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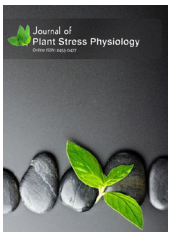
Research Article



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Growth and yield performance of Sponge Gourd (*Luffa cylindrica*) under different doses of nitrogen fertilizer

Riad Mahmud*, Faria Naznin, Farhana Binte Quyyum Bristy, Tasnova Tasin, Sohel Rana, Rafat Nur Abdullah Khan, Kawsar Hossen

Department of Agriculture, Faculty of Science, Noakhali Science and Technology University, Noakhali-3814, Bangladesh

ABSTRACT

An experiment was carried out at a farmer's field in Nowpara village, Trishal upazila, Mymensingh from 3rd May 2023 to 15th September 2023 to find out the effects of nitrogen (urea) fertilizers on the growth and yield performance of sponge gourd. The field experiment was arranged using a randomized complete block design with local variety Fujian F_1 with four treatments and three replications viz. (Urea) T_1: Control (0 kg N/ha), T_2: 25 kg N/ha, T_3: 50 kg/ha, T_4: 75 kg N/ha were used for the present study with three replications. In treatment T_4, the tallest sponge gourd plant was 123.5 cm, while in treatment T_3, it measured 112.5 cm. For treatment T_1, the smallest plant measured 61.33 cm. In terms of leaf numbers, treatment T_4 had the greatest number of leaves 63 while treatment T_1 had the lowest number of leaves 30. The highest diameter of the leaf measured was 13.05 cm in T_4 and the lowest diameter found was 6.8 cm in T_1. Out of the four treatments, treatment T_4 had the tallest leaves, measuring 12.73 cm, followed by treatment T_3, which had leaves measuring 9.7 cm. In T_1 and T_2, the smallest leaf lengths were found to be 6.7 and 7.8 cm, respectively. The tallest length of the petiole found was 7.8 cm in T_4 and the smallest length of the petiole recorded was 5.5 cm for the treatment T_1. The longest fruit measured from T_4 was 28.33 cm, while the tiniest fruit came from T_1 and measured 18.6 cm. The treatment T_4 had the highest fruit weight, measuring 227 g, while treatment T_3 had a weight of 176 g. The minimum weight was 93 g found in T_1. Treatment T_2 has shown the weight of the fruit those were 134 g.

KEYWORDS: *Luffa cylindrica*, Nitrogen, Growth and yield

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***Corresponding author:**
Riad Mahmud
Email: riadmahmud2016@gmail.com

INTRODUCTION

Locally, the sponge gourd (*Luffa cylindrica*) is referred to as Kalitori. The plant is classified under the family Cucurbitaceae and is commonly referred to as angled gourd or angled loofah. Luffa is a monoecious viny vegetable and contains 2n=26 chromosomes (Zohura *et al.*, 2013). The fruits of *L. cylindrica* are smooth and cylindrical shaped. The fibers consist of 60% cellulose, 30% hemicellulose, and 10% lignin (Mazali & Alves, 2005). *L. cylindrica* is a subtropical plant that, when cultivated in temperate regions, requires warm summer temperatures and an extended frost-free growing season. It produces a fruit with a fibrous vascular system and is an annual ascending plant. It is a summer season vegetable (Oboh & Aluyor, 2009). *L. cylinderica* fruits are green, and large cylindrical in shape that is crawled on other materials (Partap *et al.*, 2012). According to a nutritionist, sponge gourd is an essential component of human nourishment. The daily requirement of an adult's total food is 284 g per head which is around 20% (Solangi *et al.*, 2009). Nitrogen is a crucial nutrient that contributes to the development of the canopy and the rich green colour of the crop (Hashan *et al.*, 2023). The successful production of crops is dependent on the efficient utilization of nitrogen. Nitrogen is also a major element of nucleic acid, co-enzymes, and membranes, and it is involved in many metabolic processes, viz., cell division, photosynthesis, protein synthesis, and the expansion of shoot and root growth in plants. It also has an active role during vegetative growth (Leghari *et al.*, 2014). Notably, given the significant importance of nitrogen on plant growth and productivity, the present study was conducted to determine the response of the sponge gourd to applied nitrogen fertilizer on growth, development, and yield.

MATERIALS AND METHODS

Study Area

The experiment was conducted at the farmer's field in Nowpara village, Trishal upazila, Mymensingh during the period from 28 May 2023. Geographically the experimental site is located

at 24.33 43" N latitude and 90.22 52" E longitudes under the Agro-ecological Zone of the Old Brahmaputra Floodplain Agro-ecological zone-9 (FAO, 1988). The land was medium high with moderate drainage facility and the soil was silt loam. The plot size was 30m x 10 m in the experiment. The total area of the experiment was 30 m x 10 m, and the distance between two units was 2 m with a spacing of 2 m x 1.50 m.

Source of Seed

The sponge gourd variety Fujian F_1 was used and seeds were collected from Lal Teer Seed Limited.

Planting and Growing Young Plants

Healthy seedlings were raised with the necessary attention. Seeds were sown in well prepared poly bag seed beds on 3rd May 2023. The seeds were sown at about 1.25 cm depth and were covered uniformly with light soil for proper germination. The seedbed was irrigated as and when required to ensure optimal germination and normal seedling growth. After germination, shade was set up to shield the small plant from the sun's glaring rays, and it was left exposed at night, in the morning, and in the afternoon. Healthy seedlings were developed by proper nursing. The seedlings were moved to the experimental plot when they reached one month of age.

Land Preparation

The experimental plot was prepared by multiple ploughing, laddering, and harrowing with a power tiller and a country plough to get good tilth. The experimental plot's weeds and other stubbles were meticulously cleared and levelled. The final land preparation was done on 28th May 2023. A drainage channel of 30 cm was made between rows.

Fertilizer Application

Applying well-decomposed cow dung helped prepare the soil for cultivation. Vermicompost, cocopeat, and farmyard manure were used to improve the soil.

Transplanting of Seedling

On June 4, 2023, Thirty-day-old seedlings were placed in a meticulously set-up experimental area. Plant spacing was maintained by planting two plants in a single pit for every replication.

Weeding and Mulching

Initially, the plots needed to be kept weed-free for simple aeration and to maintain soil moisture, which meant weeding and mulching. Seven times, weeding was finished in order to keep the region weed-free. The soil was mulched to encourage optimal aeration and inhibit crust development following each treatment.

Irrigation and Drainage

Water cane was used twice a day for watering during the early stages of transplanting. When flood irrigation was required for the crop in its mature stage, it was applied to the field. During periods of heavy irrigation, stagnant water was successfully flushed out.

Harvesting

Fruit harvesting began on August 12, 2023, and it lasted until September 15, 2023. The selection of sponge gourd fruits was based on factors such as age, size, color, and maturity. Picking took place every five days during the harvest season. Using a sharp knife, the fruits were removed, being careful not to damage the plant.

Statistical Analysis

The data was illustrated as mean ± standard deviation from three independent analyses. One-way analysis of variance (ANOVA) was accomplished at the level of significance $P \leq 0.05$, according to the factorial design based on randomized complete block design (RCBD). Statistical analysis was performed on the data collected for the study's various parameters using an Excel data sheet and the Minitab 17 statistical software package (Minitab Inc., State College, PA, USA).

RESULTS AND DISCUSSION

Plant Growth Parameters

Application of varying levels of nitrogen has significant effects on plant height, number, diameter, length, and petiole length. At 15 days, the height of the sponge gourd plant showed no significant effect. At 45 days, T_4 produced the longest plant height of 62.2 cm, which was statistically equivalent to T_3 compared to the control, which had a shorter plant height of 17.33 cm. The tallest plant height measured at 75 days was 123.5 cm from T_4, while the lowest height measured at that time was 61.33 cm from T_1. The T_4 treatment of nitrogen dosages produced most of the considerably biggest measurements of leaf number, leaf diameter, leaf length, and petiole length at 15 and 45 days, while the T_1 treatment produced the least results. However, the highest leaf number (63), leaf diameter (13.05 cm), and leaf length (12.73 cm) were observed from the treatment of T_4 at 75 days. On the other hand, at 75 days, 28 leaves with a diameter of 6.7 cm and a length of 7 cm were identified from the T_1 treatment. In the case of leaf petiole, the considerably largest length collected was 6.8 cm at 15 days and 7.4 cm at 45 days from T_4 treatment, and the tiniest length was 4.5 cm and 5.67 cm from control (T_1) at 15 days and 45 days respectively. At 75 days, the longest petiole of 7.8 cm was collected from T_4, which was statistically equal to the length of T_3, where the shortest one was 5.7 cm from T_1. The outcomes revealed that, nitrogen application boosts the growth of sponge gourd (Figure 1).

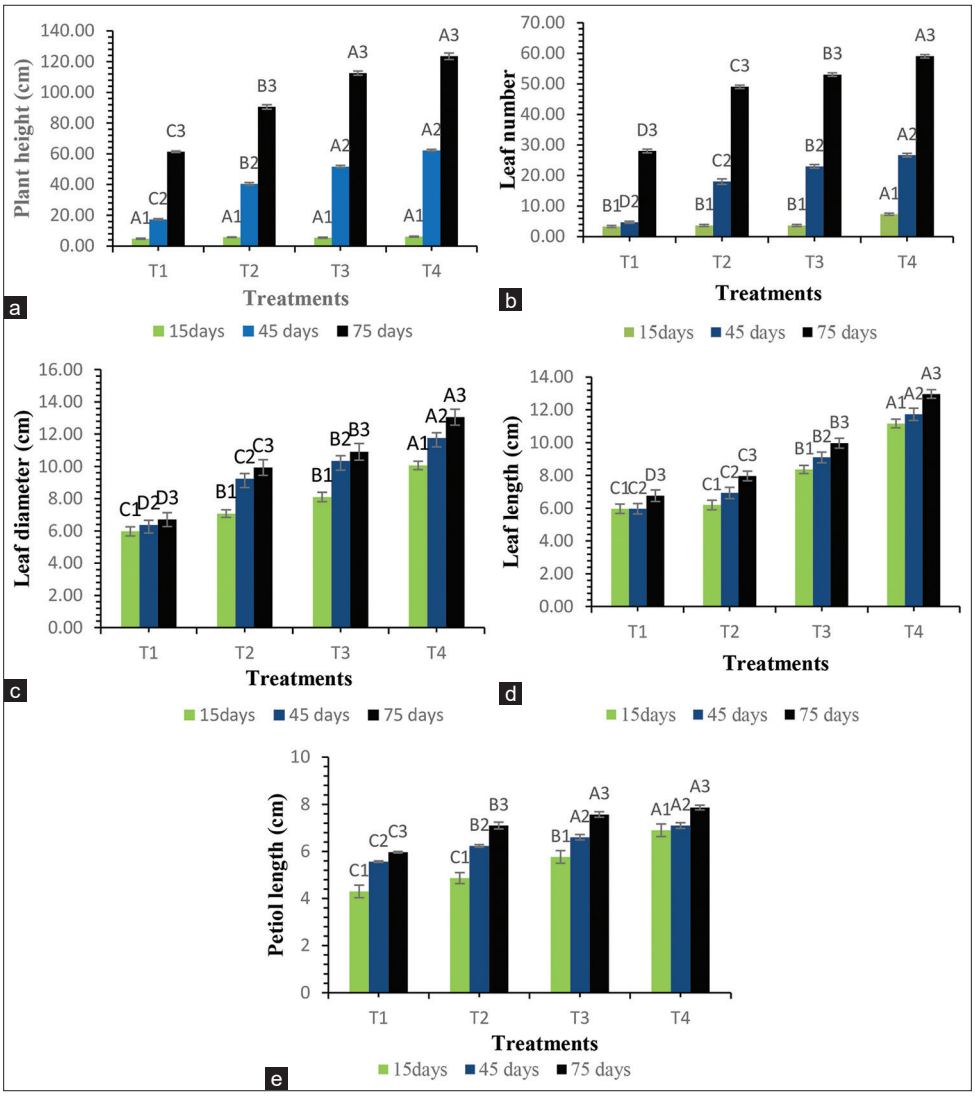

Figure 1: Effect of Nitrogen doses on growth parameters (T1 = Control; T2 =25 kg/ha nitrogen; T3 = 50 kg/ha nitrogen; T4 = 75 kg/ha nitrogen. a) Alteration of plant height, b) leaf number per plant, c) leaf diameter, d) leaf length (cm) and e) petiole length. Data are the averages of three replicates ± SEM (standard error mean). The values with different characters (A, B, C, D, E) indicate significant difference (*p<0.05) over control)

Yield Parameters

One vital parameter is yield. If there is a possible yield, farmers will accept any outcome. The amount of nitrogen significantly raised the sponge gourd's weight and fruit length, among other yield-related characteristics. The weight and quality of the sponge gourd determine its quality. The lightest fruit (93 g) came from the T_1 nitrogen treatment, while the heaviest fruit (227 g) was harvested from the T_4 treatment. The highest length of fruit was found in treatment T_4, which was 28.33 cm, followed by treatment T_3, which was 25.56 cm. The lowest length of fruit was 18.6 cm found in T_1. Treatment T_2 has shown a medium length of fruit; those were 22.97 cm. (Figure 2).

DISCUSSION

The production of sponge gourd, a crucial fruit and vegetable, is negatively impacted by a lack of nutrients, especially nitrogen. For better sponge gourd growth, it is necessary to clarify the likely cultivation tactics for soil deficient in nutrients. The current study discovered that adding various amounts of nitrogen to the soil enhanced the sponge gourd's growth and yield-related characteristics. According to an experiment conducted on the native sponge gourd crop, 50 kg/ha of nitrogen produced the maximum fruit weight (Siyag & Arora, 1988). Nitrogen application with biofertilizer significantly increased the average fruit weight (68.93 g) and fruit length (13.45 cm) of bitter gourd, as declared by an investigation of the effect of nitrogen and biofertilizer on the growth and yield parameters of bitter gourd, which belong to the similar family of Cucurbitaceae like sponge gourd (Prasad *et al*., 2009). Another study on grain amaranth revealed that nitrogen application significantly altered the plant height and leaf number, where maximum plant height was obtained from 60 kg/ha nitrogen, sharing the same claim as this experiment (Olaniyi *et al*., 2008). An experiment with Swiss chard revealed that applying 140 kg of nitrogen per hectare

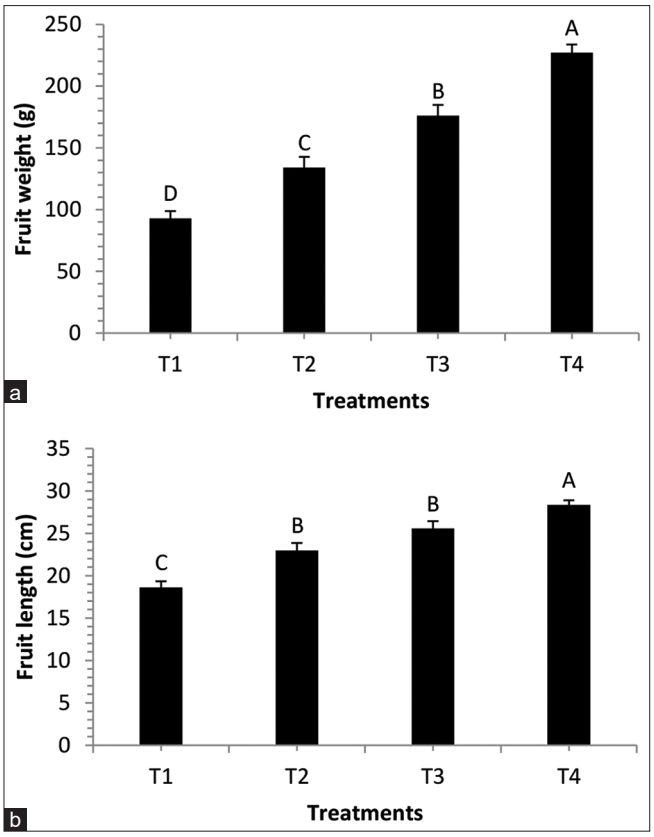

Figure 2: Effect of Nitrogen doses on yield parameters (T1 = Control; T2 =25 kg/ha nitrogen; T3 = 50 kg/ha nitrogen; T4 = 75 kg/ha nitrogen. a) Alteration of fruit weight (g) and b) fruit length (cm). Data are the averages of three replicates ± SEM (standard error mean). The values with different characters (A, B, C, D, E) indicate significant difference (*p<0.05) over control)

resulted in broader leaves, supporting the idea that nitrogen application significantly increases leaf diameter (Ali & Ali, 2011). A further study on soybeans found that nitrogen doses significantly increased the petiole's length (Nurrohman *et al*., 2018), which mirrored the experiment's sponge gourd response.

CONCLUSION

The study concludes that the data on the growth and yield parameters were collected and analyzed statistically. The parameters were all considerably impacted by varying amounts of nitrogen. The plant height (cm), leaf number, leaf diameter (cm), leaf length (cm), petiole length (cm), fruit length (cm), and fruit weight (g) were obtained with T_4=75 kg/ha nitrogen application, which superior to all other nitrogen treatments by a substantial margin. The results of the experiment indicated that the T_4 treatment was applied at a rate of 75 kg/ha, produced the highest yield of all the treatments. As a result, it can be advised that Fujian F_1 grown using T_4 treatment for higher yield.

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