

International Journal of Advanced Biochemistry Research



ISSN Print: 2617-4693
ISSN Online: 2617-4707
NAAS Rating (2026): 5.29
IJABR 2026; SP-10(8): 2554-2557
www.biochemjournal.com
Received: 08-05-2026
Accepted: 12-06-2026

Shelke Rushikesh Ramdas
PG Scholar, Horticulture
Section (Vegetable Science),
College of Agriculture, Nagpur,
Dr. Panjabrao Deshmukh
Krishi Vidyapeeth, Akola,
Maharashtra, India

Dr. Ramakant P Gajbhiye
Associate Professor of
Horticulture, College of
Agriculture, Nagpur,
Maharashtra, India

Dr. RI Khobragade
Assistant Professor of
Horticulture Section, College of
Agriculture, Nagpur,
Maharashtra, India

Dr. Yogesh B Dharmik
Assistant Professor Regional
Fruit Research Station, Katol,
Dist. Nagpur, Maharashtra,
India

Kadam Aditya Mahadeo
PG Scholar, Horticulture
Section, College of Agriculture,
Nagpur, Maharashtra, India

Corresponding Author:
Shelke Rushikesh Ramdas
PG Scholar, Horticulture
Section (Vegetable Science),
College of Agriculture, Nagpur,
Dr. Panjabrao Deshmukh
Krishi Vidyapeeth, Akola,
Maharashtra, India

Effect of foliar application of humic acid and potassium nitrate on growth of okra

Shelke Rushikesh Ramdas, Ramakant P Gajbhiye, RI Khobragade, Yogesh B Dharmik and Kadam Aditya Mahadeo

DOI: <https://www.doi.org/10.33545/26174693.2026.v10.i8Sac.9785>

Abstract

The present investigation entitled “Effect of foliar application of humic acid and potassium nitrate on growth, yield and quality of okra” was conducted during the year 2025-2026 at the Research Field of Bhajiwadi, Horticulture Section, College of Agriculture, Nagpur. The experiment was laid out in a Factorial Randomized Block Design (FRBD) with three replications comprising sixteen treatment combinations involving four levels of humic acid, viz., control, 1%, 2% and 3%, and four levels of potassium nitrate, viz., control, 1%, 1.5% and 2%. The observations were recorded on growth parameters of chilli.

Among the different treatment combinations, foliar application of 1% humic acid + 1.5% potassium nitrate recorded superior performance for the growth parameters, viz., plant height, plant spread, number of branches plant⁻¹, number of internodes on main stem and internodal length. The same treatment combination also recorded early emergence of the first flower and minimum days required to 50 percent flowering. Thus, foliar application of 1% humic acid in combination with 1.5% potassium nitrate was found to be the most promising treatment for improving growth and promoting early flowering in okra under the conditions of the present investigation.

Keywords: Okra, humic acid, potassium nitrate, foliar application, growth and flowering

Introduction

Okra (*Abelmoschus esculentus* L. Moench), belonging to the family Malvaceae, is an important vegetable crop cultivated widely in tropical and subtropical regions. It is commonly known as bhendi or lady's finger and is primarily grown for its tender edible green pods. Okra is valued for its nutritional and economic importance and is extensively cultivated in India as well as in other major okra-growing regions of the world. The tender pods are rich in vitamins, minerals, fibre and other nutritional constituents and are consumed as a vegetable in various forms. The crop also has considerable commercial and export potential.

Humic acid is an important component of organic matter and has been reported to improve plant growth by influencing physiological processes and enhancing nutrient availability and uptake. It can promote cell division and elongation and may improve the translocation of nutrients within the plant. Potassium nitrate (KNO₃) is a readily available source of nitrogen and potassium. Nitrogen promotes vegetative growth, while potassium plays an important role in enzyme activation, water regulation, photosynthesis, translocation of assimilates, fruit development and produce quality.

Foliar application of humic acid and potassium nitrate may therefore improve nutrient utilization and physiological efficiency, resulting in better vegetative growth, flowering, fruit development, yield and quality of okra. However, the response of the crop may vary with the concentration and combination of foliar-applied nutrients, cultivar and prevailing environmental conditions. Hence, identification of suitable concentrations and combinations of humic acid and potassium nitrate is essential for obtaining optimum crop performance. Therefore, the present investigation entitled “Effect of foliar application of humic acid and potassium nitrate on growth, yield and quality of okra (*Abelmoschus esculentus* L.) cv. PDKV Pragati”. was undertaken to evaluate their effect on growth, yield and quality attributes of okra and to identify suitable foliar application treatments for improved crop productivity.

Materials and Methods

The present investigation entitled “Effect of foliar application of Humic acid and potassium nitrate on growth, yield and quality of okra” was carried out during the kharif season of the year 2025-26 at the Experimental Unit, Horticultural Section, College of Agriculture, Nagpur.

The experiment was laid out in a Factorial Randomized Block Design with Factor (A) comprising four concentration of Humic acid [H₁-Water spray (Control), H₂-1%, H₃-2% and H₄-3%] and Factor (B) comprising four concentration of potassium nitrate [P₁-water spray (Control), P₂-1%, P₃-1.5%, P₄-2%], with sixteen treatment combinations replicated thrice.

The experiment was carried out on a flat bed with a gross plot size of 3.6 m × 3 m. Healthy seeds were sown in the main field at a spacing of 60 cm × 45 cm. The recommended dose i.e. 100:50:50 NPK kg ha⁻¹ of fertilizers while, half dose of N and full dose of P & K and reaming N was uniformly applied to all the experimental plots to supply essential nutrients. Observations on vegetative growth parameters, viz., plant height, plant spread, branches plant⁻¹, number of internode on main stem, internodal length, days to first flower emergence, and 50 percent flowering were recorded.

Results

Growth parameters

Effect of Humic acid

Foliar application of Humic acid significantly influenced the vegetative growth of okra. Humic acid significantly influenced plant height, plant spread and number of branches on main at 60 and 90 DAS. The maximum plant height was recorded with 1% humic acid (H₂), measuring 85.40 cm at 60 DAS and 151.20 cm at 90 DAS, whereas the minimum (121.10 cm) was observed under water spray at 90 DAS. at 60 and 90 DAS. The highest plant spread was recorded with 1% humic acid (H₂), with 39.77 cm at 60 DAS and 46.89 cm at 90 DAS, while the lowest (35.21) was recorded with water spray (H₁) at 90 DAS.

Number of branches plant⁻¹ at 60 and 90 DAS. The maximum number of branches was recorded with 1% humic acid (H₂), i.e. 7.00 at 60 DAS and 8.40 at 90 DAS, compared with 5.50 and 6.80, respectively, under water spray. number of internodes at 50% flowering. The maximum number of internodes (10.30) was recorded with 1% humic acid (H₂), followed by 2% and 3% humic acid, while the minimum (8.69) was recorded under water spray. The maximum internodal length (10.52 cm) was recorded with 1% humic acid (H₂), followed by 2% (10.39 cm) and 3% (10.23 cm), whereas the minimum (9.29 cm) was recorded under water spray.

Days to first flower emergence significantly influenced flowering. The earliest first flower emergence (39.61 days) was recorded with 1% humic acid (H₂), whereas the latest

(41.94 days) was recorded under water spray. The earliest 50% flowering (46.09 days) was recorded with 1% humic acid (H₂), followed by 2% (46.63 days) and 3% (46.75 days), while the latest (47.83 days) was recorded under water spray.

Effect of potassium nitrate

Potassium nitrate significantly influenced plant height, plant spread and number of branches on main stem at 60 and 90 DAS. The maximum plant height was recorded with 1.5% potassium nitrate (P₃), with 83.76 cm at 60 DAS and 150.68 cm at 90 DAS, whereas the minimum was recorded under water spray.

At 60 and 90 DAS the highest plant spread was recorded with 1.5% potassium nitrate (P₃), measuring 37.74 cm at 60 DAS and 46.81 cm at 90 DAS, while the lowest was observed under water spray. at 60 and 90 DAS The maximum number of branches was recorded with 1.5% potassium nitrate (P₃), with 7.15 and 8.44 branches plant⁻¹, respectively, whereas the minimum was recorded under water spray. the number of internodes on the main stem, with the highest number recorded under 1.5% potassium nitrate (P₃) and the lowest under water spray. The highest mean internodal length (10.41 cm) was recorded with 1.5% potassium nitrate (P₃), followed by 1% and 2% potassium nitrate (10.05 cm each), while the lowest (9.78 cm) was observed under water spray.

The minimum number of days (39.76 days) was recorded with 1.5% potassium nitrate (P₃), followed by 1% (40.21 days) and 2% (40.74 days), while the maximum (42.37 days) was recorded under water spray. The earliest 50% flowering (45.28 days) was recorded with 1.5% potassium nitrate (P₃), followed by 1% (46.45 days) and 2% (47.51 days), whereas the latest (48.04 days) was observed under water spray.

Interaction effect

The interaction between Humic acid and potassium nitrate significantly influenced plant height, plant spread and number of branches at 90 DAS and number of internode, internodal length at 50 percent flowering and first flower emergence and 50 percent flowering of okra. The application of 1% humic acid and 1.5% potassium nitrate at 90 DAS (H₁P₃) recorded the maximum plant height (156.74 cm), whereas the maximum plant spread (51.40 cm) was obtained with 1% humic acid and 1.5% potassium nitrate at 90 DAS and maximum number of branches (9.71) was recorded. The earlier first flower emergence (38.42 days) was recorded with 1% humic acid and 1.5% potassium nitrate.

Performance of these treatment combinations may be attributed to complementary effect of optimum humic acid concentration and potassium nitrate application.

Table 1: Effect of humic acid and potassium nitrate on plant height of okra.

Treatments	Plant height (cm) (90 DAS)	Plant spread (cm) (90 DAS)	No. of branches on main stem (90 DAS)	No. of internode at 50% flowering	Internodal length (cm)	First flower emergence	50% flowering
Humic acid (H)							
H1-Water spray	121.10	35.21	6.80	8.69	9.29	40.86	47.83
H2-1%	151.20	46.89	8.36	10.30	10.52	39.61	46.09
H3-2%	147.10	46.83	8.10	10.21	10.39	40.68	46.63
H4-3%	143.50	45.36	7.70	10.26	10.23	41.94	46.75
F' test	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.
SE (m)±	2.11	1.23	0.13	0.16	0.14	0.50	0.17
CD at 5%	6.33	3.54	0.37	0.47	0.42	1.45	0.50
Potassium nitrate (P)							
P1-water spray	136.00	39.84	7.31	9.48	9.79	42.37	48.04
P2-1%	141.32	43.63	7.70	9.92	10.05	40.21	46.45
P3-1.5%	147.38	46.81	8.44	10.18	10.41	39.76	45.28
P4-2%	138.17	44.00	7.70	9.59	10.05	40.74	47.51
F' test	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.
SE (m)±	2.11	1.23	0.13	0.16	0.14	0.50	0.17
CD at 5%	6.33	3.54	0.37	0.47	0.42	1.45	0.50
Interaction effect (H x P)							
F' test	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.
SE (m)±	4.22	2.46	0.26	0.33	0.18	1.00	0.35
CD at 5%	12.18	7.09	0.75	0.95	0.54	2.90	1.01

Table 2: Interaction effect of humic acid and potassium nitrate on growth of okra.

Treatments	Plant height (cm) (90 DAS)	Plant spread (cm) (90 DAS)	Number of branches (90 DAS)	Number of internode on main stem	Internodal length (cm)	First flower emergence	50% flowering
T ₁ -H1P1	117.65	33.29	6.20	7.61	8.79	44.12	48.98
T ₂ -H1P2	120.26	35.47	6.89	8.96	9.28	39.47	47.57
T ₃ -H1P3	127.20	37.29	7.21	9.26	9.84	39.77	46.63
T ₄ -H1P4	119.31	34.81	6.86	8.92	9.23	40.10	48.14
T ₅ -H2P1	146.72	43.67	7.84	10.16	10.09	41.43	47.13
T ₆ -H2P2	153.42	47.31	8.24	10.32	10.61	39.00	45.98
T ₇ -H2P3	156.74	51.40	9.71	10.94	10.71	38.42	44.14
T ₈ -H2P4	147.92	45.16	7.72	9.79	10.42	39.60	47.09
T ₉ -H3P1	141.26	42.35	7.77	10.12	10.12	41.70	47.92
T ₁₀ -H3P2	147.12	46.18	8.05	10.27	10.33	40.87	46.59
T ₁₁ -H3P3	154.91	50.21	8.90	10.90	10.65	38.95	44.75
T ₁₂ -H3P4	145.13	48.59	7.69	9.53	10.31	41.20	47.25
T ₁₃ -H4P1	138.39	40.06	7.48	10.03	10.15	42.24	48.13
T ₁₄ -H4P2	144.49	45.58	7.63	10.16	10.00	41.53	45.67
T ₁₅ -H4P3	150.68	48.35	7.97	10.74	10.44	41.92	45.61
T ₁₆ -H4P4	140.33	47.46	7.60	10.12	10.27	42.09	47.58
F' test	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.
SE (m)±	4.22	2.46	0.26	0.33	0.18	1.00	0.34
CD at 5%	12.18	7.09	0.75	0.95	0.54	2.90	1.02

Humic acid application may have improved plant growth by enhancing nutrient availability, root development and physiological activity, thereby promoting greater plant height, plant spread and number of branches in okra. Potassium nitrate, being a readily available source of nitrogen and potassium, may have enhanced photosynthetic activity, cell division and assimilate translocation, resulting in improved vegetative growth and early flowering. The combined application of humic acid and potassium nitrate at optimum concentrations may have promoted better nutrient uptake and utilization, leading to improved growth attributes, reduced days to first flower emergence and enhanced flowering.

Conclusion

From the present investigation, it can be concluded that foliar application of humic acid and potassium nitrate significantly improved the growth and flowering performance of okra.

Among the treatment combinations, 1% humic acid + 1.5% potassium nitrate (H₂P₃) was found to be the most effective, recording maximum plant height, plant spread, number of branches, number of internodes and internodal length, along with earlier first flower emergence and 50 percent flowering. Thus, H₂P₃ was identified as the most promising treatment for improving growth and promoting early flowering in okra under the conditions of the present investigation.

References

- Haider N, Alam M, Muhammad H, Gul I, Haq SU, Hussain S, *et al.* Effect of humic acid on growth and productivity of okra (*Abelmoschus esculentus*) cultivars. Pure and Applied Biology. 2017;6(3):932-941.
- Kirn A, Kashif SR, Yaseen M. Using indigenous humic acid from lignite to increase growth and yield of okra

- (*Abelmoschus esculentus* L.). Soil and Environment. 2010;29(2):187-191.
- 3 Kumar P, Rana DK, Singh V, Shah KHN. Effect of humic acid on growth, yield and quality of okra (*Abelmoschus esculentus* L. Moench) cv. Arka Anamika under subtropical conditions of Garhwal Himalaya. International Journal for Innovative Research in Science & Technology. 2015;1(8):151-155.
 - 4 Maurya A, Yadava LP, Singh J, Singh SP, Srivastava D. Effect of foliar application of humic acid on growth and yield of okra (*Abelmoschus esculentus* L.). Advances in Research. 2025;26(2):333-339. doi:10.9734/air/2025/v26i21299.
 - 5 Mulla SAR, Dasar GV, Biradar IB, Math KK, Venugopal CK, Gaddanakeri SA. Influence of humic acid and fulvic acid on growth and yield of okra. International Journal of Research in Agronomy. 2025;8(7):1218-1229. doi:10.33545/2618060X.2025.v8.i7p.3360.
 - 6 Mulla SAR, Dasar GV, Biradar IB, Math KK, Venugopal CK, Gaddanakeri SA. Influence of foliar application of humic and fulvic acids on yield and nutrient uptake by okra (*Abelmoschus esculentus* L.) under different nutrient management practices. Journal of Farm Sciences. 2025;38(3). doi:10.61475/JFS.2025.v38i3.11.
 - 7 Kumar M, Reddy AH, Rattan P, Pathania A. Influence of priming and irrigation intervals on growth and fruit yield of okra [*Abelmoschus esculentus* (L.) Moench]. Journal of Eco-friendly Agriculture. 2023;18(1):43-50. doi:10.5958/2582-2683.2023.00008.4.
 - 8 Adheena KM, *et al.* Optimizing pre-sowing treatments for the enhanced growth, fruit yield, and seed quality in *Abelmoschus esculentus* L. Moench. International Journal of Plant & Soil Science. 2024;36(2):53-62.