Effect of Biofilm Biofertilizer and Chemical Fertilizer Application Practices on Growth and Endophytic Bacterial Count of Rice (*Oryza sativa* L.)

A.L.A. Lakmini[1], G. Seneviratne[2], K.P.K.Madushani[3]

Utilization of beneficial microbes as a biofertilizer has become paramount importance in the agriculture sector for their potential role in sustainable crop production. Nitrogen-fixing bacteria with rhizosphere fungi form fungal-bacterial biofilms which can be developed as biofilm biofertilizers (BFBFs) as an extension of biofertilizer research application which could save chemical fertilizer use (CF) for many crops with a wide range of beneficial biological functions. BFBF application has been reported by many authors to significantly increased rice yield with lower CF inputs, as it facilitates biological nitrogen fixation with non-legumes (rice, tea, wheat, and vegetables), while increasing solubility and availability of phosphorous and other macro, micro nutrients as a result of its beneficial interactions between bacteria and fungi as well as interaction between soil and microorganisms. This study investigates the effect of commercially available biofilm biofertilizer and chemical fertilizer application practices on growth and endophytic bacterial count of rice after the 2013 new chemical fertilizer recommendation by the Department of Agriculture Sri Lanka. This experiment was conducted in two selected fields at Dehiaththakandiya in Mahaweli system C and Rice Research and Development Institute, Bathalegoda. Six different treatments were applied (100% CF, 80% CF, 80% CF + BF, 65% CF, 65% CF + BF and no fertilizer as the control). The experiment was arranged in Randomized Complete Block Design with four replicates to each treatment. Plant growth (root and shoot length, tiller and panicle count, total dry mass) and soil parameters (soil pH, available ammonium, nitrate and phosphate levels) were recorded at both tillering and flowering stages. Endophytic bacteria were isolated from rice leaves and root samples to obtain a colony count. Data were subjected to statistical analysis. Results indicate that BFBFs influenced positively on plant-microbe interactions. BFBF significantly increased both vegetative and reproductive parameters of rice plants with increasing trend of total and diastrophic endophytic bacterial count compared to CF. Therefore, the application of BFBFs to the soil could induce endophytic diversity and their functionality. This indicates that the effects of community based approach of microbial biofilms increases soil and plant well-being for ensuring higher yield with the sustainability of the rice agro-ecosystems to restore their depletion due to chemical agriculture.

Keywords: “Biofilm biofertilizer; chemichal fertilizer; rice; endophytic bacteria; rhizosphere”

[1] Postgraduate Institute of Science, University of Peradeniya, Peradeniya, Sri Lanka
[2] National Institute of Fundamental Studies, Kandy , Sri Lanka , [c*]Department of Botany, University of Ruhuna, Matara, Sri Lanka
[3] Department of Botany, University of Ruhuna, Matara, Sri Lanka, *kpkmadushani@gmail.com*