ORIGINAL RESEARCH PAPER

Forestry Science

EFFECT OF NPK LEVEL ON DEVELOPMENT OF MYCORRHIZA IN *SHOREA ROBUSTA GAERTN.F* OF TROPICAL DRY DECIDUOUS FOREST OF CENTRAL INDIA

KEY WORDS:

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ABSTRACT

The present investigation deals with the effect of NPK level on development of mycorrhiza in *Shorea robusta gaertn. f* seedling of Tropical Dry Deciduous Forest of Central India. The study revealed high fertilizers application in *Shorea* results in better in plant growth but it retards the development of mycorrhiza. the higher dosages of fertilizers had a depressing effect on the production of short mycorrhizal roots.

Addition of fertilizer at dosages 1N and above increased shoot height though such increase was significant only at 1N (14.6cm) and 4N levels (14.5cm) in *Shorea robusta*. The result shows that mycorrhizal development and dry weight of seedling was best in 1/2 normal NPK (63.75%) and moderate (26.60%) in 1/4 normal NPK and in treatment without Phosphrus (22.5%).%). In 2N phosphorus (10.1%) and in treatment where N is absent (8.40%) infection was moderate. For other levels, infection was sporadic or absent. Infection was scare or mostly absent at higher dosages of NPK.

Introduction-

The low productivity of the soil is often related to chemical constraints including deficiency of phosphorus, nitrogen, potassium, calcium and other nutrients. There are a number of factors which affect the development of mycorrhizal roots. Short roots die depending upon age and soil properties (Thaper and Rehill, 1984). Vertical distribution of ectomycorrhiza in good and poor sites (Marks *et. al.,* 1984) and their destruction rate (Thaper and Rehill, 1984) have been studied. However, soil characteristics get changed along the soil depth and therefore, govern the mycorrhizal development and its survival. The extent of root colonization varies with several soil and climatic factors apart from the host involved.(Kavatagi and Lakhaman,2012). Root colonization with arbuscular micorrhizal fungi (AMF) have enhanced the uptake of nutrients, especially, P, N, and other nutrients and improve plant growth (Smith and Read, 1997; Gerdemann, 1975), reduced the amount of fertilizer required by plant (Miyasa *et al*., 2003; Robson *et al.,* 1981; Joubert and Archer, 2000) and reclaim degraded soil. The interactions of onion with AMF under field conditions were well documented (Hayman and Mosse, 1971; Mosse and Hayman, 1971; Mosse, 1973). The fungi form a symbiotic association with host plant thereby improving the plants growth through acquisition of soil nutrients via their extramatrical hyphae. Furthermore, complementary effect of AM fungi as an alternative for reducing fertilizer need of major crop species were reported (Mosse, 1981; Lindermann and Davies, 2004). The objectives of this work was to study the effect of mycorrhizal fungal species *seleroderma geaster. fries* in combination with varying application rate of N ,P and K fertilizer on No. of Short root, Dry weight of seedlings(g.) and Ecto-trophic growth of mycorrhiza in *Shorea robusta* at early growth period under field conditions.

Material and Methods-

The study area falls in Satpuda-Maichal range situated between $22^{0}24'$ - $22^{0}35'$ N latitude and $80^{0}34'$-$81^{0}55'$ E longitude and elevation 262-721m above mean sea level in Tropical Dry Deciduous Forest of Chhattisgarh, Central India .The area is characterized by large tract of *Shorea* forest .The climate is tropical monsoon type, the temperature ranges from 10.9^{0}C -39^{0}C and average rainfall is 1322mm. The soil is red lateritic to clay loam.

The experimental work were carried out in nursery of Department of Forestry ,Guru Ghasidas University, Bilaspur (C.G.).Fresh seeds of *Shorea* were immediately sterilized and sown in sterilized sand bed. Sand bed was fully covered with polythene sheet to prevents attack of air borne fungi and was regularly watered with distilled water until two leaved stage was attained.

Selection of suitable inoculam of ectomycorrhiza was made in pot experiments. The capacity of plastic pots, which were used for this experiment were of 5 liters and filled with mixture of sand + soil (1:1 v/v). The seedlings of *Shorea robusta* were carefully transferred to the plastic pots. The experiment was setup in randomized design. Each treatment was replicated thrice. The experiment was conducted for 120 days. In first treatment spore inculum was applied. Fresh sporocarps of *seleroderma geaster. fries* were collected. Each sporocarp was gently brushed to remove soil and organic matter, cut in to pieces (1-3cm) and blended at high speed for 1 minute in 200 ml of distilled water in a blender, dilutions were made in 100 ml distilled water to deliver the appropriate number of spores.. For inoculation 10 ml. of spore slurry was deposited at the top of the soil (Ingham & Massicottee, 1994).

An experiment was conducted in acid washed sand to ensure that no free nutrients was available at the outset. A nutrient solution containing NaH_2Po_4, 0-5g, Kcl-0.075g, $MgSo_4$.- 0.15g, and $Ca(NO_3)^2$ - 0.75g. in 1 liter distilled water was prepared and designated as 1 normal which contained 130 each of N and P and 39 of K parts per million. Different concentrations namely 1/4, 1/2 1, 2, 4 and 6 normal were prepared. In other lots one of each of the 3 elements, namely N or P or K was varied from nil to 6 N, keeping the other two elements at the normal level the concentration of which is indicated in the normal solution. Control experiment without nutrients was also maintained. The treatment of NPK level 1/4, 1/2, 1, 2, 4 and 6 Normal was given with 25 gm soil inoculums. After 5 month the dry weight of seedling, total number of short root, including uninfected and infected both and ectotrophic mycorrhizal growth was recorded .

Result and discussion

The result shows that mycorrhizal development and dry weight of seedling was best in 1/2 normal NPK (63.75%) and moderate (26.60%) in 1/4 normal NPK and in treatment without P (22.5%). In 2N phosphorus (10.1%) and in treatment where N is absent (8.40%) infection was moderate. For other levels, infection was sporadic or absent. Infection was scare or mostly absent at higher dosages of NPK. These results are similar to those found by Hatch, 1937; Mitechel *et. al.,* 1937; Bjorkman, 1942, 1949; Doak, 1953; Fowells and Karuss, 1959; Hacskaylo and Snow, 1959). The lower levels of NPK supported better development of mycorrhizal infections.

The dry weight of seedling in different treatments with fertilizers did not show any significant differences. This is possibly due to the fact that nutrients are readily available to seedlings. In control series with fertilizer (-NPK) with inoculums (0.39%) was higher in comparison to (-NPK) without inoculums. Fertilizer and compost practices can be expectant to have large effects on tree fungus association and to affect tree growth responses to inoculation. Although effects of soil P and N supply on root colonization and host growth have been quantified for seedlings growing under glass house and nursery conditions, there have been few comparable studies on field sites. An experiment was conducted to study the growth parameters and mycorrhizal development through fertilizer compost interaction on the *Shorea robusta* as a test plant.

Mycorrhizae improves crop yield and increases the use of inorganic

fertilizer by forming a bridge between the roots and the soil (University of Washington, 2006).

Table:-Effect of N,P and K level on growth of *Shorea robusta*

Group	Treatments	No. of Short root		Dry weight of seedlings (g.)	Ecto-trophic growth of mycorrhiza
		Total	Infected (%)		
A	1/4NPK	210	26.60	0.55	P
	1/2NPK	309	63.75	0.75	P
	1NPK	331	-	0.68	P
	2NPK	205	3.90	0.56	P
	4NPK	156	-	0.41	P
	6NPK	160	3.75	0.53	P
B	-N	119	8.40	0.50	P
	1/4N	142	-	0.60	Ab
	1/2N	142	-	0.64	P
	1N	142	-	0.59	P
	2N	201	-	0.49	P
	4N	155	-	0.31	P
	6N	168	-	0.27	Ab
C	-K	165	-	0.57	P
	1/4K	168	1.19	0.48	P
	1/2K	200	-	0.49	P
	2K	143	-	0.68	Ab
	4K	140	-	0.48	Ab
	6K	162	-	0.57	P
D	-P	213	22.5	0.71	P
	1/4P	216	1.38	0.54	P
	1/2P	124	-	0.46	P
	2P	119	10.1	0.48	P
	4P	133	-	0.51	Ab
	6P	262	1.14	0.76	P
Control (-NPK) with inoculums	214		3.73	0.39	P
Control (-NPK) without inoculums	135		-	0.29	Ab1
SE	-			0.24	
CD at 5% level	-			0.12	

P-Present, Ab- Absent

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