CULTURING AND STORAGE OF NATIVE MICROORGANISMS LIVING IN FOREST SOIL FOR SOIL AUGMENTATION IN AGRICULTURAL LANDS

R.P. Somarathne and P. N.Yapa
Department of Biological Sciences, Faculty of Applied Sciences, Rajarata University of Sri Lanka, Mihintale, Sri Lanka.

The continued use of chemical fertilizers for enhanced crop productivity often results in unexpected harmful environmental effects. Subsequent to the Green Revolution, there was a wrong notion instilled in the farmers in the developing countries like Sri Lanka that on extensive use of chemical fertilizer they could bring in high yields which are rich in quality. But they do not realize the immense impact the use of chemicals would bring into the nature and the lives of the people. Soil micro-organisms play a significant role in regulating the dynamics of organic matter decomposition and the availability of plant nutrients. Therefore, alternatively bio-fertilizers are used as ready to use live microbial formulates, which on application to seed, root or soil, are able to enhance the availability of nutrients by their biological activity. They can also help in building up the micro-flora and in turn improve the general soil health. Therefore, utilization of native forest soil micro-organisms for direct application in agriculture might foster sustainable agricultural production in developing countries of the tropics. The choice of the technology for inocula production and of the carrier for formulation is the key to their successful application. A good carrier should have essential characteristics, as the capacity to deliver the right number of *viable* cells in good physiological condition at the required time[1]. This study was focused on finding most suitable carrier material for successful inoculation of forest soil micro-organisms to be used as a tool for enhancing plant growth and yield. Four naturally occurring substances were tested for their performance as carrier materials for microbial inocula. This study is therefore, important as it contributes the dual benefit of effective utilization of bio-organic waste materials from the environment and for the production of microbial inocula carrier materials as well.

Soils of undisturbed forest area of Mihintale Sanctuary, Anuradhapura District were used as indigenous microbial inocula. The viable cell counts in the forest soil were enumerated by serial dilution plate count technique by using Nutrient Agar and Rose Bengal for culture of bacteria and fungi respectively. These plates in duplicate were incubated at 28±2°C for 24 -48 h for bacteria and 72 h for fungi. The population of bacteria and fungi were counted and computed for number of CFU/g of native forest soil inocula. For using with native forest soil live microbial inocula "Jeeva amurthum" was prepared. A total of 10^2 to 10^7 bacteria were added to the "Jeeva amurthum" inocula with 1 g of native forest soil. The inocula was stored at room temperature (28±2°C) and periodically sampled for bacterial and fungal population determinations. Aquatic weed *Eichhornia crassipes*, coir dust, bio-char and compost, which was used as carrier materials were collected, air dried and autoclaved. The carrier material were inoculated with prepared microbial inocula "Jeewa amurthum" (10^7-10^{13} CFU/g bacteria). Inoculated carrier material were kept for 15 days with continuous aeration. Determinations of CFU/g counts were made in each carrier-based inocula separately, while in storage, at three day time intervals. From that CFU/g counts most stable carrier materials on the basis of highest microbial survival with time was selected after statistical analysis, using SAS software package. Biochemical tests were used to identify some bacteria and fungi into generic level in the inocula.

Native forest soil consisted of higher CFU/g counts of bacteria as 10^7 CFU/g. However, it showed that after preparation of "Jeewa amurthum", bacterial population was further increased up to 10^{13} CFU/g. There was a significant difference ($p<0.05$) of CFU/g counts between the native forest soil and the "Jeewa amurthum" inocula.

It was noted that microbial diversity was high in the native forest soil. Among the carrier materials, aquatic weed (*Eichhornia crassipes*), bio-char and compost showed significantly higher microbial survival of the inocula through 15 days (Table 1). *Eichhornia crassipes* had the highest CFU/g counts of bacteria ($29.6x10^{13}$) even after 15 days of storage in **28±2°C.** However, coir dust showed a significantly lower CFU/g counts of bacteria while in storage (Table 1).

Table 1: Mean CFU/g counts of survived bacteria in each carrier material

Carrier material	Mean CFU/g bacteria survived within 15 days $x10^{13}$
Aquatic weeds	29.6^{a}
Coir dust	2.50^{b}
Bio char	7.0^{a}
Compost	15.3^{a}

(Mean CFU/g counts of bacteria in "Jeewa amurthum" inocula was $20.7^{a}x10^{13}$. Means denoted by same letters are not significantly different at $p<0.05$)

The high percentage total organic matter, crude protein and amino acids composition of *Eichhornia crassipes may have helped survival of the highest bacterial population in storage*[2]. *Among the identified bacteria, Bacillus spp. was dominant. Aspergillus sp. Penicillium sp. were identified as dominant fungi. This finding may help in the* formulation of indigenous soil microbial inocula, with a reliable and consistent effect for their wider use under field conditions for sustainable agricultural practices.

REFERENCES

1.Smith, R.S. (1987). Production and quality of inoculants. In: Symbiotic nitrogen fixation technology, G. H. Elkan (ed.), pp. 391-411, Marcel Dekker, New York.

2.Bazilah, A.B, Sariah, M., Abidin, M.A. and Yasmeen, S. (2011). Effect of carrier and temperature on the viability of *Burkholderia* sp. (UPMB3) and *Pseudomonas* sp. (UPMP3) during storage. International Journal of Agricultural Biology 13, 198202.