.and Bajaj ,YP.S. (1994). XXVII *Vetiveriazizanioides (L.)* Nash (*Vetivera Grass*): In vitro culture, regeneration, and the production of essential oils. In: Bajaj YPS (ed) Biotechnology in Agriculture and Forestry. 403-421.

[26] Sathe,V.D.(2005).Assessment of ArbuscularMycorrhizal status in the soils on some forest plateaus of the WesternGhats of Maharashtra. A Ph.D.Thesissubmitted to Mumbai University.

[27] Schenck,N.C and Perez,Y.(1990).A Manual for identification of vesicular-arbuscularmycorrhizal fungi.***INAM University of Florida,Gainesville. FL***.286.

[28] Sadhana, B.(2014) ArbuscularMycorrhizal Fungi as a biofertilizers-a reviw.***Int.Curr.Microbiol.App.Sci.(4)*****:**384-400.

[29] Zaman., P. Roy.,A.K. Khanum.,N. S. Absar.N. andYeasmin,T.(2008). ArbuscularMycorrhizal status of medicinal plants in Rajashahi University campus. **http://journals.im.ac.cn/jwxtcn.27(4):** 543-553.

Authors Profile

Dr.R. M. Mulani received the M.Sc. in Botany from Shivaji University, Kolhapur in 1985 and received Dr. G.V. Joshi Gold Medal and Ph.D. degree from Mumbai University 1989. Presently working as Associate Professor in Botany at School of Life Sciences, Swami Ramanand Teerth Marathwada University, Nanded. He has 40 National and International Publication and he is a member of RRC for Botany to Mumbai University.

Miss. Wankhede S.B.received the M.sc. in Botany from Swami Ramanand Teerth Marathwada University, Nanded in 2012 and now she is working as Research Scholar pursuing M.phil.Botany inthe field of Mycology and Biofertilizers at School of Life Sciences, Swami Ramanand Teerth Marathwada University Nanded.