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Akash R
M.Sc (Agri) Scholar, Department of Soil Science, ZAHRS, Navile, Shivamogga, Karnataka, India

Thippeshappa GN
Professor of Soil Science and Agricultural Chemistry, College of Agriculture, Navile, Shivamogga, Karnataka, India

Anjali M C
Assistant Professor of Soil Science, College of Agriculture, Mandya, Karnataka, India

Nandish M S
Professor, Department of Agricultural Microbiology, College of Agriculture, Navile, Shivamogga, Karnataka, India

Basavalingaiah
Associate Professor of Agronomy, ICAR-KVK, V.C. Farm Mandya, Karnataka, India

Corresponding Author:
Thippeshappa GN
Professor of Soil Science and Agricultural Chemistry, College of Agriculture, Navile, Shivamogga, Karnataka, India

Foliar nutrition of water soluble potassium from banana pseudostem on growth, yield and quality of tomato

Akash R, Thippeshappa GN, Anjali MC, Nandish MS and Basavalingaiah

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Abstract
A pot culture experiment was conducted at the College of Agriculture, Navile, Shivamogga, during the *rabi* 2024–25 to evaluate the effect of foliar fertilization using water-extractable potassium (We-K) obtained from banana pseudostem on tomato plant growth, yield and quality parameters. The study comprised eleven treatments in completely randomized design with three replications, integrating foliar sprays of 1–4 per cent We-K concentrations with reduced K fertilizer dose. Results revealed that foliar potassium significantly enhanced vegetative growth, yield and quality attributes compared to RDF alone. The treatment recieving 100% RDF + 4% We-K foliar spray recorded maximum plant height (124.67 cm), fruit yield (2.43 kg plant^{-1}) and superior fruit quality in terms of lycopene (4.27 mg 100 g^{-1}), total soluble solids (4.77°Brix), ascorbic acid (33.68 mg 100 g^{-1}) and extended shelf life (19.5 days). The study concludes that water-extracted potassium from banana pseudostem offers a sustainable, cost-effective and eco-friendly alternative to conventional K fertilizers for enhancing tomato productivity and quality.

Keywords: Tomato, foliar fertilization, water-extractable potassium, banana pseudostem, fruit quality, sustainable nutrient management

Introduction
Tomato (*Solanum lycopersicum* L.) is one of the most important vegetable crops worldwide due to its nutritional, economic and industrial significance. It is rich in vitamins, minerals, antioxidants and bioactive compounds such as lycopene, making it a vital component of human diets. Globally, tomato occupies a prominent position in area and production. In India, area under tomato reported during 2023-24 was 8.71 lakh ha (21.52 lakh acres), tomato production in 2023-24 is 213.20 lakh tonnes and a productivity of roughly 24.4 metric tonnes per hectare.
Potassium (K) is a critical macronutrient in tomato production, influencing photosynthesis, enzyme activation, translocation of assimilates, water relations and stress tolerance. Adequate K supply improves fruit yield, size, firmness, total soluble solids and lycopene content, thereby enhancing both productivity and quality.
Crop residues and agro-industrial by products contain appreciable quantities of water-soluble K that can be harnessed through simple extraction methods. Banana pseudostem, in particular, has been reported to release substantial amounts of readily available potassium, making it a promising organic source. Foliar application of such water-extracted K solutions offers the advantage of direct nutrient absorption by leaves, bypassing soil fixation processes, and enabling quick correction of deficiencies. Hence the present investigation was undertaken to evaluate the effect of foliar fertilization of water-extractable potassium from different organic residues on plant growth, fruit yield and fruit quality parameters of tomato under controlled conditions.

Materials and Methods
Experimental Site and Crop
The experimental site located at College of Agriculture, Navile, Shivamogga which comes under the Southern Transitional Zone of Karnataka (Agro-climatic Zone - VII).
The experiment was conducted under pot culture conditions during *rabi* 2024-25. Tomato (Saaho hybrid) was used as the test crop.

Organic Residue Collection and Extract Preparation

Banana pseudostem residues wastes were collected from local farm fields.

Water extraction method (as described by Reddy and Veeranki, 2013) [17]:

To evaluate the impact of extraction variables on water-extractable K, finely ground and dried samples of crop residues were extracted with distilled water employing a range of sample-to-water (w/v) dilution ratios and shaking periods. The treatments consisted of combinations of four sample-to-water (w/v) ratios *viz.*, 1:60, 1:80, 1:100 and 1:120 and three shaking periods *viz.*, 10, 20 and 30 min with three replications. In the present investigation 0.5 g weighed finely ground (<0.5 mm) and dried (60 ^{0}C) plant powder sample was taken into a 250-ml Erlenmeyer flask and distilled water was added to the flask to get the required extraction ratios. The contents of the flask subjected for shaking on a reciprocating shaker and filtered through filter paper (grade 1). The extracted sample preserved for K determination.

Experimental Design and Treatments

The experiment was laid out in a Completely Randomized Design (CRD) with eleven treatments and three replications.

T_1	Absolute Control
T_2	100% RDF
T_3	100% RD N, P + 75% RDK
T_4	T_2 + 1% water extract K from banana pseudostem as foliar spray
T_5	T_2 + 2% water extract K from banana pseudostem as foliar spray
T_6	T_2 + 3% water extract K from banana pseudostem as foliar spray
T_7	T_2 + 4% water extract K from banana pseudostem as foliar spray
T_8	T_3+ 1% water extract K from banana pseudostem as foliar spray
T_9	T_3 + 2% water extract K from banana pseudostem as foliar spray
T_{10}	T_3 + 3% water extract K from banana pseudostem as foliar spray
T_{11}	T_3 + 4% water extract K from banana pseudostem as foliar spray

Planting and Crop Management

The experiment was carried out in an open ventilated polyhouse in pots. The pots are filled with soil of 10 -12 kg in 15 kg capacity pots. The soil sample was collected before imposition of treatments and analyzed for different physical and chemical properties. The result of the analysis is given in Table 1.

One month-old tomato seedling were planted one for all the pots. The recommended dose of nutrients for tomato used was 250 kg N, 250 kg P_2O_5 and 250 kg K_2O kg ha^{-1}. Nitrogen and phosphorus were applied through urea and DAP, while potash was applied using sulphate of potash (SOP) as per treatments. The foliar spray of water extracted K from the banana pseudostem was applied to the plants at 30 and 60 days after transplanting with different concentrations as mentioned in treatment details. Standard agronomic practices and plant protection management were followed uniformly across treatments.

Table 1: Initial properties of soil used for pot culture experiment

Physical properties	Value
Sand (%)	73.15
Silt (%)	16.55
Clay (%)	10.30
Textural class	Sandy loam
Chemical properties	
pH (1:2.5)	5.62
Electrical conductivity (dSm^{-1} @ 25 ^{0}C) (1:2)	0.43
Organic carbon (g kg^{-1})	4.10
Available macro nutrients status	
Available N (kg ha^{-1})	207.28
Available P_2O_5 (kg ha^{-1})	75.22
Available K_2O (kg ha^{-1})	197.79
Exchangeable Ca [cmol (p^{+}) kg^{-1}]	3.45
Exchangeable Mg [cmol (p^{+}) kg^{-1}]	1.45
Available S (mg kg^{-1})	21.65

Data recorded

Observations were recorded at different growth stages for growth parameters *viz.*, plant height, number of branches per plant and number of leaves per plant.

Observation on yield parameters *viz.*, number of fruits per plant, individual fruit weight, fruit diameter and fruit yield per plant were recorded.

Observation on quality parameters *viz.*, total soluble solids (TSS), ascorbic acid content, lycopene content and shelf life of fruits.

Fisher's method of analysis of variance was adopted for statistical analysis and interpretation of the data. The treatments were tested at five per cent levels of significance.

Results and Discussion

Growth parameters

Plant height

Scrutiny of data indicated that there was no significant variation in plant height of tomato at 30 DAT. At 60 DAT the treatment T_7 (100% RDF + 4% We-K from banana pseudostem as foliar spray) recorded the highest plant height (122.33 cm) (Table 2). The maximum plant height (124.67 cm) was recorded in T_7 at harvest which was significantly superior to almost all treatments, followed by T_6 (119.67 cm). The treatments T_2 (110.33 cm), T_4 (110.33 cm), T_5 (111.67 cm) and T_{10} (108.67 cm) were on par with each other. Whereas treatment T_1 recorded the lowest plant height (98.33 cm).

At 30 DAT, no significant differences in plant height were observed among the treatments. However, from 60 DAT onwards, the influence of foliar potassium became statistically significant. The tallest plants at harvest were recorded in T_7 (124.67 cm), followed by T_6 (119.67 cm). The increase in plant height with foliar application of We-K due to potassium role in promoting cell expansion, osmotic regulation and photosynthate translocation as reported by and Mengel and Kirkby, 2001 [13]. The significant response at 60 DAT and harvest stages implies that foliar potassium becomes increasingly important during the reproductive phase, when root absorption may be less efficient due to soil moisture or other stress conditions. The increase in plant height may be due to more availability of nutrient in soil and more uptake of nutrients and root growth. (Mercy *et al.*, 2014) [14].

Number of Branches per plant

There was a significant difference found in the number of branches of tomato at 30 DAT. The maximum number of branches per plant of tomato was recorded in treatment T_7 supplied with 100 per cent RDF + 4 per cent We-K from banana pseudostem as foliar spray at all growth stages (12.33, 22.67 and 24.67 at 30, 60 DAT and harvest, respectively). The treatments T_6 was on par with T_7. At the same time, the treatment received 100 per cent RDF alone (T_2) recorded 12.00, 17.33 and 18.67 branches per plant at 30, 60 DAT and harvest, respectively. While, the lowest number of branches per plant was observed in the T_1 treatment (8.67, 14.33 and 16.00 at 30, 60 DAT and harvest, respectively) at all the growth stages.

The branching pattern in tomato showed a clear positive response to foliar potassium application (Table 2). The maximum number of branches at harvest was recorded in T_7 (24.67), followed by T_6 (23.00) and T_{11} (19.33). In contrast, the T_2 (100% RDF) had lower branches (18.67) when compared with T_7, the control treatment (T_1) had the fewest branches (16.00). Potassium influences the synthesis and transport of auxins and cytokinins, which regulate shoot branching and apical dominance (Cakmak, 2005) [4]. Notably, T_7 and T_6 treatments not only supplied basal potassium *viz.*, RDF but also provided an additional foliar boost, ensuring consistent K availability throughout the crop cycle. These results align with the findings of Subramanian *et al*. (2005) [20] who observed increased shoot branching in tomato and chilli under foliar potassium treatments. Similar results were observed by Shukla *et al*. (2021) [18] in which different concentrations at doses foliar spray treatment were used as the tool of application.

Table 2: Effect of foliar fertilization of water extractable potassium from banana pseudostem on growth parameters of tomato

Treatments	Plant Height (cm)			Number of Branches			Number of Leaves		
	30 DAT	60 DAT	At Harvest	30 DAT	60 DAT	At Harvest	30 DAT	60 DAT	At Harvest
T_1 - Absolute control	39.49	87.67	98.33	8.67	14.33	16.00	63.33	67.00	54.67
T_2 - 100% RDF	50.81	100.67	110.33	12.00	17.33	18.67	72.33	84.00	65.00
T_3 - 100% RD N, P + 75% RDK	47.77	94.67	103.67	10.33	15.67	16.33	69.33	74.33	57.67
T_4 - T_2+ 1% FS of We-K from BPS	49.42	102.33	110.33	12.00	17.67	19.33	75.33	86.33	62.33
T_5 - T_2+ 2% FS of We-K from BPS	50.02	103.00	111.67	12.00	18.00	19.67	70.67	88.00	65.00
T_6 - T_2+ 3% FS of We-K from BPS	50.82	115.67	119.67	12.33	21.33	23.00	76.00	102.00	78.67
T_7 - T_2+ 4% FS of We-K from BPS	50.94	122.33	124.67	12.33	22.67	24.67	75.00	109.67	83.67
T_8 - T_3+ 1% FS of We-K from BPS	46.52	95.33	105.00	10.33	15.67	17.67	69.33	75.33	57.67
T_9 - T_3+ 2% FS of We-K from BPS	46.73	96.33	105.33	10.67	16.00	18.00	65.33	77.67	58.00
T_{10} - T_3+ 3% FS of We-K from BPS	47.52	102.33	108.67	10.33	16.67	18.67	72.33	88.67	64.67
T_{11} - T_3+ 4% FS of We-K from BPS	47.68	106.33	110.33	10.67	17.67	19.33	72.33	95.33	74.00
S. Em±	2.28	1.70	1.74	0.28	0.38	0.50	1.87	2.25	1.73
CD (p=0.05)	NS	4.96	5.09	0.81	1.11	1.47	5.46	6.58	5.06

FS - foliar spray; We-K – Water extractable Potassium; BPS – Banana pseudostem; RDF – Recommended dose of fertilizers; DAT – days after transplanting; RDK –Recommended dose of potassium; RD N, P - Recommended dose of nitrogen and phosphorous; NS – Non significant

Number of leaves per plant

There was a significant difference found in the number of leaves of tomato at 30 DAT. The maximum number of leaves per plant of tomato recorded in the treatment

T_7 (100% RDF + 4% We-K from banana pseudostem as foliar spray) at all growth stages with the values 75.00, 109.67 and 83.67 at 30, 60 DAT and harvest, respectively. At the same time, the treatment received only 100 per cent RDF (T_2) recorded 72.33, 84.00 and 65.00 leaves per plant at 30, 60 DAT and harvest, respectively. While, the lowest number of leaves per plant was observed in the T_1 treatment (Absolute control) with values of 63.33, 67.00 and 54.67 at 30, 60 DAT and harvest, respectively as recorded in Table 2.

A similar trend was observed in leaf production, with T_7 producing the highest number of leaves at harvest (83.67), followed by T_6 (78.67) and T_{11} (74.00). The 100 per cent RDF treatment recorded lesser number of leaf (65.00) compared to the T_2 treatment and the control (T_1) recorded the lowest leaf count (54.67). The differences were statistically significant from 60 DAT onwards as observed by Mohammad *et al.* (2014) and Subramanian *et al*. (2005) [20]. Potassium is essential for stomatal function and chlorophyll maintenance and its sufficiency promotes active leaf growth. A general decline in the number of leaves was observed at harvest in several treatments compared to 60 DAT. This reduction may be attributed to leaf senescence and abscission associated with plant aging and reproductive transition. The extent of leaf loss was less pronounced in potassium-rich treatments (T_6 and T_7) suggesting that improved K nutrition may delay senescence and help maintain functional leaf area for a longer duration.

Yield and Yield Attributing characters

Total number of fruits per plant

The maximum number of fruits per plant of tomato was observed with treatment

T_7 (100% RDF + 4% We-K from banana pseudostem as foliar spray) (34.33) which was on par with the treatment T_6 (33.33 fruits plant^{-1}) and significantly superior over the other treatments (Table 3). Treatment with 100 per cent RDF (T_2) recorded 31.33 fruits plant^{-1} which was on par with T_4. The lowest total number of fruits per plant (21.00) was recorded in absolute control treatment. Potassium helps maintain the balance of key hytohormones such as cytokinins, auxins and gibberellins, which are involved in flowering and fruit set (Wang *et al*., 2013) [21]. potassium maintains proper turgor pressure in cells, which prevents flower abortion and enhances retention. The increase in fruit number may be due to more availability of nutrient to the plants during the vegetative period through foliar spray and soil applied nutritents.

Fruit diameter (cm) and Individual fruit weight (g)

The maximum fruit diameter of (5.67 cm) and fruit weight of 70.74 g tomato was recorded in the treatment received 4 per cent We-K from banana pseudostem through foliar fertilization along with 100 per cent mineral fertilizer treatment (T_7) which was on par with treatment T_6 (5.62 cm and 70.54 g). The Treatment which received only RDF (T_2) recorded the fruit diameter of 5.30 cm and 69.87 g fruit weight which was on par with Treatment T_{11} (5.40 cm), T_{10} (5.36 cm), T_5 (5.34 cm) and T_4 (5.31cm). The lowest fruit diameter (4.91 cm) and fruit weight (49.20 g) was observed with the T_1 treatment as recorded in

Table 3.

The increase in fruit size and weight can be primarily attributed to potassium's role in cell division and expansion, which directly contributes to tissue growth. Potassium enhances turgor pressure in fruit cells by maintaining osmotic balance, thus enabling expansion during fruit filling stages (Marschner, 2012) [12]. In potassium-rich environments, sink strength of the fruits is elevated due to enhanced enzymatic activity (starch synthetase, invertase, and sucrose synthase), leading to increased accumulation of carbohydrates and organic acids within fruits (Afzal *et al.* 2015) [2]. Potassium also increases the efficiency of phloem loading and unloading, ensuring better translocation of photosynthates from source to sink, which results in fruit development and improved size.

Total yield plant $^{-1}$ (kg plant $^{-1}$)

Treatment received 4 per cent We-K from banana pseudostem through foliar fertilization and 100 per cent mineral fertilizer treatment (T_7) recorded a higher fruit yield of 2.43 kg plant^{-1} which was on par with T_6 (2.35 kg plant^{-1}). Whereas treatment T_2 (100% RDF) recorded yield of 2.19 kg plant^{-1} which was on par with treatments T_4. The T_1 (Absolute control) treatment recorded the lowest total fruit yield per plant with a value of 1.03 kg plant^{-1}.

The maximum fruit yield of 2.43 kg plant^{-1} was recorded in T_7, this treatment outperformed all others (Table 3) and was statistically superior, highlighting the synergistic effect of combining soil-applied K with foliar-applied organic K similar results were obtained in the works of Gopinath *et al.* (2016) [7] and Abro *et al*. (2023) [1]. The enhanced yield may be attributed to improved K availability during critical phenological stages such as flowering and fruit setting, ensuring better assimilate partitioning and sink strength of developing fruits (Jiffon and Lester, 2009) [9].

Table 3: Effect of foliar fertilization of water extractable potassium from banana pseudostem on yield and yield attributing parameters of tomato

Treatments	Number of Fruits plant^{-1}	Fruit diameter (cm)	Fruit weight (g fruit)	Fruit yield (kg plant^{-1})
T_1 - Absolute control	21.00	4.91	49.20	1.03
T_2 - 100% RDF	31.33	5.30	69.87	2.19
T_3 - 100% RD N, P + 75% RDK	26.00	5.05	63.80	1.66
T_4 - T_2+ 1% FS of We-K from BPS	32.00	5.31	68.87	2.20
T_5 - T_2+ 2% FS of We-K from BPS	32.33	5.34	69.44	2.24
T_6 - T_2+ 3% FS of We-K from BPS	33.33	5.62	70.54	2.35
T_7 - T_2+ 4% FS of We-K from BPS	34.33	5.67	70.74	2.43
T_8 - T_3+ 1% FS of We-K from BPS	26.00	5.08	64.74	1.68
T_9 - T_3+ 2% FS of We-K from BPS	26.67	5.20	64.77	1.73
T_{10} - T_3+ 3% FS of We-K from BPS	27.67	5.36	66.17	1.83
T_{11} - T_3+ 4% FS of We-K from BPS	28.67	5.40	67.70	1.94
S. Em±	0.69	0.09	0.85	0.05
CD (p=0.05)	2.01	0.25	2.48	0.15

FS - foliar spray; We-K – Water extractable Potassium; BPS – Banana pseudostem; RDF – Recommended dose of fertilizers; DAT – days after transplanting; RDK –Recommended dose of potassium; RD N, P - Recommended dose of nitrogen and phosphorous; NS – Non significant

Fruit Quality Parameters

Lycopene content (mg 100g^{-1})

The maximum lycopene content was recorded with treatment T_7 (100% RDF + 4% We-K from banana pseudostem as foliar spray) with a value of 4.27 mg 100 g^{-1}, followed by treatment T_6 (3.91 mg 100 g^{-1}). The treatment T_2 (100% RDF) has lycopene content to the tune of 3.33 mg 100 g^{-1} and the lowest lycopene content of 1.75 mg 100 g^{-1} in fruit was recorded with treatment T_1 (Absolute control) as recorded in Table 4.

Lycopene content increased progressively with higher concentrations of We-K.

The maximum value of 4.27 mg 100 g^{-1} was recorded in T_7 (100% RDF + 4% We-K), which was significantly higher than all other treatments. The improvement in lycopene content can be attributed to potassium's crucial role in regulating photosynthate translocation to fruits and activating enzymes in the carotenoid biosynthetic pathway, particularly phytoene synthase, which leads to greater pigment accumulation (Dorais *et al.*, 2008). Similar results were obtained by Irfan *et al.* (2015) who reported that the exogenous application of 0.6 per cent K significantly improved plant height, lycopene content, potassium, fruit weight and diameter.

TSS (^{0}Brix)

Treatment T_7 (100 per cent RDF+4 per cent We-K) recorded the value of 4.77 ^{0}Brix, which was on par with treatment T_6 with a value of 4.63 ^{0}Brix and T_5 (4.5 ^{0}Brix) as presented in Table 4. The treatment T_2 (100% RDF) has TSS of 4.20 ^{0}Brix and it was on par with treatment T_{11}. The lowest TSS was obtained in the treatment T_1 (Absolute control) to the tune of 3.50 ^{0}Brix.

TSS values also showed a significant upward trend with increasing We-K concentration. T_7 recorded the highest TSS (4.77 °Brix) and RDF alone (T_2) recorded 4.20 °Brix. Potassium plays a vital role in carbohydrate synthesis and translocation. As reported by Nair *et al.* (1970) [16] it plays an important role in the starch formation and production and translocation of sugar, especially from source leaves to sink tissues like fruits. This finding aligns with Lester *et al.* (2010) [11], who reported that foliar K application significantly improved sweetness in tomato due to enhanced sugar metabolism.

Ascorbic acid content (mg 100g^{-1})

Treatment received 100 per cent RDF with 4 per cent We-K from banana pseudostem as foliar spray(T_7) 33.68 mg 100g^{-1}, which was significantly higher than the rest of the other treatments. This was followed by T_6 treatment (29.65 mg 100 g^{-1}). The 100 per cent RDF treatment (T_2) showed 25.26 mg 100 g^{-1} of ascorbic acid content which was on par with treatments T_{10}, T_4 and T_5. The result further noticed that the lowest ascorbic acid of 17.89 mg 100 g^{-1} in fruit was recorded in the treatment T_1 (Absolute control) as presented in Table 4.

Ascorbic acid content was significantly influenced by We-K foliar spray, with T_7 showing the highest value of 33.68 mg 100 g^{-1} which is higher than RDF alone. Potassium enhances the activity of enzymes involved in ascorbic acid biosynthesis (such as L-galactono-1,4-lactone dehydrogenase) and reduces its oxidative degradation, thereby increasing fruit vitamin C levels (Kanai *et al.*, 2007) [10]. Moreover, foliar K ensures nutrient availability at later stages of fruit ripening, when ascorbic acid content typically peaks. Similar observations were reported by Dorais *et al*. (2001) who found that foliar K sprays enhanced antioxidant content in various horticultural crops.

Fruit shelf life (days)

Fruit shelf life was longest in T_7 (19.50 days), significantly higher than the 100 per cent RDF (18.33) and control (15.50 days) (Table 4). Potassium plays a key role in maintaining cell membrane stability, reducing respiration rate and delaying senescence, which collectively improve storability (Cakmak, 2005) [4]. The higher shelf life in T_6 and T_7 may also be related to the improved firmness from enhanced pectin cross-linking as observed in K-sufficient tomato fruits (Kanai *et al.*, 2007) [10]. Treatments with partial soil K substitution (T_8–T_{11}) recorded comparatively lower shelf life, possibly due to insufficient basal K supply affecting overall physiological balance. Subbaiah *et al*. (2015) [19] reported that foliar application of potassium-rich biomass extract improved the physiological efficiency of tomato plants under organic farming conditions.

Overall Treatment Performance

Treatment ranking clearly indicated the superiority of banana pseudostem extracts foliar spray over the RDF and control. This suggests that water-extractable potassium from banana pseudostem is a readily available, sustainable and effective source of K nutrition when applied as foliar spray. The findings align with earlier reports on the high solubility of K in banana pseudostem and its potential as a fertilizer source (Dayod and Abat, 2016) [5]. The improvements observed can be explained through potassium's multifaceted role in plant metabolism, translocation of assimilates and regulation of enzymatic processes (Jackson and Volk, 1968) [8] that directly affect biochemical quality traits in tomato.

Table 4: Effect of foliar fertilization of water extractable potassium from banana pseudostem on the quality parameters of tomato fruit

Treatments	Lycopene content (mg $100g^{-1}$)	Ascorbic Acid (mg $100g^{-1}$)	TSS (^{0} Brix)	Fruit Shelf life (in days)
T_1 - Absolute control	1.75	17.89	3.50	15.50
T_2 - 100% RDF	3.33	25.26	4.20	18.33
T_3 - 100% RD N, P + 75% RDK	2.71	21.23	3.77	16.67
T_4 - T_2+ 1% FS of We-K from BPS	3.36	24.03	4.37	18.33
T_5 - T_2+ 2% FS of We-K from BPS	3.50	24.21	4.50	18.67
T_6 - T_2+ 3% FS of We-K from BPS	3.91	29.65	4.63	18.83
T_7 - T_2+ 4% FS of We-K from BPS	4.27	33.68	4.77	19.50
T_8 - T_3+ 1% FS of We-K from BPS	2.98	21.58	3.80	16.50
T_9 - T_3+ 2% FS of We-K from BPS	3.07	22.98	3.83	16.67
T_{10} - T_3+ 3% FS of We-K from BPS	3.13	25.09	3.97	16.83
T_{11} - T_3+ 4% FS of We-K from BPS	3.23	27.19	4.03	17.33
S. Em±	0.08	0.59	0.10	0.41
CD (p=0.05)	0.24	1.74	0.30	1.19

FS - foliar spray; We-K – Water extractable Potassium; BPS – Banana pseudostem; RDF – Recommended dose of fertilizers; DAT – days after transplanting; RDK –Recommended dose of potassium; RD N, P - Recommended dose of nitrogen and phosphorous; NS – Non significant

Conclusion

The study demonstrated that foliar application of water-extractable potassium derived from organic residues, particularly banana pseudostem applied as foliar spray at desirable concentration in combination with recommended fertilizer dose NPK will significantly improve growth, yield and fruit quality parameters of tomato. Among the treatments, T_7 proved most effective, followed consistently outperforming the recommended dose of fertilizer (RDF) control. With better assimilate translocation and improved biochemical processes contributed to taller plants and more branches and leaves with higher yield and superior quality attributes such as TSS, lycopene, and ascorbic acid. This confirms the vital role of foliar K in enhancing physiological efficiency and ensuring better source–sink balance during reproductive growth and suggest that banana pseudostem extract can serve as a sustainable, low-cost alternative to chemical K fertilizers for tomato cultivation, thereby supporting eco-friendly and resource-efficient horticultural production systems.

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