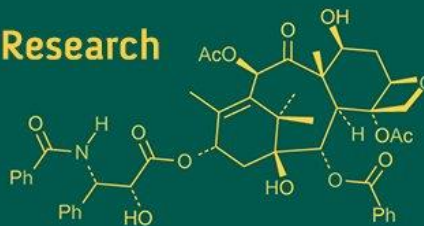


International Journal of Advanced Biochemistry Research



ISSN Print: 2617-4693
ISSN Online: 2617-4707
NAAS Rating (2026): 5.29
IJABR 2026; SP-10(6): 762-765
www.biochemjournal.com
Received: 01-04-2026
Accepted: 03-05-2026

Suraj Kumar
M.Sc. (Ag.) Horticulture
(Vegetable Science), Faculty of
Agricultural Sciences and
Allied Industries, Rama
University, Mandhana,
Kanpur, Uttar Pradesh, India

Jitendra Kumar
Assistant Professor,
Horticulture (Vegetable
Science), Faculty of
Agricultural Sciences and
Allied Industries, Rama
University, Mandhana,
Kanpur, Uttar Pradesh, India

Corresponding Author:
Jitendra Kumar
Assistant Professor,
Horticulture (Vegetable
Science), Faculty of
Agricultural Sciences and
Allied Industries, Rama
University, Mandhana,
Kanpur, Uttar Pradesh, India

Effect of plant growth regulators on growth, yield and quality of cabbage (*Brassica oleracea* var. Capitata)

Suraj Kumar and Jitendra Kumar

DOI: <https://www.doi.org/10.33545/26174693.2026.v10.i6Si.8700>

Abstract

A field experiment entitled “Effect of Plant Growth Regulators on Growth and Yield of Cabbage (*Brassica oleracea* var. capitata)” was conducted during 2025-2026 at the Agriculture Research Farm, Rama University, Mandhana, Kanpur (U.P.), and India. The experiment was laid out in a Randomized Block Design (RBD) with nine treatments and three replications. The treatments consisted of different concentrations of GA₃ and NAA applied as foliar spray at 30 DAT. Among all the treatments, T₇ (NAA @ 100 ppm foliar spray at 30 DAT) recorded the best performance in terms of growth, yield and quality parameters. It showed maximum plant height (34.38 cm), number of leaves per plant (17.84), leaf length (28.34 cm), leaf width (20.54 cm), plant spread (45.78 cm), head diameter (11.54 cm), stalk length (5.98 cm), average head weight (1.78 kg), yield per hectare (5.70 t ha⁻¹), TSS (7.54 °Brix), and highest benefit-cost ratio (2.12). The earliest head initiation (42.54 days) and head maturity (68.54 days) were also recorded in T₇. The results revealed that application of NAA @ 100 ppm significantly enhanced vegetative growth, yield and quality of cabbage compared to other treatments and control. Therefore, NAA @ 100 ppm may be recommended for commercial cultivation of cabbage under Kanpur agro-climatic conditions.

Keywords: Cabbage, plant growth regulators, GA₃, NAA, yield, quality, economics

Introduction

Cabbage (*Brassica oleracea* var. capitata) is one of the most important cole vegetable crops belonging to the family Brassicaceae. It is widely cultivated throughout India due to its nutritional value, adaptability, and economic importance. Cabbage is rich in vitamins A, B, and C, minerals, proteins, carbohydrates and antioxidants. It is consumed both as cooked and raw vegetable in salads and various culinary preparations. Plant growth regulators (PGRs) play a vital role in regulating physiological and biochemical activities in plants. Among different PGRs, gibberellic acid (GA₃) and naphthalene acetic acid (NAA) are extensively used for improving vegetative growth, head formation, yield and quality in vegetable crops. GA₃ promotes cell elongation, stem growth and leaf expansion, whereas NAA enhances root development, nutrient absorption and overall plant growth. The balanced application of plant growth regulators can significantly improve cabbage productivity by enhancing photosynthesis, nutrient translocation, and metabolic activities. Therefore, the present investigation was undertaken to evaluate the effect of different concentrations of GA₃ and NAA on growth, yield and quality of cabbage under Kanpur conditions.

Materials and Methods

The present investigation was conducted during 2025-2026 at the Agriculture Research Farm, Rama University, Mandhana, Kanpur (U.P.), India. The experimental soil was sandy loam in texture with good drainage facilities. The experiment was laid out in Randomized Block Design (RBD) with three replications. The cabbage variety used in the experiment was Pride of India. Nine treatments consisting of different concentrations of GA₃ and NAA were evaluated. The treatments were:-T₀ - Control, T₁ - GA₃ @ 50 ppm (foliar spray at 30 DAT), T₂ - GA₃ @ 75 ppm (foliar spray at 30 DAT), T₃ - GA₃ @ 100 ppm (foliar spray at 30 DAT), T₄ - GA₃ @ 125 ppm (foliar spray at 30 DAT), T₅ - NAA @ 50 ppm (foliar spray at 30 DAT), T₆ - NAA @ 75 ppm (foliar spray at 30 DAT), T₇ - NAA @ 100 ppm (foliar spray at 30 DAT), T₈ - NAA @ 125 ppm (foliar spray at 30 DAT)

Results and Discussion: Growth Parameter

Table 1: Effect of Plant Growth Regulators on Growth Characters of Cabbage

Symbol	Plant Height 45 DAT (cm)	Plant Height 60 DAT (cm)	No. of Leaves 45 DAT	No. of Leaves 60 DAT	Leaf Length (cm)	Leaf Width (cm)	Plant Spread (cm)
T ₀	23.36	26.68	11.08	14.64	24.12	17.32	42.01
T ₁	25.48	29.45	11.85	16.02	25.56	18.30	43.12
T ₂	27.24	31.32	12.34	16.78	26.84	19.04	43.82
T ₃	28.82	32.12	12.66	16.54	27.24	19.52	44.66
T ₄	29.78	33.62	13.24	17.52	27.66	20.18	45.52
T ₅	26.54	30.48	12.04	16.64	26.38	18.68	43.50
T ₆	27.94	31.78	12.52	16.16	27.12	19.24	44.44
T ₇	30.54	34.38	13.68	17.84	28.34	20.54	45.78
T ₈	29.14	32.54	12.98	17.01	27.48	19.76	45.16
C.D.	1.30	1.24	0.44	0.59	1.50	0.76	1.93
SEm (±)	0.43	0.41	0.15	0.20	0.50	0.25	0.64

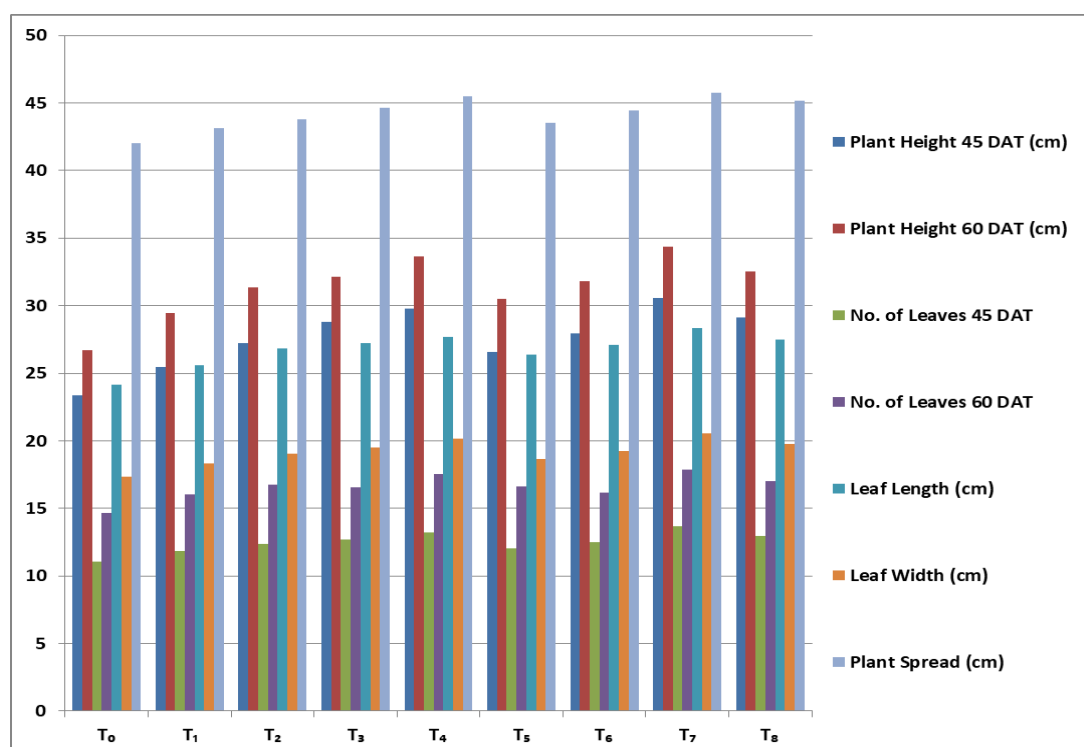


Fig 1: Effect of Plant Growth Regulators on Growth Characters of Cabbage

Plant Height

Significant differences among treatments were observed for plant height at 45 and 60 days after transplanting. The maximum plant height at 45 days (30.54 cm) and 60 days (34.38 cm) was recorded in T₇ (NAA @ 100 ppm), followed by T₄ and T₈. The minimum plant height was recorded in control treatment (T₀). The increased plant height under NAA treatment might be due to enhanced cell elongation, increased nutrient uptake and stimulation of physiological activities. Similar findings were reported by several researchers in cabbage and other cole crops.

Number of Leaves per Plant

The highest number of leaves per plant at 45 DAT (13.68) and 60 DAT (17.84) was observed in T₇ (NAA @ 100 ppm), while the lowest number of leaves was recorded in control. Enhanced vegetative growth under NAA might be attributed

to increased photosynthetic activity and better nutrient utilization.

Leaf Length and Width

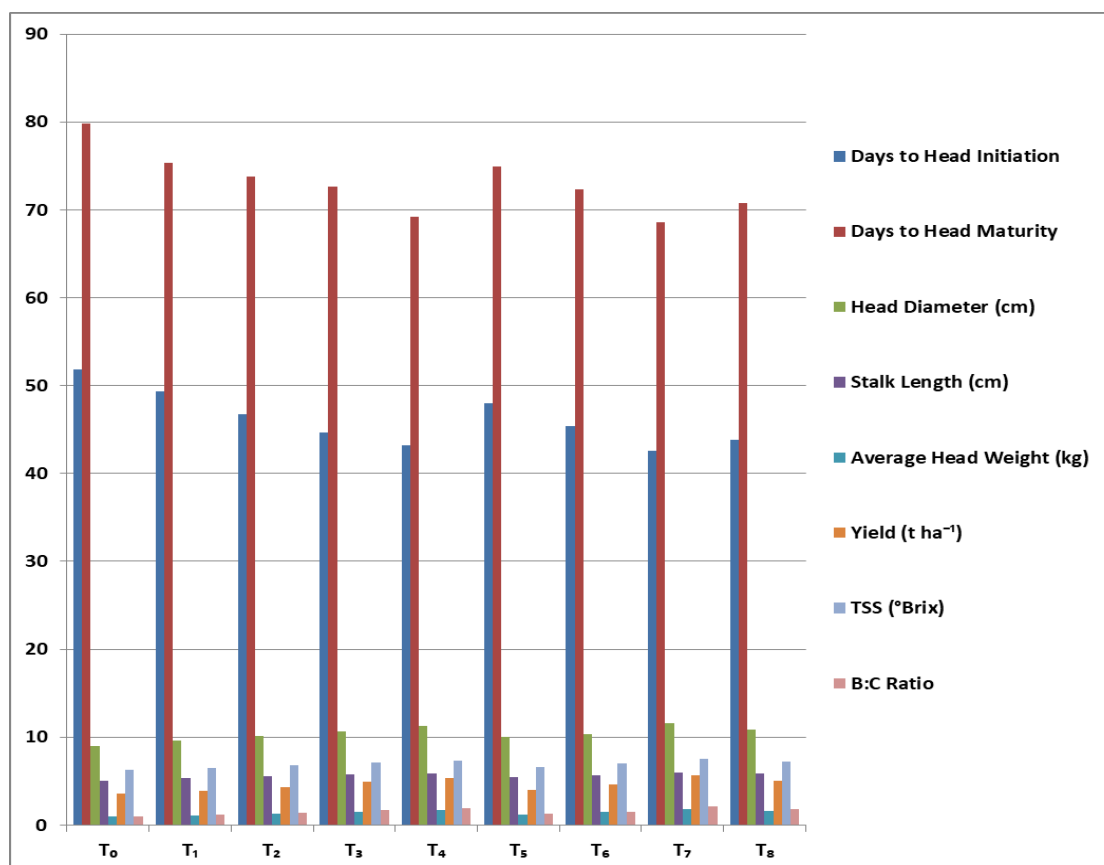
The maximum leaf length (28.34 cm) and leaf width (20.54 cm) were recorded in T₇, followed by T₄ and T₈. The minimum values were observed under control treatment. The application of NAA improved vegetative growth due to enhanced metabolic activities and cell enlargement.

Plant Spread: The maximum plant spread (45.78 cm) was recorded in T₇ followed by T₄ (45.52 cm). The minimum plant spread (42.01 cm) was observed in control treatment. Increased plant spread may be due to vigorous vegetative growth promoted by NAA application.

Yield Parameters

Table 2: Effect of Plant Growth Regulators on Yield and Quality Characters of Cabbage

Symbol	Days to Head Initiation	Days to Head Maturity	Head Diameter (cm)	Stalk Length (cm)	Average Head Weight (kg)	Yield (t ha ⁻¹)	TSS (°Brix)	B:C Ratio
T ₀	51.82	79.82	9.01	5.02	1.02	3.58	6.26	1.02
T ₁	49.34	75.34	9.64	5.34	1.12	3.92	6.48	1.16
T ₂	46.78	73.78	10.14	5.55	1.34	4.32	6.84	1.44
T ₃	44.65	72.65	10.64	5.76	1.52	4.96	7.14	1.68
T ₄	43.18	69.18	11.24	5.90	1.70	5.40	7.32	1.96
T ₅	47.96	74.96	9.98	5.44	1.22	4.04	6.62	1.28
T ₆	45.38	72.38	10.34	5.68	1.48	4.64	6.98	1.54
T ₇	42.54	68.54	11.54	5.98	1.78	5.70	7.54	2.12
T ₈	43.82	70.82	10.88	5.84	1.64	5.06	7.24	1.82
C.D.	2.44	3.96	0.45	0.26	0.07	0.20	0.32	0.07
SEm (±)	0.82	1.32	0.15	0.09	0.02	0.07	0.11	0.02

**Fig 2:** Effect of Plant Growth Regulators on Yield and Quality Characters of Cabbage**Days to Head Initiation and Maturity**

The earliest head initiation (42.54 days) and head maturity (68.54 days) were recorded in T₇. Early head formation under NAA treatment may be attributed to enhanced physiological efficiency and accelerated growth processes.

Diameter of Head and Stalk Length

The maximum head diameter (11.54 cm) and stalk length (5.98 cm) were recorded under T₇. Better head development under NAA treatment might be due to increased carbohydrate accumulation and nutrient translocation.

Average Head Weight and Yield

The highest average head weight (1.78 kg) and yield per hectare (5.70 t ha⁻¹) were recorded in T₇, followed by T₄ and T₈. The minimum yield was recorded in control. The higher yield under T₇ may be attributed to increased vegetative growth, larger head size, and enhanced photosynthetic activity.

Quality Parameter**TSS (°Brix)**

The highest TSS (7.54 °Brix) was recorded in T₇ followed by T₄ (7.32 °Brix). The minimum TSS (6.26 °Brix) was recorded in control. Increased TSS indicates improved quality and accumulation of soluble solids due to better metabolic activities.

Economics: The maximum benefit-cost ratio (2.12) was recorded in T₇, followed by T₄ (1.96). The minimum B:C ratio (1.02) was observed in control treatment. The higher economic return under T₇ was mainly due to increased yield and improved quality.

References

1. Bose TK, Som MG, Kabir J. Vegetable Crops. Kolkata: Naya Udyog; 2002.
2. Choudhury B. Vegetables. New Delhi: National Book Trust; 1996.

3. Kumar S, Sharma RR. Effect of plant growth regulators on growth and yield of cabbage. *Vegetable Science*. 2010;37(2):142-145.
4. Singh AK, Singh VB, Singh RK. Influence of GA₃ and NAA on growth and yield of cabbage. *Indian Journal of Horticulture*. 2012;69(3):413-416.
5. Yadav RK, Patel PK, Singh HK. Effect of plant growth regulators on growth and yield of cabbage. *International Journal of Agricultural Sciences*. 2015;11(2):240-244.
6. Thapa U, Rai R, Prasad VM. Influence of plant growth regulators on vegetative growth and yield of cabbage. *Asian Journal of Horticulture*. 2013;8(1):123-126.
7. Taiz L, Zeiger E. *Plant Physiology*. USA: Sinauer Associates Inc.; 2010.
8. Pandey SN, Sinha BK. *Plant Physiology*. New Delhi: Vikas Publishing House Pvt. Ltd.; 2006.