The Pharma Innovation Journal 2022; 11(11): 2465-2468

www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2022; 11(11): 2465-2468

www.thepharmajournal.com
Received: 03-08-2022
Accepted: 08-09-2022

Dipake Shital
M.Sc. Scholar, Plant Pathology Section, College of Agriculture, Nagpur Dr. PDKV, Akola, Maharashtra, India

Ekta D Bagde
Assistant Professor, Regional Fruit Research Station, Katol, Maharashtra, India

Tini Pillai
Assistant Professor, Plant Pathology Section, College of Agriculture, Nagpur, Dr. PDKV, Akola, Maharashtra, India

Corresponding Author:
Dipake Shital
M.Sc. Scholar, Plant Pathology Section, College of Agriculture, Nagpur Dr. PDKV, Akola, Maharashtra, India

Correlation analysis between physico-chemical properties of mycorrhizal soil from different forest Sp.

Dipake Shital, Ekta D Bagde and Tini Pillai

Abstract
Five forest species *viz.* Bamboo, Teak, Eucalyptus, Accacia and Neem were investigated for arbuscular mycorrhizal association from three different locations *viz.* Nagpur, Ramtek and Umred region to of Maharashtra. The results indicated that AM spore isolated by using wet-sieving and decanting method. All forest species were infected by arbuscular mycorrhiza as found by Trypan blue staining procedure. Based on correlation analysis, physico-chemical properties like Soil pH, EC, OM% and available nutrients play an important role in mycorrhizal population in forest species. One way ANOVA analysis was done to know the effects of physico-chemical properties on mycorrizal population and the conclusion was drawn that soil physico-chemical properties like Soil pH, EC, OM% and available nutrients showed significant difference in forest species like Bamboo, Teak, Eucalyptus, Accacia and Neem.

Keywords: Correlation, arbuscular mycorrhiza, rhizospheric soil, spore count, forest sp.

Introduction
Vesicular arbuscular mycorrhiza are ubiquitous plant root symbiont considered as "keystone mutualists" in terrestrial ecosystem forming a link between biotic and abiotic components via carbon and nutrient fluxes between plant and fungi in the soil (O'Neill *et al*., 1991) [8]. Mycorrhiza play crucial role in native ecosystems such as forest where fertigation of extensive land area with large quantities of phosphorous is not practical (Habte, 2000) [3]. Mycorrhiza have extensive host range benefited from symbiotic fungal association which enhanced plant growth by augmenting nutrient uptake especially phosphorous and provide better condition for the survival of plants under stress condition by uptake of nutrients such as P, Zn, Cu and water. Besides, they suppress the detrimental effect of root pathogen but several edaphic factors, soil and environmental conditions influence spore population as well as root colonization. Arbuscular mycorrhizal technology, the most advanced well balanced and eco-friendly biotechnology has been considered worldwide for better management, survival and sustainability of the forest tree seedlings in the nutrient deficient soils of the tropical and subtropical area. So, Forest trees requires mycorrhizae to survive and grow in natural forest environment. They also improve water relations under draught-stressed conditions. Thus, the present study aimed to know the association of such advantageous mycorrhiza with forest species and its correlation with soil pH, EC, soil type, percent organic matter, available nutrients etc.

Material and Methods
Collected roots were cleared for assessment of VAM infection following the method of Phillips and Hayman (1970) [9]. The VAM spores were separated out by Wet-sieving Decantimg Method (Gerdmann and Nicolson, 1963) [2].

Analysis of soil properties
Soil samples were analysed for pH and electrical conductivity by using electrode pH meter and conductivity meter respectively. Percent organic matter analysed by titration method. Available Nitrogen analysed by Kjeldal method, Available Phosphorus analysed by using spectrophotometer, Available potassium by neutral normal ammonium using flame photometer and available sulphur analysed by turbidimetric method. Available micronutrients such as Zn, Fe, Mn and Cu analysed by DTPA extractable using atomic absorption spectrophotometer.

Statistical Analysis

SPSS Statistical package (Window Version 17). The analysis of arbuscular mycorrhizal spore count and physico-chemical properties of rhizosphere soil of forest sp. was carried out by Pearson correlation matrix. One-way ANOVA method allows testing the significant difference of the mean. For this test each sampling sites was selected and its physico-chemical properties (soil pH, EC, OM% and available nutrients) as the correspondence variable.

Result and Discussion

The physico-chemical properties of rhizospheric soil of forest sp. are believed to influence by the arbuscular mycorrhizal spore. Soil pH sensitive to AM spore helps in the stabilization OM% in soil and AM helps in uptake of available nutrients in soils, supply to plants. Hence effects are made to study the correlation between physico-chemical properties with AM spore count of rhizosphere soil collected from forest species of Nagpur, Ramtek and Umred region. Correlation between AM spore count and physico-chemical properties was accomplished by SPSS stastistical package (Window version 17).

The correlation study of spore count with physico-chemical properties of Nagpur location predicted in Table 1. The soil physico-chemical properties like soil pH showed positive significant correlation i.e. 0.811 at P≤0.05 and P≤0.01 level with OM% whereas EC showed positive significant correlation with available S, Cu, Zn and Fe at both level whereas negatively significant correlation was observed with spore count at both level i.e. -0.674. However positively significant with available Mn i.e. 0.565 at P≤0.05 level. OM% was positively correlated with available N whereas Nitrogen, Phosphorus, Potash play an important role with spore population. All these micronutrients are positively correlated with spore count i.e. 0.868, 0.905 and 0.903 at both level. While available N was positively significant correlated with available P and K at P≤0.05 and P≤0.01 level whereas negatively significant with available S and Zn. Available P was positively significant with available K i.e. 0.871 at both level whereas negatively significant with available S, Cu and Mn. Available K was negatively significant with S, Zn and Mn. Available S was positively significant correlated with available Zn, Fe and Mn. Available S, Cu, Zn, Fe, Mn was negatively significant correlated with spore count i.e. -0.831, -0.559, -0.726, -0.603 and -0.649 respectively. Available Cu was positively significant correlated with available Zn, Fe whereas available Zn showed positively significant correlation with Fe and Mn while Fe was positively significant correlated with available Mn.

The correlation study of spore count with physico-chemical properties of Ramtek location predicted in Table 2. The soil physico-chemical properties like soil pH showed positive significant correlation i.e. 0.606 at P≤0.05 level with OM% whereas EC showed positive significant correlation with available P, K and Zn at both level whereas negatively significant correlation with available S, Cu, Fe and Mn at both level. OM% was positively correlated with available N. Only available Nitrogen showed positive significant correlation with spore count i.e. 0.667 at P≤0.05 and at P≤0.01 level. While available N was positively significant correlation with available Fe and Mn whereas negatively significant with available Zn i.e. -0.614 at P≤0.05. Available P was positively significant with available K and Zn at both level whereas negatively significant with available S, Cu, Fe and Mn. Available K was positive significant correlation with available Zn i.e. 0.704 at P≤0.05 and P≤0.01 level. However negatively significant with available S, Cu, Fe and Mn. Available S was positively significant correlated with available Cu, Fe and Mn whereas negatively significant with available Zn i.e. -0.842 at both level. Available Cu was positively significant correlated with available Fe and Mn whereas negatively significant with available Zn. While available Zn showed negatively significant correlation with available Fe and Mn. Available Fe was positively significant correlation with available Mn.

The correlation study of spore count with physico-chemical properties of Umred location predicted in Table 3. The soil physico-chemical properties like soil pH showed positive significant correlation i.e. 0.795 at P≤0.05 and at P≤0.01 level with OM% whereas EC showed positive significant correlation with available S, Cu, Fe and Mn whereas negatively significant correlation with OM%, available N, P, and K at both level. OM% was positively significant correlation with available N and P while negatively significant with available S and Cu. Available N was positive significant correlation with available P and K whereas negatively significant with available S, Cu, Zn, Fe and Mn. However available P showed positive significant correlation with available K i.e. 0.818 at both level whereas negatively significant with available S, Cu, Fe and Mn. Available K was negatively significant correlation with available S, Cu, Fe and Mn at both level. Available S was positively significantly correlated with available Cu, Fe and Mn whereas available Cu was positively significant correlated with available Fe and Mn at both level. While available Fe positively significant correlated with available Mn i.e. 0.619 at P≤0.05. Physico-chemical properties of soil showed Non-significant correlation with spore count.

The results are in confirmity with the findings of Sivakumar (2013) [13] reported Pearson correlation followed to edaphic factors such as soil pH on AM spore density revealed a positive correlation and negative corelation between EC, N and P. Positive and significant relationships with soil N, P, Cu, Zn, Mn and Fe and AM spore number in apple trees whereas negative and non-significant correlation were found with soil K reported by Kumar (2002) [5]. AM spore population was positively and significantly correlated with soil pH, organic carbon and available N but negatively and significantly correlated with available K, Cu and Zn in the soil. The correlation between AM spore population and available K, Fe and Mn was found to be negative and these correlation were non-significant reported by Sharma and Sharma (2006) [11]. Soil pH showed negatively significant correlation with Fe, Mn and Zn whereas negatively non-significant with Cu while EC showed positively significant with Fe and negatively significant with Zn, Mn and Cu by Reshma *et al.* (2016) [10]. Vijayakumar *et al.* (2011) [15] showed available Fe positively correlated with soil pH. EC and OM. Available Mn shows positively correlated with EC and OM whereas negatively with soil pH. Available Cu showed positively correlated with OM but negatively with pH, EC and Zn. Singh and Mishra (2012) [12] reported positively significant correlation were found between Organic carbon available N, P, K and S of soil.

Table 1: Correlation between physico-chemical properties and AM spore population of Nagpur

	Soil pH	EC	OM%	Available N	Available P	Available K	Available S	Available Cu	Available Zn	Available Fe	Available Mn	SPORE COUNT
Soil pH	1											
EC	-.238	1										
OM%	.811**	-.320	1									
Available N	.265	-.624*	.612*	1								
Available P	.246	-.546*	.471	.794**	1							
Available K	-.152	-.469	.104	.646**	.871**	1						
Available S	-.364	.862**	-.394	-.763**	-.819**	-.680**	1					
Available Cu	-.383	.815**	-.458	-.446	-.309	-.292	.584*	1				
Available Zn	-.028	.814**	-.318	-.638*	-.739**	-.662**	.741**	.552*	1			
Available Fe	-.400	.769**	-.264	-.314	-.588*	-.528*	.782**	.720**	.630*	1		
Available Mn	.094	.565*	-.019	-.365	-.777**	-.785**	.668**	.265	.823**	.709**	1	
Spore count	.151	-.674**	.430	.868**	.905**	.903**	-.831**	-.559*	-.726**	-.603*	-.649**	1

*Correlation is significant at 0.05 level (2- tailed)
**Correlation is significant at 0.01 level (2- tailed)

Table 2: Correlation between physico-chemical properties and AM spore population of Ramtek

	Soil pH	EC	OM%	Available N	Available P	Available K	Available S	Available Cu	Available Zn	Available Fe	Available Mn	SPORE COUNT
Soil pH	1											
EC	.035	1										
OM%	.606*	-.271	1									
Available N	.084	-.507	.712**	1								
Available P	.304	.944**	-.132	-.547*	1							
Available K	-.104	.971**	-.414	-.567*	.883**	1						
Available S	-.365	-.772**	.244	.571*	-.873**	-.738**	1					
Available Cu	-.317	-.939**	.069	.490	-.985**	-.892**	.860**	1				
Available Zn	.390	.658**	-.272	-.614*	.761**	.704**	-.842**	-.789**	1			
Available Fe	-.329	-.673**	.257	.627*	-.802**	-.643**	.971**	.784**	-.780**	1		
Available Mn	.020	-.809**	.434	.650**	-.835**	-.794**	.885**	.793**	-.627*	.900**	1	
Spore count	-.018	.075	.470	.667**	.015	.065	-.030	-.107	-.059	.034	.004	1

*Correlation is significant at 0.05 level (2- tailed)
**Correlation is significant at 0.01 level (2- tailed)

Table 3: Correlation between physico-chemical properties and AM spore population of Umred

	Soil pH	EC	OM%	Available N	Available P	Available K	Available S	Available Cu	Available Zn	Available Fe	Available Mn	Spore Count
Soil pH	1											
EC	-.400	1										
OM%	.795**	-.561*	1									
Available N	.455	-.776**	.815**	1								
Available P	.400	-.882**	.631*	.872**	1							
Available K	.022	-.879**	.307	.609*	.818**	1						
Available S	-.424	.910**	-.577*	-.743**	-.798**	-.759**	1					
Available Cu	-.502	.886**	-.681**	-.743**	-.912**	-.852**	.809**	1				
Available Zn	-.003	.337	-.353	-.687**	-.519*	-.261	.505	.238	1			
Available Fe	-.539*	.904**	-.490	-.610*	-.757**	-.691**	.939**	.783**	.299	1		
Available Mn	-.111	.796**	-.350	-.528*	-.795**	-.948**	.661**	.894**	.086	.619*	1	
Spore count	.043	-.254	-.072	.253	.255	.063	-.019	.036	-.187	-.172	.088	1

*Correlation is significant at 0.05 level (2- tailed)
**Correlation is significant at 0.01 level (2- tailed)

Acknowledgment
Authors are grateful to the Chairperson and Head, Plant Pathology Section, College of Agriculture, Nagpur for providing Lab. Facilities.

References

1. Chesnin L, Yein CH. Turbidimetric determination of available sulfates 1.Soil Sci. Soc. America J. 1951;15(C):149-151.
2. Gerdemann JW, Nicolson TH. Spores of mycorrhizal endogone species extracted from soil by wet sieving and decanting method. Trans. Br. Mycol. Soc. 1963;6(2):235-244.
3. Habte M. Mycorrhiza fungi and plant nutrition. Plant Soil. 2000;106:127-131.
4. Jackson ML. Soil chemical analysis. Prentice Hall India, New Delhi, India; c1973.
5. Kumar P. Studies on indigenous VAM fungi and *Azatobacter chrococcum* in apple orchards. M.Sc. Thesis, Dr. Y. S. Parmar Univ. Horti. and Forestry, Nauni, Solan (H. P.); c2002.
6. Lindsay WL, Norvell WA. Development of DTPA soil test for zinc, iron, manganese and copper. Soil Sci. Society of America J. 1978;42(3):421-428.
7. Olsen SR, Sommer LE. Phosphorus methods of soil analysis; chemical and microbiology properties. Part 2, 2nd ed., Agronomy. 1982;9(2):403-430.
8. O'Neill EG, O'Neill RV, Norby RJ. Hierachy theory as a guide to mycorrhizal research on large scale problem. Environ. Pollution. 1991;73(3-4):271-284.
9. Phillips JM, Hayman DS. Improved procedures for clearing roots and staining parasitic and VAM fungi assessment of infection. Trans. Br. Mycol. Soc. 1970;55:158-161.
10. Reshma MR, Duraisami VP, Muthumanickam D, Purma S, Jayasoorian N. Relation between soil properties and available micronutrients in soil. International J Agril. Sci. Res. 2016;6(1):247-252.
11. Sharma SD, Sharma NC. Studies on correlations between endomycorrhiza and azotobacter population with growth, yield and soil nutrient status of apple orchards in Himachal Pradesh. Indian J Horti. 2006;63(4):379-382.
12. Singh RP, Mishra SK. Available macronutrients (N, P, K and S) in the soils of chiraigaon block of District Varanasi (U. P.) in relation to soil characteristics. Indian J Sci. Res. 2012;3(1):97-100.
13. Sivakumar N. Effect of edaphic factors and seasonal variation on spore density and root colonization of arbuscular mycorrhizal fungi in sugarcane fields. Ann. Microbiol. 2013;63:151-160.
14. Subbiah BV, Asija GL. A rapid procedure for determination of available nitrogen in soil. Current Sci. 1956;25:259-260.
15. Vijayakumar RA, Arokiaraj, Prasath PMD. Micronutrient and micronutrients status in relation to soil characteristics in south-east coast plain-riverine soils of India. Oriental J Chem. 2011;27(2):567-571.
16. Walkley A, Black IA. An examination of the Degtijreff method for determining soil organic matter and a proposed modifications of the chromic acid titration method. Soil Sci. 1934;37(1):29-38.