ECO-FRIENDLY AM FUNGI IN FORESTRY TO GET GOOD PLANTING STOCK AND SURVIVAL PERCENTAGE WITH INCREASED PRODUCTIVITY

Eco-friendly AM fungi in forestry

By

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A. Nature of Technology

Application of 'Eco- friendly AM fungi' to forestry seedlings for getting good planting stock and survival percentage with increased productivity. The technology is very useful in re-vegetation especially in degraded soil and even in mine dump soil. In degraded or stress areas or land with the problem of nutrient deficiency, it is necessary to make use of Arbuscular Mycorrhizal (AM) fungi as biofertilizers to substitute for inorganic fertilizer, especially in forestry practices, where application of fertiliser is not possible because of economic consideration. One of the most widely distributed, ecologically and economically important fungal groups are the arbuscular mycorrhizal (AM) fungi. They have been shown to increase crop yield and nutrient uptake, enhance resistance to plant pathogens, drought tolerance, and to stabilize soil structure.

B. Process in brief

Mycorrhizal technology has greater relevance in establishing nursery of forestry species and afforestation programme. AM fungi may by multiplied and applied at seedling stage to discernibly good growth, survival percent both in nursery and out-planting in field

Mass production of AM fungi:

The AM fungi have so far not been cultured on artificial or synthetic media. AM fungi being highly specific in their nutritional requirement can be only cultured on living host. They produce large number of spores in the soil on the extrametrical mycelium, which is developed profusely once the fungus enters into symbiotic association with the host plant. Large-scale production of AM inoculum is technically feasible by employing traditional pot culture technique by using Maize or Ragi as nurse seedlings.

AM inoculum may be obtained from known source or soil can be collected from root zone of same tree species and AM spores are separated by using 'Wet sieving and decanting technique' **(**Gerdmann and Nicolson, 1963).

Wet sieving and decanting technique:

About 500 gm soil from root zone of respective species was mixed with about 200 ml of water in a flask with constant stirring for one hour and allowed to settle down by adding more water. Pass this suspension through a fine sieve (38-250 mesh) and further filter this suspension on filter paper and take on Petri-dish to observe the spores under the microscope. Use this spores directly for multiplying by pot culture method.

Pot culture method for multiplication:

Fill the pot to ¾ portions with sand:soil mixture (1: 1) and spread the AM inoculum (50-100 gm) and fill the remaining portion of the pot with sand mixture and sow the Maize or Ragi seeds (6-8 seedlings/pot). When seeds are germinated the roots will get associated with AM inoculum and multiply. Maintain these plants for 3-4 months with minimum water supply. Restricted water helps in more multiplication of inoculum. Applying 'Hoagland' or commercially available 'Multiplex' (without-phosphorous) solution will help in getting good growth of maize plants. When the ear heads are formed, reduce the watering frequency gradually and then allow the plants to dry for 6-7 days. Cut off the shoots, dry the soil with well chopped roots under shade. These root bits along with soil serve as AM inoculum and now ready for storing. It can be stored for two years, when you store in dry condition. Large scale multiplication may be done by trench method using a polythene sheets in the trench and filling the soil mixture followed by broad casting the AM inoculum and then sowing the Ragi/maize seeds and covering them again from soil mixture and maintaining the plants following the same method.

How to use?

Fill the poly-bag ¾ portions by soil mixture and add AM inoculum followed by soil mixture and transfer the seedlings from seed bed. The root zone should touch the AM inoculum to get better result as shown in figure-4. Colonization of AM infection is very important for getting good results (Figure-5).

C. Beneficiaries of the technology

1. Prominent beneficiaries: Establishing good planting stock in forest nurseries by forest department officials.
2. No. of clients to whom technology has been transferred: Developed and demonstrated in mine dump soil in 3 places of Goa. (Gotemode nursery, Tatodi and Shivade mine-dump area), Training has given to Karnataka forest department officials and many farmers who are interested in growing Sandal- wood plants.
3. Potential for further dissemination: Forest officals, NGO's, nursery and plantation managers.

D. Economic significance: The technology in highly economic, eco friendly and user friendly. Using this technology has long-lasting benefit.

Economic at a Glance

Expenditure incurred towards the raising of 10,000 seedlings using AM soil (inoculum) and Inorganic fertilizer @ the rate of 10 Rs/Poly bag for six months

Particulars	AM soil	Inorganic fertiliser
Cost for 100 Kg	Rs. 1250/- (multiplication of inoculum)	Rs 2000/-
Maintenance charges	Rs. 1,00,000	1,30,000 (includes spraying of Pesticides& insecticides)
Survival Percentage	90-95%	60-65%
Available stock	9000	6000
Growth increment	3-4 Folds (depends on species)	1-2 fold (depends on species)
Field Trial (Out planting)	0% Mortality	30-40% Mortality
Gain	100%	60-70%
Environmental impact	Eco-friendly	Hazardous

Transfer of Technology: The technology can be transferred to any industry or individual. The institute is having a policy to transfer the technology to different stakeholders.
For detailed terms and conditions and negotiation of cost of technology, interested parties may contact Marketing Cell of IWST. Email Id: groupco_iwst@icfre.org phone No. 080-23340115. Office Hours- 9.00 A.M. – 5.30 P.M.

Developed by: H.C. Nagaveni, Scientist, IWST, Bangalore

Tectona grandis

Santalum album

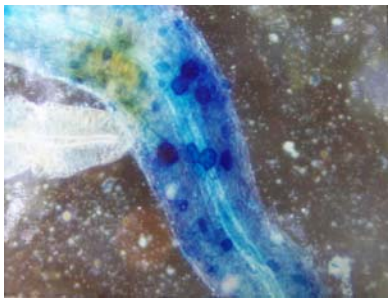
Grevelliea robusta

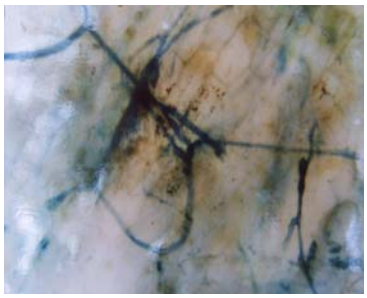
Eucalyptus camaldulensis.

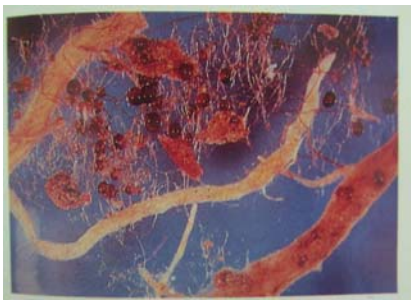
Acacia auriculiformis

Casuarina euisetifolia

Comparative growth in different plant species with AM treatment

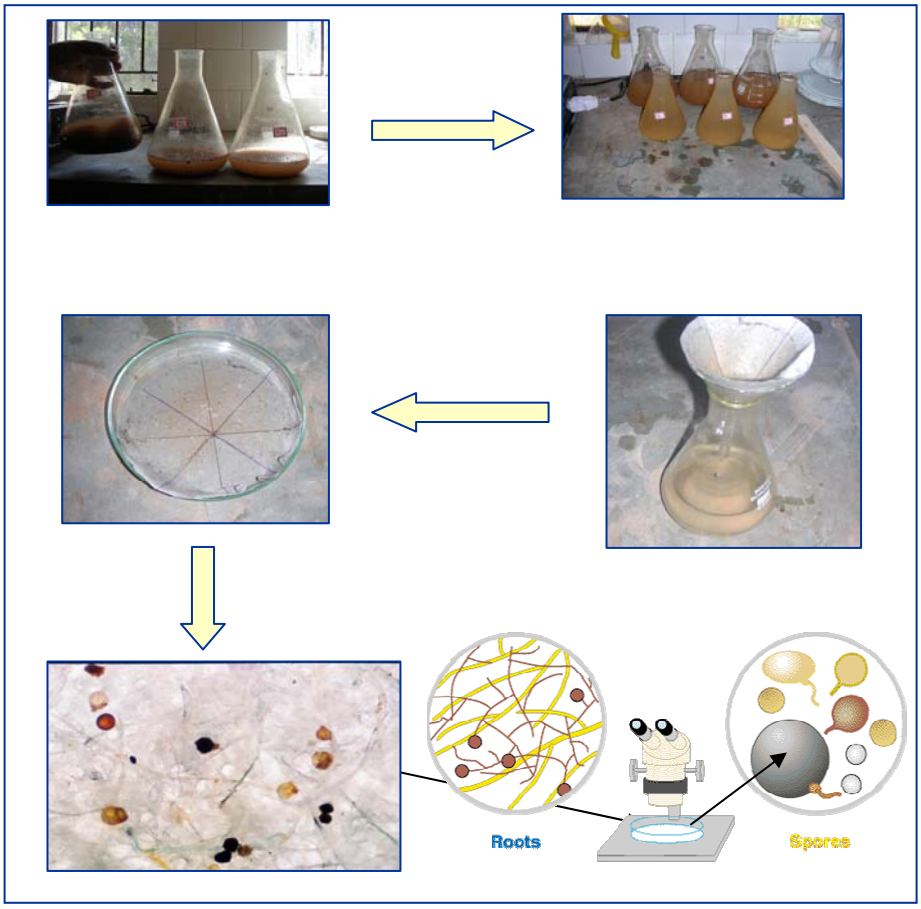




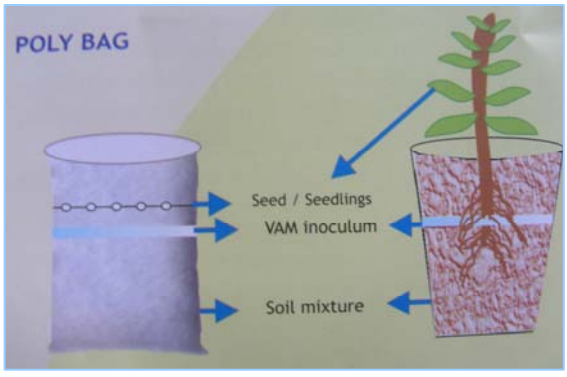


AM fungal spores, intracellular hyphae and their association in the root system of treated plants

Performance of AM treated seedlings in Mine dump area



Isolation of spores from 'Wet sieving and decanting' method



Mass multiplication & application of Am inoculum