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Short Communication

Influence of supplement liquid manure on snake gourd growth and yield (*Trichosanthes anguina* L.)

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ABSTRACT

An experiment was accomplished at the Horticulture Farm, Sher-e-Bangla Agricultural University, Dhaka, from March to June 2024 to study the influence of supplement liquid manure on the growth and yield of snake gourd. Supplement liquid manure applications viz., frequency, T_0: control (BARI recommended fertilizers doses), **T_1**: 100% RFD + Liquid manure (once), and **T_2**: 100% RFD + Liquid manure (twice) were used in this experiment arranged in a Randomized Complete Block Design with three replications. Data on growth, yield, and quality attributes parameters were taken in which all the treatments showed significant variations. The maximum leaves number (10.0), leaf area (147.0 sq.cm), the highest SPAD value (50.1), and maximum female flowers per plant (58.0) were found in twice application (T_2) of liquid manure. Furthermore, the maximum number of fruits per plant (53.0), maximum single fruit weight (0.61g), and maximum snake gourd yield (29.8 t/ha) were found in T_2, whereas the minimum was found from control (T_0) in case of all parameters. Therefore, it can be concluded that the liquid manure supplement applied as **T_2** is an easy and effective liquid manure that can potentially increase the growth and yield of snake gourd.

Introduction

Snake gourd (*Trichosanthes anguina* L.) is a popular vegetable in Bangladesh, and it is valued for its high nutritional content, including vitamins, minerals, and dietary fiber. Organic matter is a vital soil component for improving soil physical properties, and returning organic matter to the soil can increase the soil's active organic carbon content and improve soil vitality (Li et al., 2017). Nowadays, liquid organic manure is used in crop production to increase yield because it is easy to prepare, good for most vegetables, and applied as a top dressing while the crop grows. Unlike conventional organic manure, liquid organic manure contains essential amounts of organic matter and soluble nutrients that help maintain soil health and stability (Somashekar et al., 2018). The specific composition of liquid fertilizers, micronutrients, and beneficial microbes can influence plant resistance to diseases and pests, thus contributing to better yields (Uddin et al., 2023). It is made from domestic cow urine, cow dung, horse gram (Besan), and molasses and is a time-honored agricultural tradition of using cow-based products (Gong et al., 2022). This organic supplement boosts soil fertility, enhances microbial activity, and improves the overall health of plants without the adverse environmental impacts associated with

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synthetic fertilizers. The present study explored the benefits of liquid manure application frequency in the growth and yield of snake gourd.

Materials and Methods

The field experiment was conducted from March to June 2024 at Sher-e-Bangla Agricultural University, Dhaka. The trial plot was carefully prepared by plowing and cross-plowing with a shovel to ensure good tilth. The area was leveled, and after that, drainage and irrigation channels were built all around the plot. As basal doses, synthetic fertilizers were applied as BARI recommendations (Krishi Projikti Hatboi, 2020). The research was done using a Single-factor experiment. The experiment was conducted in a Randomized Complete Block Design (RCBD) with 3 treatments. The treatments were T_0: control (BARI recommended fertilizers doses), T_1: 100% RFD + Liquid manure (once), and T_2: 100% RFD + liquid manure (twice). A hybrid snake gourd, "Asha," was used in this study, and seedlings of 30 days of age were planted. The plot size was 6 m x 6 m, and the spacing was maintained at 1.5 m x 1.5 m.

Preparation of liquid Manure (PLM)

To prepare the PLM, 10 parts of cow dung mixed with 10 parts of urine, 1 part molasses,1 part of besan flour, and 1 part of virgin soil were mixed in a 100 L drum. This mixture blended well with 100 liters of water (Fresh Cow dung: Urine: Jiggery: Chickpea/ Gram Besan: Soil: Water=10:10:1: 1:1:100). The solution was stirred with a stick, and the drum was covered with a lid (Uddin et al., 2023). It was stirred occasionally with a stick by opening the lid once a day to prepare the PLM well. One part of PLM was mixed with 5 parts water when it was used as the treatment.; 1:5; PLM: Water, V/V).

Data on different morphological characteristics were recorded in visual observation and represented into appropriate categories. Data were also collected based on vegetative growth and yield attributing parameters. Three plants were randomly selected from each plot unit for data collection. Data on vine length (cm), leaves numbers/plant, leaf area (sq.cm), SPAD value, Days to 80% flowering, female flowers/plant, fruits /plant, fruit length (cm), fruit width (cm), average fruit weight (g), and yield (t/ha) were recorded during the study period. The leaf area was calculated using a portable laser leaf area meter. Using a SPAD meter (Plate 2b), the leaf SPAD value was determined.

The statistical analyses were conducted using the STATISTIX 10 statistical program. The analysis of variance (ANOVA) was conducted to assess the differences between treatments. The Least Significance Difference (LSD) test was employed at a significance level of 5%.

Result and Discussion

The research work on "Influence of supplement liquid manure on growth and yield of snake gourd was undertaken in the Horticulture Farm, Sher-e-Bangla Agricultural University, Dhaka. The experimental results on growth, yield, and quality parameters obtained throughout the study period are presented as follows:

Vine length (cm)

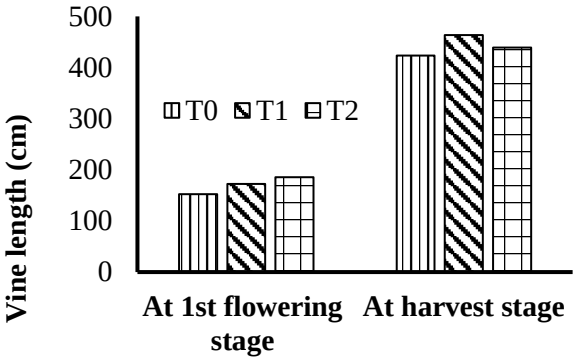
Plant vine length of snake gourd showed statistically significant variation with the application of liquid manure (Fig. 1). Vine length increased consistently with the advancement of crop growth with the application of liquid manure.

The maximum vine length (185.6 cm) at 1st flowering stage with T_2 treatment was the lowest (152.6 cm) with control (T_0). At the harvesting stage, the T_1 treatment showed maximum vine length (463.33 cm), and the lowest vine length (423.3 cm) was found with T_0. It was statistically similar to T_1 (463.3 cm) (Fig. 1.). Liquid manure is often derived from animal waste or plant residues that can significantly increase the vine length of snake gourd (or any vining plants) due to its rich nutrient content. Uddin et al. (2024) mentioned that liquid manure provides essential nutrients such as nitrogen, phosphorus, and potassium, which are critical for plant growth.

Leaves number /1 m vine length

Leaves numbers showed a significant variation among the treatments. The maximum leaves number was observed in T_2 (10.0), and the minimum leaves number was observed in T_0 (7.7) in 1m vine length at 46 days after transplanting (Table 1). A result of

increased leaf number in organic matter-enriched soil has been observed in cucumber by Adesida et al. (2020). Healthy plants in nutrient-rich, organically enhanced soil are better able to produce growth hormones like cytokinins, which are responsible for stimulating leaf production.



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plant length of snake gourd (*Trichosanthes anguina* L.) T_0: control (BARI recommended fertilizers doses), T_1: 100% RFD + Liquid manure (once), and T_2: 100% RFD + liquid manure (twice).

Leaf area (sq. cm): Leaf area showed significant variation among the treatments (Table 1). The maximum leaf area (147.0 sq. cm) was observed in T_2, which was identical to T_2, whereas the lowest leaf area (67.9 sq. cm) was found in T_0 (Plate 1). Liquid manure can increase plant leaf area by providing key nutrients and enhancing soil conditions that promote healthy, vigorous leaf growth. Similarly Azeezahmed et al. (2022) also reported a significant increase in leaf area due to liquid manure. Liquid manure increases leaf area by providing essential nutrients, improving water retention, stimulating cell division and expansion, and enhancing plant health.

SPAD Value

SPAD value showed significant variation among the application of liquid manure. The highest (50.1) SPAD value was observed in T_2, and the lowest (40.3) value was observed in T_0 (Table 1). A higher SPAD value indicates a higher concentration of chlorophyll in the leaf. Chlorophyll is vital for photosynthesis, the process by which plants convert light energy into

Table 1. Influence of supplement liquid manure on growth and flowering of snake gourd *(Trichosanthes anguina* L.)

Treatments	Leaves number /1m vine length	Leaf area (sq.cm)	SPAD	Days to 80% flowering	Female flower/ plant
T_0	7.7 ^{b}	67.9 ^{b}	40.3 ^{b}	41.66 ^{a}	42.3 ^{b}
T_1	8.3 ^{ab}	145.1 ^{a}	41.8 ^{ab}	38.33 ^{b}	49.3 ^{ab}
T_2	10.0 ^{a}	147.0 ^{a}	50.1 ^{a}	30.66 ^{c}	58.0 ^{a}
Cv%	9.4	0.7	8.9	3.26	9.1
LSD	1.9	2.0	8.9	2.7	10.3

T_0: control (BARI recommended fertilizers doses), T_1: 100% RFD + Liquid manure (once), and T_2: 100% RFD + liquid manure (twice).

According to the 0.05 threshold of probability, means in a column with similar letters are statistically non-significent, whereas those with differing letters differ significantly.

chemical energy. High SPAD values can suggest that the plant has sufficient nitrogen, a key element for chlorophyll production.

Days to 80% flowering

Significant variation was shown on days to 80% flowering of snake gourd plants due to different treatments and the maximum days (41.66 days) required for flowering of 80% of plants from the control (T_0) treatment. In contrast, the minimum days (30.66 days) to 80% flowering was required in T_2 treatment.

T_0	T_1	T_3

Plate 1. Variation of leaf area with different treatments.

Female flowers per plant

Significant variation of female flower numbers per plant was shown with the different treatments. The highest number of female flowers per plant (58.0) was recorded with the T_2 treatment, and it is statistically identical to T_1 (49.3) and the minimum number of female flowers (42.3) from the T_0 treatment (Table 1). Liquid manure provides essential nutrients, especially nitrogen, phosphorus, and potassium, crucial for flower development and overall plant health. Adequate nutrition can enhance the plant's ability to produce female flowers, which is beneficial for the fruit set and overall yield of snake gourd. A similar result was observed in tomatoes by Shakila and Anburani (2008) and chili, tomato, okra, and cowpea by Mathews et al. (2017).

Fruits per plant

The number of fruits per plant showed significant inequality with different treatments under the study. Among the various applications of liquid manure imposed on the plant, T_2 (Twice) recorded a significant maximum fruit number (53.0) and the minimum fruit number (40.0) from the control (Table 2). Liquid manure is rich in essential nutrients such as nitrogen, phosphorus, and potassium and enhances microbial activity, which is vital for plant growth and development. These nutrients are more favorable environments to promote healthy vegetative growth, flowering, and fruit set. A similar result was reported by Deore et al. (2010), which revealed consistent and significant results for growth and yield parameters due to the application of novel organic liquid manure. Application of panchagavya increased parameters like number of branches per plant, number of flowers per plant, and total yield per plant (Rao et al., 2015).

Single fruit weight

Significant variations in single fruit weight were found with different treatments (Table 2). The maximum average single fruit weight (0.61 g) was recorded in T_2 and the minimum fruit weight (0.39 g) was recorded in T_0.

Yield

Significant differences in yield of snake gourd were observed due to different treatments (Table 2). In the case of different liquid fertilizer applications, the highest result was observed in T_2 (29.8 t/ha) with two applications and the lowest result in T_0 (26.0 t/ha) in the control condition. Probiotic liquid manure can be beneficial in increasing the yield of snake gourd by enhancing soil health and providing essential nutrients in a bioavailable form. Applying probiotic liquid manure at regular intervals throughout the growing period can help sustain beneficial microbial activities, which assist in decomposing organic matter, releasing the essential nutrients like nitrogen, phosphorus, and potassium, that are vital for snake gourd growth and yield. The results are consistent with Somasundaram et al. (2003) and Ali et al. (2011). Mahanta and Dhar (2021) expressed similar opinions that liquid manure enhances soil organic matter content and microbial diversity and stimulates microfauna and enzymes for higher productivity of crops.

Table 2. Influence of supplement liquid manure on yield of snake gourd (*Trichosanthes anguina* L.)

Treatments	Fruits /plant	Fruit length (cm)	Fruits width (cm)	Average fruit wt. (g)	Yield (t/ha)
T_0	40.0 [b]	28.3 [b]	6.2 [b]	0.39 [b]	26.0 [c]
T_1	51.7 [a]	31.7 [a]	7.3 [a]	0.44 [b]	27.8 [b]
T_2	53.0 [a]	33.3 [a]	7.9 [a]	0.61 [a]	29.8 [a]
Cv%	2.9	4.5	4.8	5.62	2.41
LSD	3.2	3.2	0.8	0.07	1.52

T_0: control (BARI recommended fertilizers doses), T_1: 100% RFD + Liquid manure (once), and T_2: 100% RFD + liquid manure (twice).

According to the 0.05 threshold of provability, means in a column with similar letters are statistically non-significant, whereas those with differing letters differ significantly.

Conclusion

The experiment results showed that **T_2** plot plant (Direct use 100% of PLM) treatments more prominently enhanced vegetative growth, SPAD value, and yield attributes of snake gourd. So, we observed that **T_2** treatment was found to perform better regarding vegetative growth, yield, and quality attributes. Therefore, PLM as **T_2** is an effective supplement of liquid manure that has the potential to increase the growth and yield of snake gourd.

Author contribution

AFM Jamal Uddin: Experiment designing and writing, Tamalika Roy: Data collection and analysis, Purnima Saha: Data collection, Tamima Dastagir: writing, Fatema Tuz Juhora Chaitee: Data analysis and writing.

Declaration of conflicting interests

The authors declare that there is no conflict of interest regarding the publication of this paper.

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