



Performance of Some Chilli (*Capsicum Annum* L.) Varieties in Costal Soil in Noakhali, Bangladesh

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Abstract: A field study was carried out at the Department of Agriculture's Research Field in Noakhali during Rabi season 2022 to evaluate the varietal performance of chilli varieties: Bijli Plus (V1), Anal (1701) (V2), Vanilla (V5), Moti (V4), and Dhum (V5). Three replications of the experiment were carried out using randomized complete block design (RCBD). The highest plant height (70.43cm), leaf length (9.6cm), fruit length (8.37cm), number of fruits (74.67), number of flowers (10.88), yield (11.98 tonh⁻¹) were measured in V1(Bijli Plus), and the highest number of branches (21), number of leaves (102.33) was counted in V2 (Anal 1701). Vanilla produced the lowest yield, whereas Bijli Plus produced the highest yield. The results indicate significant variations among varieties in the field. According to the research outcomes, the Bijli Plus is produced the maximum yield production of chilli.

Keywords: Chilli; Bijli plus; Costal soil; Yield.

INTRODUCTION

A significant crop of spices is the chilli (*Capsicum annum*; family Solanaceae), which is grown extensively in Asia, Africa, some regions of the United States, and Southern Europe (Khan and Raj 2006). The chilli is a significant vegetable and spice crop that is consumed both domestically and commercially throughout the world (Khan et al. 2012). A berry-fruit belonging to the Solanaceae family, the chilli (*Capsicum annum* L., 2n=2x=24) is a member of the Capsicum family. Other names for it include sweet pepper and green pepper. Native Americans in America domesticated five species: *C. annum* var. *annuum*, *C. chinense*, *C. frutescens* and *C. pubescens* (Moscone et al. 2006). It is a significant cash crop and spice in many nations throughout the world. In order to give food a strong "hot," chillies are frequently used in a variety of dishes. As opposed to the tropics, where it is primarily used as a spice in cooked food, chilli is typically utilized as a salad element in western countries. The human diet relies heavily on the nutrients found in chillies, which are also a great source of vitamins A and C and phenolic mixtures, which are crucial antioxidants for many plant defense mechanisms. Ascorbic acid, potassium, folic acid, and vitamin E are all abundant in chili peppers, which also have

a low salt content. Fresh green chilli peppers have a higher ascorbic acid content per weight than citrus fruits (Litoriya et al. 2014). Fruits and vegetables are extremely beneficial not only for their nutritional content but also for their powerful health benefits against a variety of degenerative diseases brought on by free radicals. Additionally, they are a good source of natural antioxidants with a variety of bioactive components that actively scavenge or encourage the breakdown of free radicals, preventing the production of new ones. The combination of color, flavor, taste, and nutritional content in chillies makes them one of the most popularly consumed vegetables. Along with being a strong source of vitamin C, it also contains vitamin A and E, as well as trace amounts of proteins, lipids, carbohydrates, and minerals (Krithika et al. 2014).

Balijuri, Bona, Bain, Saita, Suryamukhi, Paba, Halda, Dhani, Shikarpuri, and Patnai are a few of the regional variants. The two commercial species of the genus *Capsicum* that are most frequently grown in Bangladesh are *Capsicum annum* and *Capsicum frutescens*. Bangladeshi chilli growers mainly grow their produce in rainfed conditions (Khan et al. 2009).

Tropical and subtropical regions are the natural habitat of the chilli plant. It flourishes in hot, humid areas. For

satisfactory growth, the crop prefers deep, loamy, fertile soils rich in organic matter. For the crop to flourish, you also need well-drained soils with enough soil moisture. Chilli grows best in the country's middle and arid regions. The best location for chilli plants is one that gets plenty of light. The temperature shouldn't be below 12°C at night when growing peppers. Growth will be delayed by a dip in temperature below 15°C. Seasonal crops, such as chilli pepper plants, are annual plants that only exist for one season before dying. This plant can develop and produce if it is cultivated for a number of months after planting before dying (BBS 2020).

Bangladeshi farmers use traditional techniques to raise chillies, but the yield is minimal. The productivity of chillies can be increased by using improved production methods, such as proper plant spacing. Despite being a substantial spice crop in Bangladesh, chili's production methods are not standardized from a scientific or commercial perspective. Therefore, research must advance industrial technology while simultaneously considering economic return. If the weather is favorable, farmers can expect a good crop. Production of chilli is influenced by inorganic fertilizer such as Urea, MOP, TSP. Inorganic fertilizer increases soil improvement like fertility and water holding capacity for better production. Chilli production is increased by the use of Urea, MOP, TSP. It increases soil activity by which increased the production of chilli. It is essential for long-term soil fertility and productivity. The goal of the current experiment was to identify which variety is performed better in saline soil and under the condition on greenhouse from the existing chilli cultivars in the Noakhali region. The precise goal was to locate high yielding variety of chili plants on the five preselected local chilli cultivars being used by the farmers.

MATERIALS AND METHODS

Experimental site and climate conditions

The research was conducted in Noakhali. The experiment lasted from January 17, 2022 to March 17, 2022. The average temperature and relative humidity in Noakhali, Bangladesh, according to the Bangladesh Meteorological Department (Climate Division), were 19°C in January 2022 and 26.1°C and 62% relative humidity in March 2022, respectively. There were roughly 3,302 mm of rainfall per year.

Soil

Sand: Silt: Clay makes up 40%, 40%, and 20% of the soil's particle size composition at that location. The soil composition is loam, with 0.68 percent organic matter, 0.04 g/kg of total nitrogen, 27.79 g/g of accessible phosphorus, and 0.18 mEq/100 g of available potassium. The soil's pH is 7.5 (Osman et al. 2020).

Salinity of costal soil

Physio-chemical composition of experimental soil such as pH-7.5, moisture -1.56%, EC- 2.6 dS/m, total organic carbon 1.37% and total organic matter 2.36%. All properties were tested by SRDI before conducting this experiment. According to agronomic classification of soil salinity based on EC (Richards, 1954), the soil salinity ranges between 2-4 dS/m considered as slightly saline soil on which sensitive crops are affected. The experimental soil is under the category of slightly saline soil. In Bangladesh, coastal regions are considered as salinity zone due to the presence of soluble salt in soil.

Design and layout of the experiment

The experiment had five treatments and three replications, and it was set up using the Randomized Complete Block Design (RCBD). The size of each plot (0.92 m × 0.762 m). The total number of plots was 15 (3*5). The spaces between row to row and plant to plant were 0.15 m and 50 cm.

Land preparation

The area was prepared by repeated plowing, followed by laddering to level it. After removing all the weeds and crop debris from the previous crop, the field was finally ready. The field layout was made on January 8, 2022, following the completion of the final land preparation.

Collection of seedlings

Seedlings were collected from Noakhali. Healthy seeds were collected by the following the experiment. The size of seedlings was 15 to 20 cm.

Seedling transplantation

Healthy and uniform chilli seedlings were plucked from poly bag. Two seedlings were placed in each plot on 17. January 2022. To protect the roots and maintain the most root retention possible. In the afternoon, the transplant was performed.

Irrigation

Immediately after seeding, the plant was irrigated, and then at intervals of 5-6 days throughout the growing period. Water cane was used for irrigation, which done in the morning.

Weeding

The eradication of unwanted plants was done at intervals of 12–15 days.

Mulching

Mulching was done on the plots. Water hyacinths were used for mulching.

Fertilizer application

Every plot received the same base fertilizer dose of muriate of potash (MOP), triple super phosphate (TSP), and gypsum seven days before to transplanting.

Harvesting

Once the fruits were fully developed, the harvest was completed in the morning. When the fruits had the correct size and color, they were harvested.

Statistical analysis

Statistical analysis was carried out using an Excel data sheet and the Minitab application (Minitab 17 edition) on the data gathered for the study's various parameters.

RESULTS

Plant height (cm)

According to the results of the experiment, variety had a significant influence on plant height. The highest plant height (70.43 cm) was measured in V1 (Bijli Plus), followed by V2 (Anal 1701), V5 (Dhum), and V4 (Moti), whose height was gradually 64.87, 27.20, 26.70 cm and the smallest height (23.50 cm) was measured in V3 (Vanilla). This result is shown using in (Figure 1). (Syafuruddin et al. 2020) claimed that Lado F1 variety which has a similar trait of Bijli Plus variety revealed the longest plant height (78.14 cm) at 45 DAT.

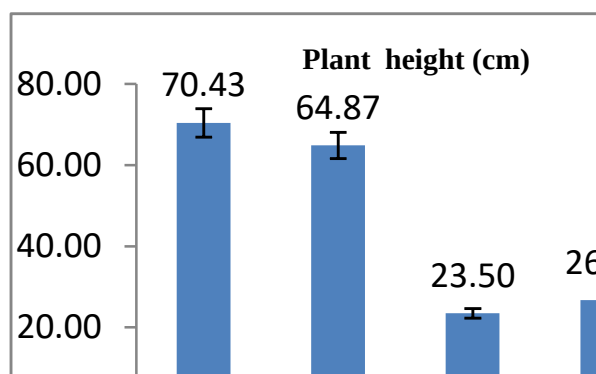


Figure 1. A comparison of plant height between various kinds of chilli

Number of Branches per plant

According to the results of the experiment, variety had a significant influence on branches per plant. The highest number of branches (21) was counted in V2 (Anal 1701), followed by V1 (Bijli Plus), V5 (Dhum), and V4 (Moti), whose height was gradually 18.33, 13.67, 10.83, and the lowest number of branch (6.5) was counted in V3 (vanilla). This result is shown using in (Figure 2). (Bahar et al. 2018) experimented on 4 chilli varieties, where highest branch number (57.33) obtained from the local variety. This result is similar to the result of the Anal 1701 variety, which is considered as local variety of coastal

area.

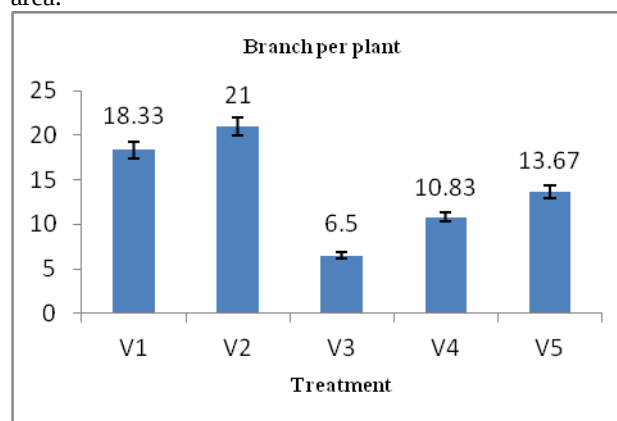


Figure 2. A comparison of the number of branches per plant between various kinds of chilli

Number of leaves per plant

According to the results of the experiment, variety had a significant influence on leaves per plant. The highest number of leaves (102.33) was counted in V2 (Anal 1701), followed by V1 (Bijli Plus), V5 (Dhum), and V4 (Moti) whose height was gradually 90.67, 45.67, 18.33, and the lowest number of leaves (15.33) was counted in V3 (Vanilla). This result is shown using in (Figure 3). (Kesumawati et al. 2020) investigated that highest number of leaves (14.44) obtained from the Bemeri chilli variety that showed an identical result of Anal 1701 chilli variety.

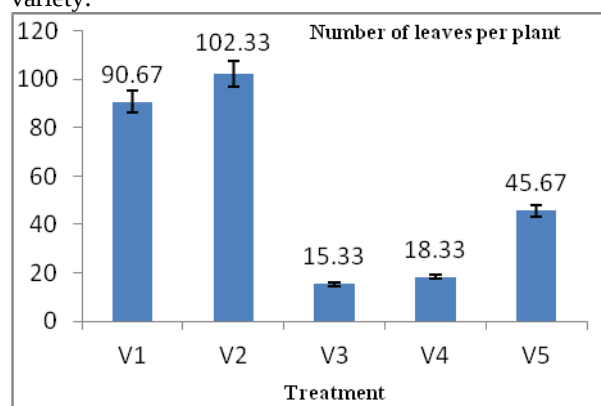


Figure 3. A comparison of number of leaves per plant between various kinds of chilli

Leaf length (cm)

According to the results of the experiment, variety had a significant influence on leaf length. The highest leaf length (9.6 cm) was measured in V1 (Bijli Plus) followed by V2 (Anal 1701), V5 (Dhum), and V3 (Vanilla) whose leaf length was gradually 8.53, 6.03, 5.97 cm, and the lowest height (5.53 cm) was measured in V4 (Moti). This result is shown using in (Figure 4). (Tsado et al. 2018) claimed that the "Atarodo" variety of chilli performed well in the case of leaf length (0.81 cm) at 6 weeks after sowing which supports the result of the Bijli Plus chilli variety.

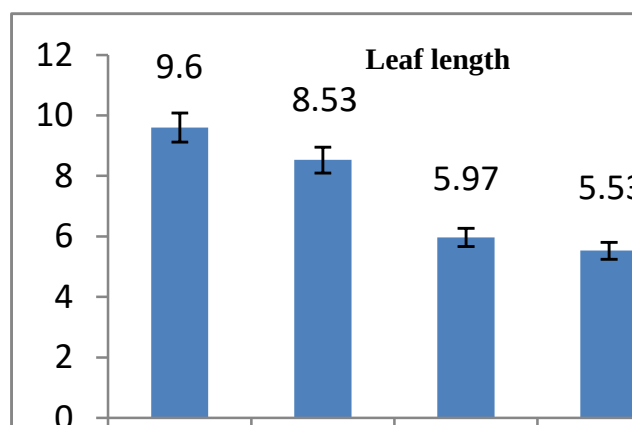


Figure 4. A comparison of leaf length between various kinds of chili

Fruit length (cm)

According to the results of the experiment, variety had a significant influence on fruit length. The highest fruit length (8.37 cm) was measured in V1 (Bijli Plus), followed by V2 (Anal 1701), V5 (Dhum), and V4 (Moti) whose height was gradually 7.5, 6.4, 5.37 cm, and the lowest fruit length (5.2 cm) was measured in V3 (Vanilla). This result is shown using in (Figure 5). According to (Naznin et al. 2023a) the longest fruit length (6.8039 cm) was recorded in the Bijli plus variety in the coastal region.

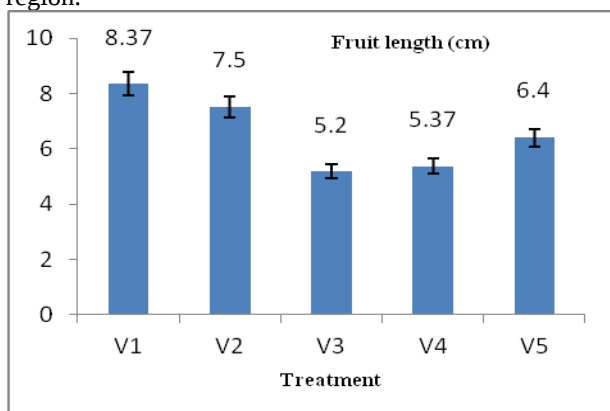


Figure 5. A comparison of Fruit length between various kinds of chilli

Number of fruits per plant

According to the results of the experiment, variety had a significant influence on number of fruits. The highest number of fruits (74.67) was measured in V1 (Bijli Plus) followed by V2 (Anal 1701), V5 (Dhum), and V4 (Moti), whose number of fruits was gradually 64.33, 52, 46.83 and the lowest fruit length (5.3) was measured in V3 (Vanilla). This result is shown using in (Figure 6). Bijli plus variety showed similar result with maximum fruit number per plant (21.742) (Naznin et al. 2023b) that is equal to the result of this experiment.

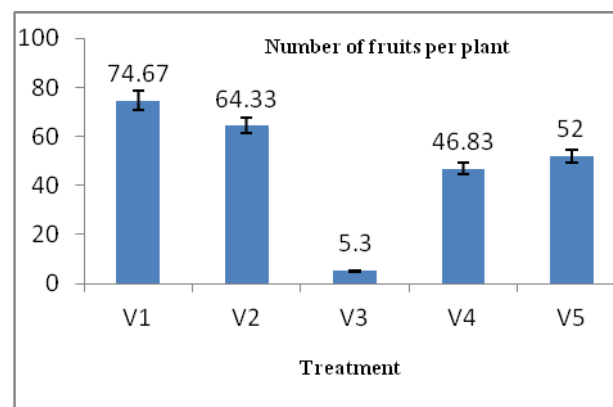


Figure 6. A comparison of number of fruits between various kinds of chilli

Number of flowers per plant

According to the results of the experiment, variety had a significant influence on number of flowers. The highest number of flowers (10.88) was measured in V1 (Bijli Plus), followed by V5 (Dhum), V2 (Anal 1701), and V4 (Moti), whose number of flowers was gradually 10.11, 9.22, 7 and the lowest fruit length (2.21) was measured in V3 (vanilla). This result is shown using in (Figure 7). A hybrid variety SAU-Cayenne showed the highest flower number per plant (151) that sharing the similar performance (Ahmad and Roni 2015).

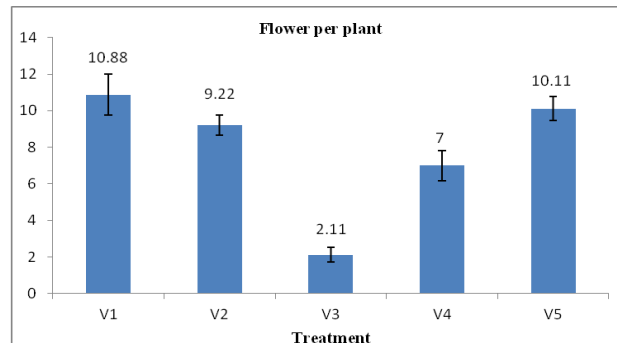


Figure 7. A comparison of number of flowers between various kinds of chilli

Yield per plot (tonh⁻¹)

According to the results of the experiment, Yield was significantly impacted by variety. The highest yield (11.98 tonh⁻¹) was measured in V1 (Bijli Plus), followed by V2 (Anal 1701), V5 (Dhum), and V4 (Moti), whose yield was gradually 8.31 tonh⁻¹, 6.44 tonh⁻¹, 4.74 tonh⁻¹, and the lowest yield (0.60 tonh⁻¹) was measured in V3 (Vanilla). This result is shown using in (Figure 8). The highest total yield (1.7815 tonh⁻¹) was harvested in Bijli Plus variety in comparison to the local variety was revealed by (Naznin et

al.2023c)

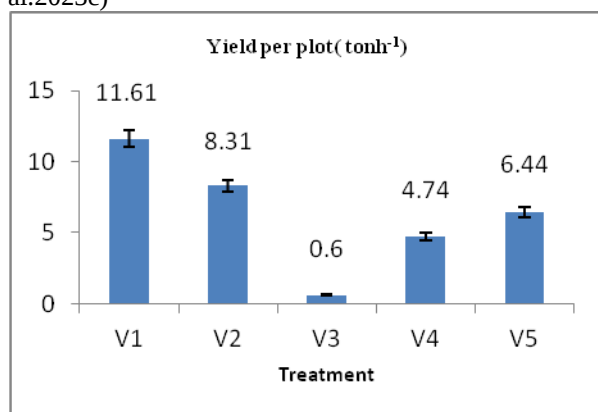


Figure 8. A comparison of yield between various kinds of chilli

DISCUSSIONS

The presented study aimed to assess the varietal performance of five chilli varieties – Bijli Plus, Anal (1701), Vanilla, Moti, and Dhum – during the Rabi season. Salinity is a significant feature of coastal areas. It is one of the everyday environmental stresses for crop production in that area. In this experiment, the Bijli plus variety, which originated from Binamorich-2 (Naznin et al. 2023d), appeared as a better-performing chili variety. According to a study (Mehedi et al. 2021), Binamorich -2 or IndoCF-25-1 showed maximum result in 76.2 cm plant height, 78.2 fruits per plant, 13.95 cm length of fruit, 31.58 ton ha⁻¹ yield in Farmers Field, Boyra, Mymensingh which are higher than our investigation result. An experiment on the hybrid chili plants concluded that the hybrid chili variety of Bangladesh SAU-Cayenne bloomed maximum flower (151.0) per plant (Ahmad and Roni 2015b). In contrast, our experiment found 10.88 flowers per plant in the hybrid variety Bijli plus. The results were lower than expected due to our experimental field's salinity stress of 2.6 dS/m. Salinity stress resulted in declined growth and yield of the chili plant. Many experiments proved that salinity reduces the plant height (Francisco et al., 2016), Branch number per plant (Mohammad and Sourì 2020a), leaf number (Francisco et al., 2016), Leaf length (Mukhtar et al. 2016), Fruit length (Mohammad and Sourì 2020b), Fruit number (Mukhtar et al. 2016a), Flower number (Mukhtar et al. 2016b) and yield (Ilahy et al. 2013) of the chili plant which support our outcome performances on chili varieties in the coastal region. Though the Bijli plus variety was excellent compared to others in our field experiment, the result could have been better if salinity was absent on that field.

CONCLUSION

The highest yield (11.98 ton/ha) was measured in V1 (Bijli Plus), followed by V2 (Anal 1701), V5 (Dhum), V4 (Moti), whose yield was gradually 8.31 ton/ha, 6.44 ton/ha, 4.74 ton/ha and the lowest yield (0.60 ton/ha) was measured in V3 (vanilla).

Our results indicate that Bijli Plus is a good variety for production in coastal areas. It has the highest plant height, the greatest number of fruit, and the high yield. In our experiment, Vanilla has a low height, the lowest number of fruit, and a low yield compared to other varieties.

Alternately, Anal (1701) performed second, then Dhum after that, Moti, with its high plant height, greatest number of fruit, and yield in these areas. It is recommended that farmers in coastal area of Bangladesh can grow Bijli Plus for its high yield and productivity.

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Conflict of Interest

There are no conflicts of interest proclaimed by the authors.

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