Biofilm Biofertilizer Can Produce Higher-Quality Rice Than That of Chemical or Organic Fertilizer Alone Application

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Biofilm biofertilizer (BFBF) is now being popularized for paddy (*Oryza sativa* L.) cultivation due to its ability to cut-down chemical fertilizers (CF), increase crop yield and soil carbon sequestration by ca. 50%, 20-30%, and 30%, respectively. About 16% of the total rice cultivation (0.7 Mha) in Sri Lanka has been applied with the BFBF practice and it is expanding gradually. Moreover, the BFBF practice has been reported to increase antioxidant content in rice grains while decreasing heavy metals compared to the CF alone practice, showing potential to produce higher-quality rice. The present study compared the primary metabolites i.e. carbohydrate, protein, and lipid contents in rice grains of three different fertilizer practices viz. (a) 100% CF (340 kg NPK/ha), (b) BFBF (66% CF + BFBF, 2.5 L/ha), (c) BFBF-based organic (Compost with N >1%, 500 kg/ha + BFBF, 2.5L/ha), (d) a reference treatment (66% CF alone), and (e) the control (no amendments). A field experiment was conducted in Agriculture schools at Vauniya, Pelwehera, and Agunakolapalassa. The five treatment plots were randomized and taken as a block design in each location, and the locations acted as replicates. Rice grain samples were collected at harvest and analyzed using Fourier-transform infrared (FT-IR) spectroscopy. The primary metabolites were quantified based on the characteristic diagnostic bands. Results showed that the BFBF practice (b) produced significantly ($P<0.000$) the highest amount of proteins and lipids in rice grains. The protein and lipid contents in the BFBF-based organic practice (c) were significantly ($P<0.000$) higher than that of the 100% CF practice (a) but lower than that of the BFBF practice (b). Moreover, the BFBF-based organic practice (c) produced significantly ($P<0.000$) the lowest amount of carbohydrates while the BFBF and 100% CF [(b) and (a)] practices produced comparable amounts. In conclusion, the BFBF can enhance the quality of rice in both chemical and organic fertilizer practices.

Keywords: Biofilm biofertilizer, Grain quality, Rice