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Using *Anabaena-Azolla* ecological interactions towards developing organic fertilizers

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Abstract

Worldwide interest in organic farming is growing, due to human health risks and the environmental effects of commercial inorganic fertilizers. However, the low availability of nitrogen (N) in organic fertilizers poses a main deterrent, leading to using nitrogen-fixing plants like *Azolla* as a nitrogen source. *Azolla* sp. is a floating aquatic fern that contains 4-5% of N from its dry weight. Symbiotic *Anabaena azollae* increases N content through N-fixation. This study aimed to determine the responses of both *Anabaena azollae* and *Azolla* sp. grow in liquid Cow Dung (CD) and Banana Peel (BP) water. The 0.25g of *Azolla* sp. was cultured in water (control) and two treatments such as liquid CD, and BP in a concentration series with triplicates. The biotic parameters of *Azolla* sp. (wet weight (FW), Surface Area (SA), Relative Growth Rate (RGR) and Total Nitrogen content (TN)) and *Anabaena azollae* (Heterocyst Frequency (HF) and the Total number of *Anabaena* Filaments (TF)) were measured at three-day intervals. Also, water quality parameters were monitored every three days during the 21-day experiment. The significantly high FW (0.314 g), SA (16.097 cm^2), RGR (0.012 g/g/day) and the highest TN (3.092 mg N/mg) of *Azolla* sp. were recorded at treatment with CD: BP volume ratio of 1:0 (T_0) in the BP series ($p<0.05$). The maximum HF of *Anabaena azollae* was recorded as 19.35 % in T_0 of the BP series while the highest TF was reported as 21 in both T_0 of the BP series and treatment with a CD: BP volume ratio of 1:1 (T_1) of the CD series. The correlation analysis between the biotic parameters of *Azolla* sp. and *Anabaena azollae* indicated that RGR predicts microscopic measurements of *Anabaena azollae*. The overall results showed that the CD medium solely yielded the best growth and TN of *Azolla* sp. These findings aid in developing organic fertilizers with *Azolla-Anabaena* symbiosis, benefiting freshwater ecosystems and human health.

Keywords

Azolla sp., *Anabaena azollae*, *total nitrogen content*, *organic fertilizers*