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ENDOPHYTIC DIAZOTROPHS MAINTAIN CHLOROPHYLL CONTENT IN ORGANIC RICE UNDER MODERN BIOFILM-BASED BIO-ORGANO-MINERAL FERTILIZER PRACTICE

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Photosynthesis is crucial for food and oxygen production on Earth. Plant endophytes improve photosynthetic efficiency by boosting chlorophyll content, which increases with biofilm biofertilizer (BFBF) application in rice (*Oryza sativa* L.). This study aimed to investigate this relationship through field experiments in Anuradhapura, Puttalam, Ampara, and Polonnaruwa districts. Three treatments were employed: (a) Bio-organo-mineral fertilizer (BOMF) practice (500 kg NPK BOMF/ha + 2.5 L BFBF/ha), (b) Chemical fertilizer (CF) practice (340 kg CF NPK/ha), and (c) control (no fertilizer), using a randomized complete block design with three replicates. Plant samples were collected at the 50% flowering stage and analysed for total counts of endophytic bacteria (TEB), endophytic diazotrophs (ED), endophytic fungi (EF), and leaf chlorophyll content. One-way ANOVA and Tukey's HSD test were performed for mean comparisons and correlation analysis. Results revealed that the highest TEB and ED were observed in the control, and they were significantly ($p < 0.05$) reduced with the CF alone application. The BOMF practice showed significantly ($p < 0.05$) higher TEB and ED compared to the CF practice, indicating a facilitative effect of restoring the plant microbiome. The EF was significantly ($p < 0.05$) higher in the BOMF practice than the other two practices. Chlorophyll content was comparable across all three treatments. Chlorophyll content was negatively correlated with TEB ($r = -0.810$, $p = 0.008$) and EF ($r = -0.881$, $p = 0.002$) only in the CF practice, indicating a potential negative impact of CF on endophytes. It can be concluded that applying BOMF could increase the abundance of ED, TEB, and EF, thereby increasing the ability of plants for diazotrophic N_2 fixation and maintaining the chlorophyll content, even without CFs. Further research using the ^{15}N isotopic technique is recommended to confirm the relative contributions of fertilizer-N and fixed-N for chlorophyll production in rice.

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