



IRCUWU 2023

7th International Research Conference

17th & 18th August 2023

“Digitalization for transition to circular economy ecosystems”

Paper ID: IRCUWU2023-457

Potential use of biofilm biofertilizers in fully organic rice cultivation of Sri Lanka

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Conventional agricultural practices that rely solely on chemical inputs [synthetic chemical fertilizers (CF) and agrochemicals] lead to degrade agroecosystems with retarded crop quality and yield. Organic agriculture (OA) is becoming popular as it reduces the usage of chemical inputs and also helps mitigate global warming through soil carbon (C) sequestration. However, the global OA share is only about 1.6%. The main reason behind this value is the impracticability of the application of organic matter (OM) in bulky quantities, E.g., 10 t/ha, as recommended in the OA practices. In this context, a biofilm biofertilizer (BFBF)-based OA practice may be a solution given its ability to cut down OM application. The present study was designed to evaluate the potential use of BFBF in OA of Sri Lanka by using rice (*Oryza sativa* L.) as the test crop. A field experiment was carried out in three schools of agriculture: Angunakolapalessa, Pelwehera, and Vavuniya. Three farming practices i.e. farmers' CF practice (100% CF, 340 kg NPK/ha); BFBF practice (66% CF + BFBF, 2.5 L/ha); and BFBF-based OA practice (nutrient-rich compost, 0.5 t/ha with NPK > 1% + BFBF, 2.5 L/ha) were compared with a reference treatment (66% CF) and under no amendments (control) for changes in soil C and nutrients, soil and plant microbes, plant growth, and yield. Results showed that the soil C, potassium, diazotrophs, and plant root dry weight were not significantly differed between the three farming practices in all three locations. The BFBF practice produced a significantly high ($P = 0.000$) grain yield in Vavuniya (6,131 kg/ha) and Angunakolapalessa (5,948 kg/ha). The yields produced by the OA practice (3,724 kg/ha) and farmers' CF practice (4,176 kg/ha) were not significantly different at Angunakolapalessa. It is concluded that the BFBF-based OA practice has the potential to be adapted in OA of Sri Lanka, because of the less bulky OM use (10 t/ha versus 0.5 t/ha). The OA practice can be recommended as an eco-friendly, economically viable, and farmer-friendly farming practice for sustainable agriculture. However, further research is needed to popularize and establish this OA practice with the use of nutrient-rich compost materials.

Keywords: Agroecosystems; Biofilm biofertilizers; Organic agriculture; Rice cultivation