

EFFECT OF NAPHTHALEIC ACETIC ACID (NAA) ON GROWTH AND YIELD ATTRIBUTING CHARACTERISTICS OF CHILLI (CAPSICUM ANNUM L.) CV PUSA JWALA

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Abstract

This study was conducted in field at Agricultural Research Farm, Mandhana, Rama University during February 2024 to May 2024 to study the effect of NAA on growth and yield attributing characteristics of chilli. There were 8 treatments and 3 replications laid out in Randomized Block Design. These were applied as basal application of fertilizer in this experiment. The treatment are T1, T2, T3, T4, T5, T6, T7, T8 as control NAA@ 10 ppm, NAA@ 20 ppm, NAA@ 30 ppm, NAA@ 40 ppm, NAA@ 50 ppm, NAA@ 60 ppm NAA@ 70 ppm respectively. NAA at different concentrations were applied exogenously to the chilly cultivar Pusa Jwala. The plant height of plants was measured correctly and recorded in which the treatment of T7 was highest at 120 DAT (131.25 cm). Similarly, NAA T7 treatment was maximum number of leaves per plants. The total number of leaves were found highest in T7@ NAA 60 ppm was 9.52 and followed by T4, T5 respectively. Likewise, maximum number of flower was also recorded in treatment T7 that was 32.81. The size and weight of fruit was also gives the best performance at treatment T7. The yield per hectare was 32.56 t/ha which was highest yield among other treatment. It revealed that application of different dose of NAA on chilly was found to be statistically significant.

Keywords: Naphthaleic, NAA, chilli, Capsicum annum L.

Introduction

Among the solanaceous fruit vegetables chilli (*Capsicum annum* L.) is one of the most valuable commercial vegetable as well as spice crop not only for India but also for all over the world. India is the largest producer, consumer as well as exporter of chilli in the world. In Indian cuisine it has a crucial value for imparting natural colorant and pungent taste in food stuffs. It is a rich source of vitamin A, C and E, whose role as antioxidants is well documented. Cultivation of chilli is increasing day to day due to its greater importance. Chilli is one of the exhaustive crop, therefore, it needs greater amount of nutrient application. The chemical fertilizers, of course increased the vegetable production but they decreased soil fertility, harm the environment and also cause health problems for consumers. Organic manures are excellent source of plant available nutrients and their addition to soil could maintain high microbial population and their activities (Joshi and Vig, 2010) ^[1].

Vegetables is any part of plant that is consumed by humans as food as part of a meal. Vegetables can be eaten either raw or cooked and play an important role in human nutrition being mostly low in fat and carbohydrates but high in vitamins, minerals and dietary fiber. Many nutritionists encourage people to consume plenty of vegetables spice is a see fruit, root, bark or other plant substance primarily used for flavoring, coloring or preserving food. Spices are distinguished from herbs, which are the leave, flowers, or stems from plants used for flavoring or as garnish. Sometimes spices may be ground in to a powder for convenience. Many spices have antimicrobial properties chilli (*capsicum annum* L.).

The origin of chilies is believed to be as old as 7000 B.C. used in Mexico. Chilies were grown and cultivated from 3500 BC. Mexicans used it to spice up their food. Chili was brought to the rest of the world by Christopher Columbus who discovered America in 1493. Christopher had set from Spain to reach India to bring spices such as pepper back to his country.

It belongs to the family solanaceae and genus capsicum. chilli is the third important crop of tropical America and west India and it is believed to have introduced in to India by Portuguese towards the end of fifteenth century. (Purthi, 2001) However, cultivation became popular only in the seventeenth century. Both green and dried chilies are virtually an indispensable item in the kitchen. Green chilies are excellent source of vitamins A and C. The red color of fruits at ripening stage is due to presence of pigment 'capsanthin' (Nath, 2006). The green chilies contain 'rutin' which have medicinal value and is of immense pharmaceutical need (purple glove,).

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Studies on the effect of plant growth regulators in solanaceous fruit and vegetables crops have revealed that the application of some of the plant growth regulator (NAA) has been found effect in reducing the flowers and fruit drops thereby enhancing production on chilli per unit area per unit time. The varying responses of chilli to plant growth regulators have been reported by Chattopdhayay and sen (2006) [2]. However, information regarding the effectiveness of PGR and growth and yield of chilli is meager in India. The present study was, therefore conducted with suggest concentration is imposed PGR as foliar spray to determine the effective growth regulators promoting growth and yield in commercial chilli cultivars, namely Jwala and suryamukhi. NAA improves the internal physiology of plants in terms of better supply of water, nutrients and other bio-compounds vital for their proper growth and development (Meena and Dhaka, 2003) [4] and Khurana et al. (2004) [5].

The beneficial effect of growth promoters like NAA on physiological processes of plants leads to accumulation of carbohydrates and minerals in different parts of the plants and thus resulted in

the production of more number of branches and leaves (Tamilselvi and Vijayaraghavan, 2014)^[6].

Materials and methods

The present experiment was conducted under the field of Rama University, Mandhana, Kanpur, Uttar Pradesh, India during February 2024 to May, 2024 to examine the “Effect of Naphthaleic Acetic Acid (NAA) on growth and yield attributing characteristics of chilly (*Capsicum annum* L.) PusaJwala”. Standard methods were used to conduct the research and analyze the findings of the research. The treatments are T₁, T₂, T₃, T₄, T₅, T₆, T₇, T₈ as control NAA@ 10 ppm, NAA@ 20 ppm, NAA@ 30 ppm, NAA@ 40 ppm, NAA@ 50 ppm, NAA@ 60 ppm, NAA@ 70 ppm respectively. NAA at different concentrations were applied exogenously to the chilly cultivar Pusa Jwala.

Transplanting of seedlings

The 35 days old about 15-20cm height seedlings were transplanted on last weeks of February 2022. Spacing between row to row and plant to plant were maintained as 60cm×30 cm. Transplantation was done during evening time. Watering was done immediately after transplantation. Further watering was done as per necessary.

Preparation of NAA stock solution

NAA was weighed with the help of digital balance. Four different concentrations viz. 10, 20, 30, 40, 50 ppm and 60 ppm of NAA were prepared manually with distilled water just before their use. In a 0.2 g Naphthalene Acetic Acid 2-3 ml of 1M NaOH was dissolved. Gradually 200 ml of distilled water were added. 10 ml of NAA stock solution were added to 1 L of buffer for a final concentration of 10 ppm. With same procedure concentrations of 20, 30, 40, 50, and 60 ppm solution were also prepared.

Time of NAA application: NAA was sprayed at 30 and 45 DAT days by using knapsack sprayer. In control treatment water was sprayed at the same time.

Statistical analysis: All the recorded data were tabulated on Microsoft Excel. Then the data were analyzed with the help of Genstat Fifteen Edition. The Analysis of Variance (ANOVA) in Randomized Complete Block Design (RCBD) was used to determine the level of significance. The treatment means were compared by the Least Significant Difference (LSD) test at 1% and 5% levels of probability (Gomez and Gomez, 1984; Shrestha, 2019).

Result and Discussion

Effect of different levels of NAA on plant height, number of leaves per plant, leaf width and number of branches per plant at different stage of Chilly in Kanpur, District (February –May 2024): The plant height of plants were measured correctly and recorded where the treatment of T₇ were highest at 120 DAT (131.25 cm) and followed by treatment T₄ and T₆ was 129.96 cm and 101.83 cm respectively. The minimum plant height was recorded from NAA 0 ppm was 84.29 cm. Total number of leaves per plants were counted and recorded from 30

DAT upto 120 DAT in which the treatment of NAA T₇ were maximum (NAA 60 ppm) and followed by T₅, T₃ that was 131.15 and 108.70 respectively. Similarly, treatments T₆ and T₈ were the same number of plants leaf (106.75) at 120 DAT, while the lowest number of leaf were recorded on zero amount of NAA (93.05) application. Total no of branches were also maintained in 30 days interval upto 120 DAT. The total number of leaves were found highest in T₇ @ NAA 60 ppm was 9.52 and followed by T₄, T₅ respectively. Likewise, the minimum number of branches were recorded as T₂ (NAA 10 ppm) was 5.19. total number of branches were also highest in T₇ treatments. The width of leaf were measured and recorded from 30 DAT up to 120 DAT within 30 days of interval. The maximum leaf width were recorded from treatment 7 (4.88). The leaf width was found higher in NAA 0 treatments while comparing with other treatments

Table1: Effect of different levels of NAA at different stage of Chilly in Kanpur, District (February – May 2024)

Treatment	Treatments Detail	Plant height (cm)				No. of leaves/plant				Leaf width (cm)				No. of branches/plant			
		30 DAT	60 DAT	90 DAT	120 DAT	30 DAT	60 DAT	90 DAT	120 DAT	30 DAT	60 DAT	90 DAT	120 DAT	30 DAT	60 DAT	90 DAT	120 DAT
T ₁	NAA 0 ppm	24.01	32.6	46.01	84.29	61.11	66.5	76.11	93.05	2.93	3.49	4.13	4.11	4.23	5.01	3.85	6.62
T ₂	NAA 10 ppm	25.33	34.8	55.33	86.57	65.91	70.49	85.91	99.02	2.73	3.02	4.5	4.17	4.45	5.92	4.45	5.19
T ₃	NAA 20 ppm	27.35	35.8	67.35	93.59	76.89	79.85	86.89	108.7	2.73	3.15	4.2	3.97	5.51	6.91	5.51	6.21
T ₄	NAA 30 ppm	26.22	33.7	66.22	129.96	81.57	85.63	81.57	102.02	2.55	2.96	3.92	3.75	4.93	5.31	4.98	8.65
T ₅	NAA 40 ppm	26.87	31.6	76.87	98.23	91.89	111.74	121.89	131.15	2.85	3.13	3.78	3.67	5.53	6.03	6.53	7.78
T ₆	NAA 50 ppm	28.34	31.3	58.34	101.83	73.21	78.91	91.21	106.75	3.13	3.48	4.24	4.17	5.75	5.97	6.75	5.86
T ₇	NAA 60 ppm	29.11	38.9	83.11	131.02	101.78	131.89	141.78	166.35	3.38	3.9	4.79	4.88	6.45	8.58	8.95	9.52
T ₈	NAA 70 ppm	27.18	35.3	77.18	98.25	61.01	72.74	61.1	106.75	2.89	3.08	3.82	3.67	4.58	7.74	4.58	6.16
	CD	3.56	3.02	2.19	1.28	2.28	2.62	2.77	3.15	0.22	0.32	0.36	0.24	1.43	1.17	2.04	2.52
	S.Em	0.22	0.81	0.89	0.75	0.51	0.34	0.42	0.82	0.06	0.08	0.09	0.06	0.21	0.84	0.34	0.64

Effect of different levels of NAA number of flowers/plant, fruit breadth, number of fruits/plant, fruit length, single fruit weight, yield per plant, total yield and germination Percentage at different stage of Chilly in Kanpur, District (February–May 2024): The total no of fruit count and recorded from the period of production to harvesting. The maximum number of fruit were recorded on T₇(NAA60ppm) was recorded 38.54 and the minimum number of fruit was recorded as T₁ (NAA 0ppm). The length of fruits were recorded to the 30 days up to 120 days of interval of harvesting period where treatment of NAA was applied plant was seen maximum on T₇ (NAA 60 ppm) and the minimum length was recorded in T₆(NAA 50 ppm) that was 5.20 cm. Fruit breath was measured and recorded from the period of production and seen maximum on T₇(NAA60ppm)were 0.93 cm while T₁ treatments (zero NAA application) were recorded as lowest breadth of fruit. All data shows that fruit yield per plant were observed quiet similar in every treatment. The highest yield per plant were recorded form T₇(145.98) whereas, the minimum yield was recorded from T₂ (NAA 10 ppm), seems to be lowest result 134.52. The single fruit weight were also measured and recorded. The highest weight of fruit were obtained from NAA 60ppm that was 2.71 while the lowest single weight of fruit were recorded in treatment₃(2.13). The data indicates that yield were observed quiet similar in every treatment, Thus the total yield, data where treatment of NAA was applied plant was seen maximum onT₇ (NAA 60ppm) highest was recorded 32.56t/ha and the minimum was recorded as T₃ (NAA 20 ppm) was seems to be lowest resulting 26.34 t/ha. The total germination percentage was observed and recorded. It seems that every treatment result same percentage of germination, where treatment of NAA was applied plant was seen maximum on T₇ (NAA 60 ppm) highest was recorded 74.63 percentage and theminimum was recorded as T₁ (NAA 0 ppm) was seems to be lowest resulting 61.10 germination percentage.

Table2:Effect of different levels of NAA at different stage of Chilli in Kanpur, District (February –May 2024)

		Noofflowers/pl ant				Fruit Breath(Cm)	No off ruit s	FruitLen gth (Cm)	Fruit Breath(Cm)	Yield PerP lant	singlef ruitwe ight(g)	Yiel d (T/H a)	Germin ation %
Trea tm ent	Treatme ntsDet ail	30 DA T	60 DA T	90 DA T	120 DA T								
T ₁	NAA0pp m	28. 92	31.6	24. 96	25.0 1	6.35	27.73	7.01	0.74	141.2	2.21	27.7	61.1
T ₂	NAA10p pm	28. 53	32.8	21. 55	25.1 6	6.39	31.31	7.56	0.79	134.5	2.3	29.3	67.6
T ₃	NAA20p pm	25. 33	28.7	23. 36	26.9 5	6.42	28.43	7.41	0.81	137.3	2.13	26.3	62.4

T ₄	NAA30p pm	29.47	34.7	26.48	30.1	6.45	29.44	6.73	0.87	142.5	2.43	28.9	63.9
T ₅	NAA40p pm	27.03	31.6	25.06	24.83	6.46	35.56	7.91	0.88	137.8	2.35	31.6	72.3
T ₆	NAA50p pm	26.86	30.8	26.86	26.31	6.21	33.21	5.2	0.9	143.7	2.62	29.4	72.6
T ₇	NAA60p pm	30.13	37.3	28.31	32.81	6.59	38.54	9.91	0.93	146	2.71	32.6	74.6
T ₈	NAA70p pm	29.1	33.3	23.18	28.72	6.4	33.41	8.53	0.83	140	2.13	28.3	67.9
	CD	4.59	3.06	3.42	2.91	0.38	1.65	2.31	0.19	11.5	0.58	1.65	0.39
	S.Em	1.21	0.85	0.69	0.11	0.17	0.41	0.51	0.02	2.31	0.21	0.37	0.21

Conclusion

The report showed that overall yield and yield attributing character was maximum in treatment T₇ (NAA 70 ppm) and minimum in T₁ (0 ppm). This result shows that there is a effect of naphthaleic acetic acid (NAA) on growth and yield attributing characteristics of chilli (*Capsicum annuum* L.), Pusa Jwala as increase in concentrations of the NAA then there will be higher yield.

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