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Effect of plant growth regulators on growth, yield and quality of pointed gourd (*Trichosanthes dioica* Roxb.)

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Abstract

A field experiment was conducted during rabi 2024-2025 at Horticulture Research Farm, Faculty of Agricultural Sciences and Allied Industries, Rama University, Kanpur (U.P.), Kanpur. The experiment was laid out in Randomized Block Design with ten treatments each replicated thrice on the basis of one year experimentation. The treatments which are T₀Control, T₁GA₃ 50 ppm, T₂GA₃ 75 ppm, T₃GA₃ 100 ppm, T₄NAA 100 ppm, T₅NAA 150 ppm, T₆NAA 200 ppm, T₇2,4,D 25 ppm, T₈2,4,D 50 ppm and T₉2,4,D 75 ppm are used. The results showed that application of T₃GA₃ 100 ppm was recorded highest plant growth, yield and quality of pointed gourd as compared to other treatments. It also recorded highest gross return, net return (Rs. ha⁻¹) and benefit cost ratio.

Keywords: PGR, growth, yield, quality and pointed gourd

Introduction

Pointed gourd (*Trichosanthes dioica* Roxb) is one of the most profitable and nutrient dense summer crops. It is a fruit-type vegetable that is dioecious and vegetatively propagated. It has 11 basic chromosomes (2n=2x=22). Kumar and Singh (2012)^[8]. An annual or perennial herb found in tropical Asia and Australia belongs to the genus *Trichosanthes* in the family Cucurbitaceae. According to Kirtikar Basu (2001)^[7]. In India and Bangladesh, it is known by the names parwal, patal, palwal, parmal, parora and patola (Pandit and Hazara, 2008)^[9]. It is famed as the “King of Gourds” because of its vast diversity and advanced nutritional content than any other cucurbits (Saha *et al.*, 2004; Yadav *et al.*, 2022)^[10, 15]. It was recently introduced in and around the Hyderabad and Bangalore areas (Bhardwaj, 2011; Yadav *et al.*, 2022)^[1, 15]. Farmers believe it to be a highly profitable vegetable crop because it is one of the most popular cucurbits among consumers (Kumar and Singh, 2012)^[8]. In India (2021-22), it is cultivated in an area about 63,260 ha with production of 7,58,530 metric tonnes & productivity of 12 t/ha (Ministry of Agriculture and Farmers Welfare). Farmers consider Pointed gourd to be a highly profitable vegetable because it is one of the most popular cucurbits in this region (Agro-climatic Zone III in Bihar) and it is mostly grown by small and marginal farmers due to its low cost of production, high return and suitability for riverbed cultivation (Bhattacharjee and Dhua, 2018)^[2]. Due to its well-established dioecism, vegetative modes of multiplication and perennial nature, the Pointed gourd is physically unique from other species of cucurbits. A female: male ratio of 9:1 is ideal for highest fruit set (Singh and Whitehead, 1999)^[12]. Seed propagation has become obsolete due to cross pollination, poor germination, delayed seedling growth, segregation of male and female plants, more than 40% maleness, difficulties differentiating the sex of plants before blooming, late fruiting and low fruit yield (Venkataravanappa *et al.*, 2022)^[14]. The problem can be defeated by exogenous application of PGRs. PGRs directly affect male and female flower ratio, fruit set, fruit drop and ultimately effects yield. Therefore, the use of PGRs like NAA, Ethrel and GA₃ in bottle gourd may become an important tool for yield increase as well as timely harvest. Sharma revealed that spray of NAA increased vine length, female flowers and yield in bottle gourd. Ethrel is used for more number of female flowers due to its property of better development of gynoecium, fruit ripening, stress induction, lateral cell expansion. The increase in female flowers, fruit and yield in bottle gourd with application of Ethrel has been reported by Belhelkar. GA₃ are responsible for shoot growth by enhancing cell elongation and cell division.

Materials and Methods

The experiment was conducted in the Horticulture Research Farm, Faculty of Agricultural Sciences and Allied Industries, Rama University, Kanpur (U.P.), Kanpur during 2024-2025. The farm is situated at 20°16' North latitude and 80°08' East longitude in the southwestern plains of Uttar Pradesh. It sits at an altitude of 180 meters above sea level, falling within the subtropical zone. The field was effectively leveled, equipped with adequate irrigation and drainage facilities. Prior to the current study, any stubble from the previous crop and weeds were manually removed from the field. The site is situated within the alluvial belt of the Indo-Gangetic central plain zone of Uttar Pradesh, falling within agro-climatic zone-V. Typically, the climate is semi-arid, characterized by hot, dry summers and moderate to severe cold winters. The average annual rainfall ranges from 800 to 900 mm, with a mean annual precipitation of approximately 818 mm. Rainfall primarily occurs during the monsoon season from June to the last week of September, with occasional frost and showers during the winter season from the North- East monsoon in December and January. The experiment was laid out in a Randomized Block Design with 10 treatments and replicated thrice. The treatment consisted of T₀ Control, T₁ GA₃ 50 ppm, T₂ GA₃ 75 ppm, T₃ GA₃ 100 ppm, T₄ NAA 100 ppm, T₅ NAA 150 ppm, T₆ NAA 200 ppm, T₇ 2,4, D 25 ppm, T₈ 2,4, D 50 ppm and T₉ 2,4, D 75 ppm. The Rajendra Parwal 1 was used for the experiment. There were 30 plots measuring 5 m × 4m. Well matured healthy cuttings of local cultivar of pointed gourd procured from the progressive farmer of Kanpur district were transplanted at the spacing 1.5 m x 1m. Rooted vine cuttings of 15-20 cm length, pencil thickness were planted. A space of 30 centimetres was uniformly left from the borders of the plot. Observations recorded along with procedure adopted during the course of investigation are given below. Randomly, five plants were selected from net plot of each treatment and tagged for recording observation. The data recorded during the course of investigation were subjected to statistical analysis as per method of analysis of variance.

Results and Discussion

The growth, yield and quality of pointed gourd were recorded as affected by different levels of plant growth regulator viz., (GA₃, NAA and 2,4,D), is furnished in Table 1: The vine length, number of branches per plant was influenced by foliar application of different levels of plant growth regulator the result was found to be in significant. The maximum vine length (315.12), number of branches per plant (11.32) and number of nodes per vine (107.90) was observed in the treatment (T₃) with GA₃ 100 ppm followed by treatment T₂ GA₃ 75 ppm, T₁ GA₃ 50 ppm, T₉ 2,4, D 75 ppm, T₈ 2,4,D 50 ppm and T₇ 2,4,D 25 ppm. The vine length, number of branches per plant and number of nodes per vine was found to be minimum (182.46 cm), (4.39) and (42.64) in the treatment (T₀) control. The node at which first flower appeared and nod days to 1st female flowering initiation was influenced by foliar application of different levels of plant growth regulator the result was found to be in significant. The minimum node at which first flower appeared (6.50) and nod days to 1st female flowering initiation (47.44) was observed in the treatment (T₃) with GA₃ 100 ppm followed by treatment T₂ GA₃ 75 ppm, T₁ GA₃ 50 ppm, T₉ 2,4,D 75 ppm, T₈ 2,4,D 50 ppm and T₇ 2,4,D 25 ppm. The node at which first flower appeared and nod days to 1st female flowering initiation was found to be maximum (12.27 and 62.80) in the treatment (T₀) control. This is might be due to application of GA₃ induces early flowering. Similar findings found by Shukla *et al.* (2023)^[11] in ridge gourd.

This is due to application of GA₃ induces early flowering. Similar result was there in Farhana (2015)^[4] in cucumber. The days to first harvest was influenced by foliar application of different levels of plant growth regulator the result was found to be in significant. The minimum days to first harvest (51.69) was observed in the treatment (T₃) with GA₃ 100 ppm followed by treatment T₂ GA₃ 75 ppm, T₁ GA₃ 50 ppm, T₉ 2,4,D 75 ppm, T₈ 2,4,D 50 ppm and T₇ 2,4,D 25 ppm. The days to first harvest was found to be maximum (72.91) in the treatment (T₀) control. The number of fruits/plant was influenced by foliar application of different levels of plant growth regulator the result was found to be in significant. The maximum number of fruits/plant (230.95) was observed in the treatment (T₃) with GA₃ 100 ppm followed by treatment T₂ GA₃ 75 ppm, T₁ GA₃ 50 ppm, T₉ 2,4,D 75 ppm, T₈ 2,4,D 50 ppm and T₇ 2,4,D 25 ppm. The number of fruits/plant was found to be minimum (176.33) in the treatment (T₀) control. This is due to application of GA₃ suppresses the male flowers and promote the female flowers which results in a greater number of fruit set there by increasing the number of fruits. Similar findings found by Jishnu *et al.* (2023)^[5] in sponge gourd and Vadigeri *et al.* (2001)^[13] in cucumber. The average fruit weight (g) was influenced by foliar application of different levels of plant growth regulator the result was found to be in significant. The maximum average fruit weight (g) (29.46) was observed in the treatment (T₃) with GA₃ 100 ppm followed by treatment T₂ GA₃ 75 ppm, T₁ GA₃ 50 ppm, T₉ 2,4,D 75 ppm, T₈ 2,4,D 50 ppm and T₇ 2,4,D 25 ppm. The average fruit weight (g) was found to be minimum (16.63) in the treatment (T₀) control. During early stages of fruit development GA₃ directly or indirectly influences the cell number, size and density. The results are in agreement with the findings of Jishnu *et al.* (2023)^[5] in sponge gourd., and Kadi *et al.* (2018)^[6] in cucumber. The fruit length (cm) and fruit diameter (cm) was influenced by foliar application of different levels of plant growth regulator the result was found to be in significant. The maximum fruit length (cm) (6.28) and fruit diameter (cm) (4.31) was observed in the treatment (T₃) with GA₃ 100 ppm followed by treatment T₂ GA₃ 75 ppm, T₁ GA₃ 50 ppm, T₉ 2,4,D 75 ppm, T₈ 2,4,D 50 ppm and T₇ 2,4,D 25 ppm. The fruit length (cm) and fruit diameter (cm) was found to be minimum (3.80 and 3.12) in the treatment (T₀) control. This may be due to higher photosynthesis and respiration occurs in treated plants compared to control (water spray). The similar results were reported by Jishnu *et al.* (2023)^[5] in sponge gourd, and Kadi *et al.* (2018)^[6] in cucumber. The fruit yield per plant (kg), fruit yield per plot (kg) and fruit yield (t ha⁻¹) was influenced by foliar application of different levels of plant growth regulator the result was found to be in significant. The maximum fruit yield per plant (kg) (6.80), fruit yield per plot (kg) (88.43) and fruit yield (t ha⁻¹) (45.35) was observed in the treatment (T₃) with GA₃ 100 ppm followed by treatment T₂ GA₃ 75 ppm, T₁ GA₃ 50 ppm, T₉ 2,4,D 75 ppm, T₈ 2,4,D 50 ppm and T₇ 2,4,D 25 ppm. The fruit yield per plant (kg), fruit yield per plot (kg) and fruit yield (t ha⁻¹) was found to be minimum (2.93, 38.113 and 19.55) in the treatment (T₀) control. The increasing fruit yield per plot is GA₃ might be due to the consequence of GA₃ on cell elongation, stimulated RNA and protein synthesis and better diversion of food material towards fruit. Similar result found by Dalai *et al.* (2016)^[3] in cucumber. The probable reason for increased fruit yield by GA₃ treatment may be due to increased fruit set percent, fruit weight, length and diameter of fruits ultimately produced the highest yield. Similar result was found by Dalai *et al.* (2016)^[3] in cucumber. The TSS (° Brix) and Ascorbic acid (mg/100 g) were recorded as affected by different levels of plant growth regulator

viz., (GA₃, NAA and 2,4,D), is furnished in Table1. The TSS (° Brix) and ascorbic acid-(mg/100g of fruit pulp) was influenced by foliar application of different levels of plant growth regulator the result was found to be in significant. The maximum TSS (° Brix) (3.78) and Ascorbic acid (mg/100 g) (28.91) was observed

in the treatment (T₃) with GA₃ 100 ppm followed by treatment T₂ GA₃ 75 ppm, T₁ GA₃ 50 ppm, T₉ 2,4,D 75 ppm, T₈ 2,4,D 50 ppm and T₇ 2,4,D 25 ppm. The TSS (° Brix) and Ascorbic acid (mg/100 g) was found to be minimum (3.09 and 26.09) in the treatment (T₀) control.

Table 1: Effect of plant growth regulators on growth, yield and quality of pointed gourd (*Trichosanthes dioica* Roxb.)

	Vine length (cm)	Number of branches per plant	Number of nodes per vine	Node at which first flower appeared	Days to 1st female flowering initiation	Days to first harvest	Number of fruits/plant	Average fruit weight (g)	Fruit length (cm)	Fruit diameter (cm)	Fruit yield per plant (kg)	Fruit yield per plot (kg)	Fruit yield (t ha ⁻¹)	TSS (° Brix)	Ascorbic acid (mg/100 g)
T ₀ Control	182.46	4.39	42.64	12.27	62.80	72.91	176.33	16.63	3.80	3.12	2.93	38.13	19.55	3.09	26.09
T ₁ GA ₃ 50 ppm	292.94	9.45	96.94	7.44	51.90	57.42	223.12	26.04	5.83	4.16	5.81	75.55	38.74	3.67	28.66
T ₂ GA ₃ 75 ppm	306.79	10.68	102.48	7.00	49.30	54.08	226.64	27.80	6.09	4.23	6.30	81.93	42.01	3.73	28.80
T ₃ GA ₃ 100 ppm	315.12	11.32	107.90	6.50	47.44	51.69	230.95	29.46	6.28	4.31	6.80	88.43	45.35	3.78	28.91
T ₄ NAA 100 ppm	275.37	6.51	79.21	8.59	57.42	64.57	208.16	20.40	4.86	3.77	4.25	55.19	28.30	3.38	28.05
T ₅ NAA 150 ppm	262.04	5.53	73.64	9.07	58.74	66.40	204.81	19.38	5.16	3.70	3.97	51.59	26.45	3.34	27.70
T ₆ NAA 200 ppm	245.39	5.13	67.94	9.33	60.49	67.94	202.07	19.12	5.19	3.55	3.86	50.24	25.76	3.27	27.50
T ₇ 2,4,D 25 ppm	281.01	8.01	82.04	8.44	55.97	62.41	211.96	21.27	5.37	3.85	4.51	58.61	30.05	3.41	28.16
T ₈ 2,4,D 50 ppm	286.52	8.09	83.90	8.09	55.23	61.35	215.26	22.00	5.52	3.89	4.74	61.57	31.57	3.51	28.34
T ₉ 2,4,D 75 ppm	289.94	8.31	91.91	7.86	53.67	59.55	218.49	23.91	5.73	4.08	5.22	67.91	34.82	3.62	28.51
F-Test	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
S.Ed. (+)	2.496	0.140	1.888	0.110	0.484	0.695	1.310	0.551	0.064	0.032	0.136	1.768	0.907	0.026	0.071
C.D. at (0.5%)	5.244	0.295	3.967	0.230	1.017	1.460	2.752	1.157	0.134	0.067	0.286	3.174	1.905	0.055	0.148

Conclusion

On the basis of present findings it is concluded that, the application of GA₃ 100 ppm with T₃ treatment was best in plant growth, yield and quality of pointed gourd.

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