International Research Journal of Emerging Trends in Multidisciplinary
ISSN 2395 - 4434
Volume 1, Issue 10 December 2015

Responses of mycorrhizal Inoculation on growth of *Shorea robusta* (Gaertn.) in Northern Tropical Moist Deciduous Forest of Chhattisgarh

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Abstract:

The present investigation deals with the suitability of different inocula on mycorrhiza formation and initial growth of *Sal* seedling. The study revealed soil inoculum are more effective than the other inoculum which gave higher shoot length value (41.34 cm),f ollowed by root based inoculum and spore based inoculum (32.70cm and 27.11 cm) respectively over control. Root length value was also higher in soil based inoculum over control (19.21 cm) , followed by root based inoculum (14.45 cm)and spore inoculum (12.09cm). The effect of soil inoculation on different growth parameters shoot length, root length , shoot fresh and dry weight , root fresh and dry weight ,germination percent was higher in inoculated plants as compared to control.

Key words: Inoculation , destruction rate and productivity

Introduction:

Among all dipterocarp growing in tropical region, *Shorea* is of great economic importance because of its valuable timber, firewood ,resin ,oil seeds and other economic product. Sal is one of the most important timber yielding plants and are also a good source of 'aromatic gum' which is also known to have medicinal properties. The leaves of Sal tree also acts as an important source of non-timber forest product. But due to over-exploitation, deforestation, encroach-ment and alteration in land use and land cover, basically in the low-lying areas of the Assam valley, the mother Sal forest was slowly replaced by secondary regenerated Sal forest .(Jyotishman Deka,2012) .The Food and Agricultural Organization (FAO) estimated that about 36% of the Sal forest cover existed in 1985;

while in 1990 only about 10% of the forest cover remained (Haque, N. 2007) . Currently these important ecosystems are deteriorating due to several anthropological and natural threats.(Rahman,2010) So , *Sal* plantation is needed to conserve and increase the cover with introduction of mycorrhizal technology. Inoculation will be necessary if the presence of infection and effective mycorrhizal fungi are not adequate to ensure the proper growth of seedling. Several inoculation techniques have been developed for VA- mycorrhizal fungi (Hayman, 1987) and ectomycorrhizal fungi (Sylvia *et.al.*,1987). Despite the fact that under many conditions, the benefits of inoculation are clear and the option technically exercisable, use of ectomycorrhiza fungi in plantations is not as widespread as the citation might suggest. The inoculation technology is yet to be routinely applied in wood production shows that the evidence which is currently available is viewed conservatively. There are few technical barriers to the large-scale production and use of inocula of specific ectomycorrhizal fungi. Forms of inoculum and development of inoculation techniques have been applied to be economically efficacious, it must produce improvement in growth rates. Apart from natural soil and litter a wide range of inoculum forms have been used which include spores, crushed sporophores and mycelium. Inoculation with spores has been widely practiced, as spores are relatively easily applied by mixing in to nursery soils prior to planting in to nursery bed and seedling containers. Spore coating of seeds has been used in order to increase ecto-mycorrhiza formation (Theodorou and Bowen, 1973; Lamb and Richards, 1974; Marx *et.al.*, 1989a ; De La Cruz *et. al.*, 1998). Soil inoculum are more effective than spores in colonizing roots and they allow large scale production of single strains of fungi (Cordell *et. al.*, 1987, Marx *et. al.*, 1989b) are reported.

Present study aims to provide quantitative information on the suitable inoculums for growth of *Shorea robusta* .

Study site :

The study conducted in Achanakmar-Amarkantak Biosphere Reserve falls under Northern Tropical Moist Deciduous Forest of Chhattisgarh. AABR is one of the premium biosphere reserve in India. The reserve Covers a huge area of 3835.5189sq. km. and it falls in almost northern part of bio-geographic zone of 6 and Bio-geographic province 6a (Deccan peninsula, Central highlands). About 68.10% out of the total area of this reserves lies in the Bilaspur district in Chhattisgarh. The

Achanakmar - Amarkantak Biosphere Reserve are located between 22'15' to 22'85' N latitude and 81`25'to 82'5' E longitude. . It can be classified in to Northern tropical moist deciduous and southern dry mixed deciduous forest. The Reserve is highly rich in biodiversity, both flora and fauna and is also endowed with several rare and endangered species. The climate of the reserve is tropical and the year is distinctly divisible in to winter (November- February) , summer (April-June) and a warm rainy season (July-September) , Mean monthly minimum temperature within the annual cycle ranges from 10.9° to 25.6 ° C and mean monthly maximum temperature from 24.1to 42.° C. The annual rainfall average 1322mm. (mean monthly range is 6.63 mm to 359. 88 mm) of which about 85% occurs during the period mid June to September.

Material and Method -

The experimental work were carried out in nursery of Deptt. 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 etc. and was regularly watered with distilled water until two leaved stage was attained.

Selection of suitable inocula of ectomycorrhiza was made in pot experiments. The capacity of plastic pots, which were used for this experiment were of 5 litres 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 one 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 min in 200 ml of distilled water in a blender, Dilutions were made in 100ml distilled water to deliver the appropriate number of spores. No attempt was made to standardize the inoculum concentrations (no of spore/ml). For inoculation 10 ml. of spore slurry was deposited at the top of the soil (Ingham & Massicottee, 1994).

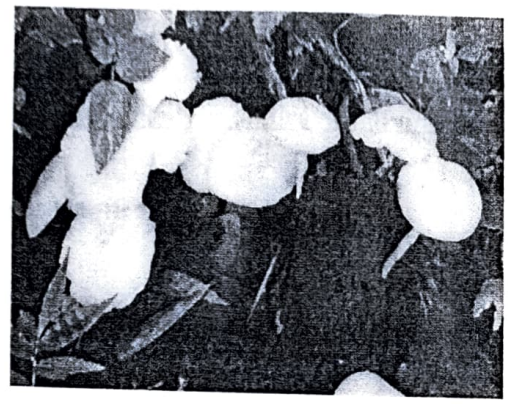

Plate1: Fruiting bodies of *seleroderma geaster*

Second treatment was made with 100 mycorrhizal root bits of 1/2 cm in each pot while third treatment was given by taking 25 gm of soil inocula having spores and root bits etc. which was collected from *Sal* trees growing in natural forest. Control was also setup simultaneously. After 120 days the shoot length, root length, mycorrhizal roots and numbr of spores were observed.

The effect of soil inoculation on different growth parameters shoot length, root length , shoot fresh and dry weight , root fresh and dry weight ,germination percent was compared to control.

Result and discussion :

Forms of inoculums and development of inoculation technique have been applied to be economically efficacious it must produce improvement in growth rates. The promlems is in ectomycorrhizal technology is weather the growth improvements readily demonstrated under controlled condition are reproducible in the field. So, overcome with this problem require broad scale productivity trials with suitable inoculums needed under various field condition.

Table:1-Responces of different inoculum on growth of *Shorea robusta*

Treatment	Shoot length	Root length	Live mycorrhiza
Spore inoculum	27.11	12.09	145
Root inoculum	32.70	14.45	171
Soil inoculum	41.34	19.21	205
Control	13.75	9.55	30
SEM+	5.79	2.05	37.96
CD at 5%	26.03	9.24	170.79

Table:2-Effect of soil inoculation on growth parameters of *Shorea robusta*

Parameters	Inoculated	Control	% gain in ison of control
Germination %	46.00	32.00	18.00
Shoot length(cm)	42.80	21.21	50.46
Root length(cm)	33.00	28.60	13.13

Shoot fresh wt(g)	06.64	2.59	60.99
Root fresh wt(g)	2.60	1.78	31.53
Shoot dry wt(g)	2.41	1.02	57.67
Root dry wt(g)	0.99	0.51	48.40
Survival%	94.40	73.53	26.47

It is clear from Table -1 soil based inoculum was highly infective and its viability and suitability are more which gave higher shoot length value(41.34 cm),followed by root based inoculum and spore based inoculums (32.70cm and 27.11 cm)respectively over control. Root length value was also higher in soil based inoculum over control(19.21 cm),followed by root based inoculums (14.45 cm)and spore inoculums (12.09 cm). The same trends were found in case of live and total mycorrhizal count .Jammaluddin and Chandra (1999) reported that the inoculum with soil, spore and roots were found effective for growth and biomass of *Bambusa nutens* . The effect of soil inoculation on different growth parameters of growth in Shorea robusta has been tabulated in Table-2 which shows that the germination percent was higher in inoculated plants as compared to control. Soil Inoculation gives 18% gain in germination percentage. Shoot length and root length have been improved by 50.46% and 13.13%, respectively as compared to control (un inoculated). Due to the soil inoculation, shoot and root weight (fresh) also increases by 60.99% and 31.53%, respectively as compared to control. The same trend was also recorded in improvement of dry weight of shoot (57.67%) and dry weight of root (48.48%) as compared to the control. Survival percentage also increased by 26.47% as compared to control.

The study will provide an insight to possibilities of using a effective and ecofriendly technique in forestry to generate not only the quality plant material for

revegetation but will also provide some possibilities in regeneration , preservation and stabilization of Sal forest.

References:

Cordell, C.E.; Marx, D.H.; Maul, S.B.; and Owen. J.H. (1987). Production and utilization of ectomycorrhizal fungal inoculum in the eastern United States,. In Mycorrhizal in the Next Decade : Practical Applications and Research Priorities, Proc. 7th NACOM. Eds.

De La Cruz, R.E., Bartolome H.T. ,Aggangan N.S. (1988). Pilot testing of mycorrhizal tablests for *pine* and *eucalyptus* in the Philippines. In press. *UNESCO Regional workshop of Development and production of Mycorrhizal inoculants Biotech,* UPLB college Lagunn, Philippines.

Hayman, D.S. (1987). *V A Mycorrrhizas in field crop systems. In : ecophysiology of V A mycorrhizal plants.* Ed. G.R. safir, pp-171-192. CRS press, Boca Rater, Florida.

Haque, N. 2007. Depletion of Tropical Forests with Particular Reference to Bangladesh. Retrieved February 10, 2009, from http://www.eb2000.org/short_note_10.htm

Ingham, E.R. and Massicottee, H.B. (1994). Protozoan communities around conifer roots colonized by ectomycorrhizal fungi. *Mycorrhiza.* **5**:53-61.

Jamaluddin and Chandra, K.K. (1999). Application of VAM technology in *bamboo* cultivation in mine spoils. In. *Modern Approaches and Innovations in soil Management.* (Eds. D.J. Bagyaraj, Ajit Varma, K.K. Khanna and H.K. Kehari), pp. 323-332.

Jyotishman Deka , Om Prakash Tripathi, Mohamed Latif Khan(2012) High Dominance of Shorea robusta Gaertn. in Alluvial Plain Kamrup Sal Forest of Assam, N. E. India International Journal of Ecosystem 2012, 2(4): 67-73

Marx, D.H., cordell, C.E; Maul, S.B. and Ruehle, J.C. (1989a). Ectomycorrhizae development on *Pine* by *Pisolothus tinctorius* in bare-root and cantainer seedling narseries II. Efficacy of various vegetative and spore inocula. *New For.***3:** 57-66.

Marx, D.H., Cordell, C.E., Maul, S.B. and Ruehle, J.L. (1989b). Ectomycorrhizal development on *Pine* by *Pisolithus tinctorius* in bare-root and cantainer seedling nurseries I. Efficacy of various vegetative and spore inocula. *New For* **3:** 45-46.

Mohammed Mahabubur Rahman , Md. Motiur Rahman, Zhang Guogang , Kazi Shakila Islam (2010) A review of the present threats to tropical moist deciduous Sal (Shorea robusta) forest ecosystem of central Bangladesh Tropical Conservation Science Vol. 3(1):90-102.

Sylvia,D.M., Hung, L.L.and Graham, J.H.(1987). Mycorrhizae in the next decade: practical applications and research priorities. *Proceedings of the 7th North Am. conf on mycorrhizae university of Florida,Gainesville.*

Theodorous, C. and Bowen, G.D. (1973). Inouculation of seeds and soil with basidiospore of mycorrhizal fungi. *Soil Biol. Biochem.* **5:**765-771.