Center for Organic Agriculture Promotion and Studies

Azolla compost as an alternative nitrogen source for organic vegetable production

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Introduction

The extension of organic farming in Asia has led to the need to find alternative sources of high quality organic fertilizer. *Azolla* is a genus of floating water ferns that is high in nitrogen and organic matter due to its rapid growth and symbiotic relationship with nitrogen-fixing bacteria (*Anabeana-azollae*). It is grown as a green manure in rice fields in many Asian countries. However, little research has been done on the use of Azolla as an organic fertilizer for vegetable production. The objective of this study was to evaluate the effects of different levels of Azolla compost fertilizer on the growth and yield of Malabar spinach (*Basella alba*) - a popular vegetable crop in the tropics and subtropics - to improve the process of using Azolla as an organic fertilizer in vegetable production.

Conclusion

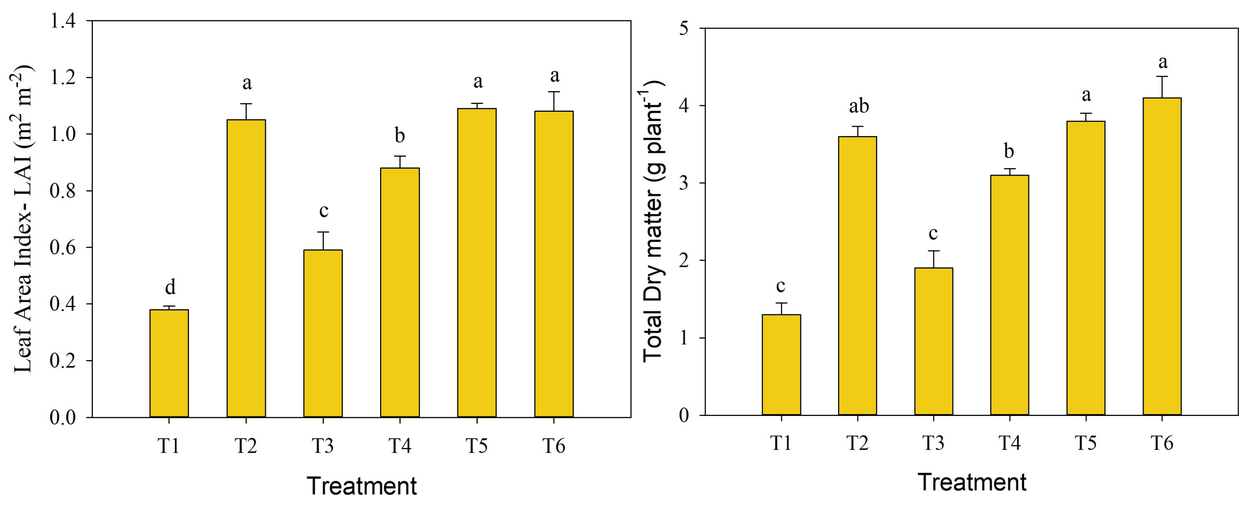
- *Azolla* compost has a higher nutrient content, especially nitrogen and potassium, than cow manure and corn meal.
- Application of *Azolla* fertilizer significantly stimulated the growth of Malabar spinach and increased SPAD in the leaves, resulting in an increase in crop yield.
- Our results suggest that *Azolla* compost can be used as an alternative organic nitrogen source in organic vegetable production.
- However, genotype selection and rapid multiplication of *Azolla* are required to develop it as a nitrogen source to meet the requirements of fast growing organic agriculture in Asia.

Results and Discussion

Nutrient content	Azolla Compost	Cow Manure	Soybean meal	Corn meal
OM (%)	44.80	69.07	-	-
Total N (%)	2.88	1.73	5.57	1.24
Total P_2O_5 (%)	0,.89	1.53	1.24	0.61
Total K_2O (%)	2.73	1.45	1.79	0.36

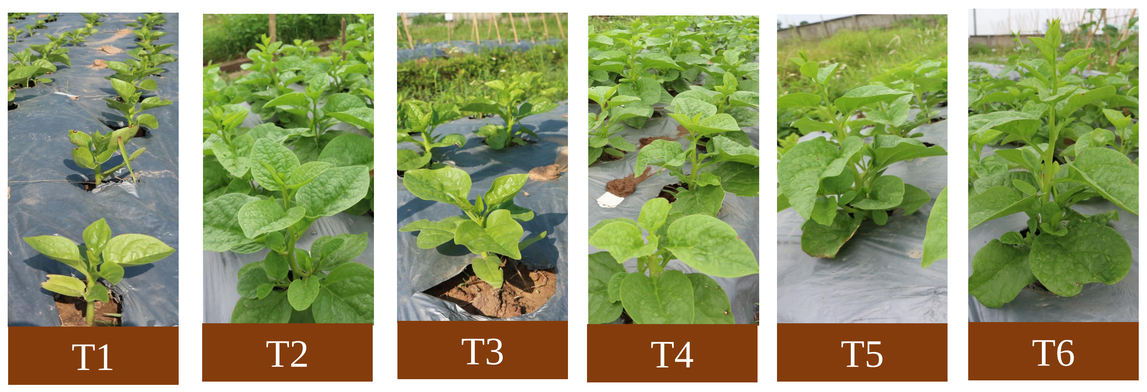
- *Azolla* compost contains a high content of organic matter and has a higher nitrogen content than cow manure and corn meal.
- *Azolla* compost has a higher potassium content than soybean meal, corn meal, and cow manure.

➢ *Azolla* compost contains high levels of organic matter, nitrogen, and potassium.



- *Azolla* fertilizer application significantly increased leaf area index (LAI) of Malabar spinach (30 DAP) compared to control or cow manure.
- Morphological parameters and dry matter were also greatly increased by *Azolla* application.

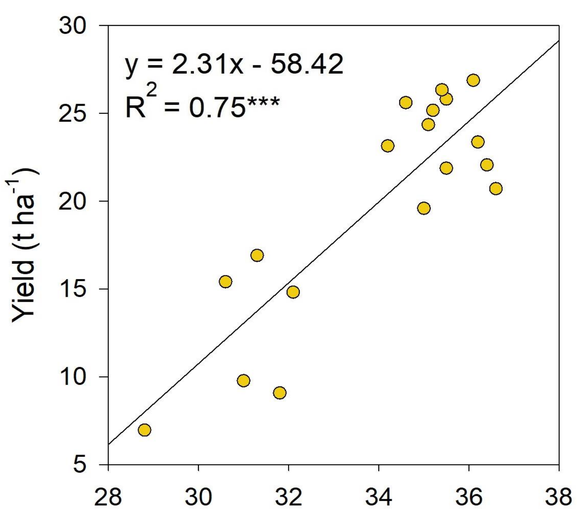
➢ *Azolla* compost significantly increased the growth of Malabar spinach compared to control or cow manure.



Plants in the treatments at 20 days after planting (DAP)

Treatments	
T1: Without application-as control	T4: 12 t ha^{-1} *Azolla* fertilizer
T2: 1 t ha^{-1} soybean meal	T5 16 t ha^{-1} *Azolla* fertilizer
T3: 16 t ha^{-1} cow manure	T6: 20 t ha^{-1} *Azolla* fertilizer

Treatment	Yield (t ha^{-1})	Difference (%)
T1	8.6^{e}	-
T2	22.0^{bc}	156.3
T3	15.7^{d}	82.6
T4	21.5^{c}	150.4
T5	25.1^{ab}	191.9
T6	26.3^{a}	205.4



- Application of *Azolla* fertilizer at rates of 12, 16, and 20 t ha^{-1} significantly increased the yield of Malabar spinach by 150, 192, and 205%, respectively, compared to the control and by 37, 60, and 67%, respectively, compared to the cow manure treatment.
- There was a positive correlation between total yield and SPAD. An increase of SPAD in the leaves of plants fertilized with *Azolla* was also observed.

➢ *Azolla* compost significantly increased the yield of Malabar spinach.

Materials and Methods

The one-factor experiment was arranged in a completely randomized block design with 6 treatments, 3 replicates, and a total of 18 plots. The experimental treatments included T1 - without application (control); T2 - soybean meal at 1 t ha^{-1}; T3 - cow manure at 16 t ha^{-1}; T4 - Azolla fertilizer at 12 t ha^{-1}; T5 - Azolla fertilizer at 16 t ha^{-1}; and T6 - Azolla fertilizer at 20 t ha^{-1}. In each experimental plot, five plants were randomly selected to measure weekly morphological parameters. At day 30 after planting (DAP), SPAD, leaf area and dry matter were measured. Yield was calculated as the total yield of all harvested time points. Nutrient content of the soil before the experiment: total OM 1.44%; total N 0.14%; total P_2O_5 0.14%; total K_2O 1.56%; available N 56 mg kg^{-1}; available P_2O_5 253 mg kg^{-1}; available K_2O 249 mg kg^{-1}.