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Effect of NPK on Growth, Yield and Quality of Chilli

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ABSTRACT

An experiment was conducted on the topic "Effect of NPK on Growth, Yield and Quality of Chilli'' during winter season 2021-22 at the Research Field of Department of Horticulture, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj. The observations were recorded on the parameters i.e. Growth, Yield, Germination Percentage, Quality. Which included the Plant Height, Number of Branches, Flowering, Plant Spread, Germination Percentage, TSS, Fruit Color, Fruit Length, Fruit Diameter, Yield/plant, Yield/hectare, Fruit Weight. In order to achieve maximum production without lowering the quality of the chilli, A study was conducted at the Department of Horticulture, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj. Eight treatments were used in the experiment, which was set up in a Randomized Block Design and triple duplicated. Results demonstrates that the treatment (T_3) i.e. 140:90:80 NPK combination gives superior Plant height (80.83cm), A greater number of branches (9.66), Maximum number of fruits per plant (47.33), Fruit length (10.66 cm), Fruit girth (4 cm), Yield (23.95 t/ha), Gross profit (479,000.00 Rs/ha), Net profit (361,554.00 Rs/ha), B:C ratio (4.07). The level of NPK enhanced the yield, improve the input-use efficiency by the crop and can certainly lower down the expenditure on costly fertilizers to the farmers.

Keywords NPK, Germination Percentage, Yield, Growth, Quality.

INTRODUCTION

Vegetables are additional foods that offer protection and are abundant in vitamins and minerals. In addition to its economic significance, the chilli (*Capsicum annuum* L.) fruit is a staple in the world's commercial spice trade due to its high nutritional value, particularly because it is a superb source of antioxidant chemicals. The word "Chilli" is derived from the Latin word "chili" from Mexico. A crucial component in Indian curries is chili. Probably no spice is as well-known as chilli, and no other spice has become as essential to the daily diet of the vast majority of people in the globe. Originally from Southern and Central America, the chilli (*Capsicum annuum* L.) is a member of the Solanaceae family. About 20 species make up the genus *Capsicum.*

Chilli is famous for its pleasant aromatic flavor, pungency and high coloring substance. It is vegeta-

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ble as well as spice and one of the most important cash crops of India. It is used for industrial purpose due to extraction of oleoresin. Green fruit of Chilli and sweet peppers are one of the richest sources of anti-oxidants, vitamins such as Vitamin-A, C and E, these anti- oxidants in food protect occurrence of cancer and instant pain relief. One of the most expensive commercial annual spices grown in India is this one. Capsaicin is the compound that gives chillies their pungency. Despite the fact that chili is a highly prized item. Chilli has a great nutritious value. Oleoresins, which allow for a greater distribution of color and flavor in food than chili powder, have also grown in relevance in the food and beverage industries. In addition to being used as a culinary ingredient, chilli is also used for a number of medical conditions. The regular use of chillies promotes salivation, which aids in healthy blood circulation and efficient digestion. Pharmaceutical preparations and medications for heart disorders use the capsaicin derived from ripe dried fruits Deshpande (2004).

India is the world's greatest producer, user, and exporter of chillies, accounting for 25% of global area and production (1.5 mha and 7 MT, respectively). With nearly 30% of the country's total area planted with chillies, Andhra Pradesh leads all other states in production, with Karnataka (20%), Maharashtra (15%), Madhya Pradesh (10%), Orissa (9%), Tamil Nadu (8%) and other states providing the remaining 18%. During (NHB 2019–20), the production and productivity of chilli in India were 364 lakh hectares, 3851 lakh tons, and 10.57 tha^{-1}, respectively. Andhra Pradesh, Karnataka, Maharashtra, West Bengal, Rajasthan, and Madhya Pradesh are the leading chilli-growing states in India.

MATERIALS AND METHODS

At the Horticultural Research Field, Naini Agricultural Institute, Sam Higginbottom University of Agriculture Technology and Sciences, Prayagraj (25.4358° N latitude, 81.8463° E longitude), India. This experiment was conducted during the *rabi* season of 2022. The Prayagraj district is part of the subtropical zone in southeast Uttar Pradesh, which has very hot summers and moderately mild winters. The location's maximum temperature can reach 46°C to 48°C and hardly ever drops below 4°C or 5°C. The relative humidity varies from 20% to 94%. In this region, there are roughly 1013.4 mm of yearly rainfall.

The field experiment was conducted using Randomized Block Design with three replications with and laboratory experiment was conducted using Complete Randomized Design with four replications and nine treatments. The experimental field was divided into three blocks of equal size. That is of 1.5 m ×1.5 m and eight plots were there and having a spacing of 45 cm × 60 cm. Eight treatments were as follows.

T_0 NPK (120:80:80), T_1 NPK (140:70:80), T_2 NPK (120:80:80),T_3 NPK (140:90:80),T_4 NPK (100:70:80), T_5 NPK(110:80:80), T_6 NPK(120:90:80) T_7 NPK (130:60:80).

Data on growth, flowering behavior and yield contributing attributes were collected from randomly selected 5 plants for each treatment in each replication on the parameters Plant Height, Number of Branches, Flowering, Plant Spread, Germination Percentage, TSS, Fruit Color, Fruit Length, Fruit Diameter, Yield/plant, Yield/hectare, Fruit Weight. Collected data from each experiment were statistically analyzed as per design of experiment.

RESULTS AND DISCUSSION

Growth parameters

Plant height

The fastest availability of nutrients, notably nitrogen, the primary nutrient of protein for the synthesis of protoplasm, which results in cell division and cell enlargement, may be the cause of the greatest plant height seen in the treatment T_3 NPK (140:90:80) as shown in Table 1. When NPK is applied to chilli plants, it is absorbed by the leaves and moves through the plant's vascular system, where it acts on the plant cells by stimulating cell elongation and division. This can result in an increase in plant height, stem diameter, and leaf area. Similar findings were reported by Das *et al.* (2017).

Table 1. Mean performance of growth and yield parameters of chilli.

Sl. No.	Treatment	Plant height 30 days	Plant height 60 days	Plant height 90 days	Number of branches	Number of flower	Fruit length	Fruit weight	Number of fruits per plant	Fruit yield per plant (g)	Yield ha	Fruit diameter	TSS	Survival %
01	T_0	11.147	40.62	67.33	7	33.89	7	2.83	38.88	0.36	13.33	2.2	3.66	94.29
02	T_1	14.48	35.44	71.83	7	35.77	7.3	3	39.33	0.42	15.56	2.433	4.36	95.06
03	T_2	15.77	47.11	77	8.55	39.44	10.33	4.56	44.33	0.58	21.48	3.867	5.03	98.40
04	T_3	17.85	52.22	80.83	9.66	42.89	10.66	5.63	47.33	0.64	23.95	4	5.7	99.48
05	T_4	15.04	45.33	72	6.66	36.11	9	3.43	41.11	0.44	16.54	3.167	4.5	97.32
06	T_5	13.92	36.99	71.33	6.33	35.89	7.66	3.8	38.77	0.44	16.3	3.8	4.96	96.77
07	T_6	13.92	41.10	74.5	6.33	34.78	8.06	3.33	38.89	0.39	14.56	3.9	4.5	95.58
08	T_7	14.48	39.44	71.16	6.33	35.99	7.16	3.16	39.55	0.38	14.31	3.133	3.9	95.37
	F-Test	S	S	S	S	S	S	S	S	S	S	S	S	S
	SEd ±	3.90	2.67	0.92	0.44	0.71	0.80	0.25	1.198	0.014	0.52	0.143	0.15	0.90
	CD at 5%	1.00	2	2.00	1.12	3.06	1.74	0.55	2.595	0.03	1.127	0.399	0.33	1.95
	CV	0.46	0.92	1.54	8.76	4.70	11.77	8.49	3.577	3.742	3.746	6.818	4.17	1.17

Number of primary branches

A significant difference was observed when various levels of NPK were applied to different branches. The mean performance of the number of branches ranged from 6.33 to 9.66, with a mean value of 6.33. Treatment T_3-NPK (140:90:80) had the most branches, with 9.66, followed by T_2-NPK (140:80:80), with 8.55 and 6.33, respectively. Under T_5-Control, the fewest branches were noted as shown in Table1. When NPK is applied to chilli plants, it is absorbed and increase the metabolic activities which further increases the number of branches by promoting the formation of new lateral shoots and inducing the formation of floral buds. Similar findings were reported by Sharma *et al.* (2017)

Numbers of flowers

With the application of various quantities of NPK, a substantial difference in the quantity of flowers was seen. The range of the average flower performance was from 33.89 to 42.89, with a mean value of 34.78. The greatest number of flowers, 42.89, were observed during treatment T_3 - NPK (140:90:80), followed by T_2 - NPK (140:80:80), which produced 39.44 cm. The fewest flowers, 33.89, were observed under T_0 - Control as shown in Table1. Similar findings were reported by Sudarshana *et al.*(2018).

Yield parameters

Numbers of fruits

With the application of various quantities of NPK, a substantial change in the quantity of fruits was seen. The range of the mean fruit performance was 38.88 to 47.33, with a mean value of 38.77. The highest recorded number of fruits was 47.33 for treatment T_3 - NPK (140:90:80), followed by 44.33 for treatment T_2 - NPK (140:80:80), and 38.88 for treatment T_0 – Control as shown in Table1. while the remaining treatments were moderate. NPK improve the chances of successful fruit set by increasing the amount of pollen produced by the plant and improving pollination efficiency. Similar findings were reported Khan *et al.* (2014).

Fruit length

When various quantities of NPK were applied, a substantial change in fruit length was seen. Fruit lengths varied in length on average from 7 cm to 10.66 cm, with a mean of 7.16 cm. The longest fruit was measured under treatment T_3 - NPK (140:90:80) at 10.66 cm, and it was followed by T_2 - NPK (140:80:80) at 10.33 cm. The shortest fruit was measured under treatment T_0 - Control at 7 cm as shown in Table1. Similar findings were seen in Rahman *et al.* (2014)

Fruit girth

With the application of various quantities of NPK, a substantial change in fruit diameter was seen. Fruit diameters ranged from 2.2 cm to 4 cm on average, with a mean of 2.43 cm. Maximum fruit girth was reported during treatment T_3 - NPK (140:90:80) at 4 cm, followed by maximum fruit length at 2.24 cm under treatment T_2 - NPK (140:80:80) as shown in Table1.While the focus might not be solely on fruit girth, it could include observations on fruit size as part of the overall assessment similar results were seen in (Basumatary *et al.* 2014).

Fruit weight

With the administration of various quantities of NPK, a substantial variation in average fruit weight was seen. Fruits ranged in weight from 2.83g to 5.63g on average, with 3g being the mean, T_3 - NPK (140:90:80) had the largest fruit weight, 5.63 g, followed by T_2 - NPK (140:80:80), 4.56 g. Treatment T_0 - Control had the smallest fruit length, 2.83 g as shown in Table1. Similar findings were seen in (Sharma *et al.* 2017).

Yield/plant

With the application of various NPK levels, a substantial variation in yield and plant was seen. The range of the mean yield performance per plant was 0.36 kg to 0.64 kg, with a mean value of 0.38 kg. Treatment T_3 - NPK (140:90:80) recorded the highest yield per plant, 0.64 kg, followed by T_2 - NPK (140:80:80), 0.58 kg. Treatment T_0 - Control had the lowest yield per plant, 0.36 kg as shown in Table1. When applied to chilli plants, NPK can stimulate cell division and elongation, promote branching and lateral shoot growth, and delay the ripening of fruits. These effects can increase the overall size and weight of the plant, as well as the number of fruits produced. Similar findings were reported by Akther *et al.* (2016).

Yield/ha

With the application of various quantities of NPK, a substantial change in yield/ha was seen. The average production per hectare ranged from 13.3 to 23.95 tons, with a mean of 14.31 tons. The treatments with the highest yield per hectare were T_3 - NPK (140:90:80), with a value of 23.95t, and T_2 - NPK (140:80:80), with a value of 21.48t. The treatments with the lowest yield per hectare were T_0 - Control, with a value of 13.33t as shown in Table1. When applied to chilli plants, NPK can stimulate cell division and elongation, promote branching and lateral shoot growth, and delay the ripening of fruits. These effects can increase the overall size and weight of the plant, as well as the number of fruits produced. Similar findings were reported by Basumatary *et al.* (2016).

TSS

When various levels of NPK were applied to TSS, a substantial difference was seen. With a mean of 3.66, the mean performance on TSS ranged from 3.66 to 5.7. TSS was reported as having a maximum of 5.7 for treatment T_3 - NPK (140:90:80) and a minimum of 5.03 for treatment T_2 - NPK (140:80:80), with treatment T_0 - Control recording the lowest TSS (3.66). As shown in Table 1.

Survival percentage

When varied levels of NPK were applied, a substantial change in day-to-survival percentage was seen. The average performance day to survival rate ranged from 94.29 to 99.48, with a mean value of 95.6. Treatment T_3 - NPK (140:90:80) had the highest survival rate (99.48%), followed by T_2 - NPK (140:80:80), which had the second-highest survival rate (99.40%). Treatment T_0 - Control had the lowest TSS (94.29%). As shown in Table 1.

CONCLUSION

From the results of the aforementioned experiment, it can be inferred that the NPK treatment T_3 (140:90:80) was best in terms of growth, including plant height, days until first flowering, days until 50% flowering, pod setting, and number of fruits per plant, as well as yield, including average fruit weight, yield per plant, yield per hectare, and quality, including TSS and fruit color, as well as physiological parameters, including. Economics-wise, the therapies T_3, T_2, T_1, T_4, and T_5 perform better than the remaining T_0, T_6, and T_7

treatments, which perform poorly when compared to the other treatments. From all of the treatments listed above, T_3 was the most effective from every angle, followed by T_2.

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