



Growth and Yield of Summer Finger Millet (*Eleusine coracana*) as Affected by Foliar Application of Water-soluble Fertilizers

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ABSTRACT

Background: Generally, finger millet is grown in steepy and sloppy areas where nutrient losses are more due to application of them in soil. Hence to assess the response of finger millet to foliar spray to water soluble fertilizers the experiment has been undertaken.

Methods: The agronomic field experiment was conducted at Shirol Farm, Regional Sugarcane and Jaggery research Station, Kolhapur and Agronomy Section, RSCM College of Agriculture, Kolhapur during summer season of 2023 year to study the growth and yield of summer finger millet (*Eleusine coracana*) as affected by foliar application of water-soluble fertilizers in a randomized block design with ten treatments replicated thrice viz. absolute control (water spray) at 45 and 60 DAS (T₁), RDF (60:30:30 NPK kg ha⁻¹) (T₂), 50% RDF fb 1% foliar spray of 19:19:19 at 45 and 60 DAS (T₃), 50% RDF fb 2% foliar spray of 19:19:19 at 45 and 60 DAS (T₄), 75% RDF fb 1% foliar spray of 19:19:19 at 45 and 60 DAS (T₅), 75% RDF fb 2% foliar spray of 19:19:19 at 45 and 60 DAS (T₆), 50% RDF fb 1% foliar spray of KNO₃ at 45 and 60 DAS (T₇), 50% RDF fb 2% foliar spray of KNO₃ at 45 and 60 DAS (T₈), 75% RDF fb 1% foliar spray of KNO₃ at 45 and 60 DAS (T₉) and 75% RDF fb 2% foliar spray of KNO₃ at 45 and 60 DAS (T₁₀).

Result: The results revealed that among the various treatments, treatment RDF (60:30:30 NPK kg ha⁻¹) recorded the highest values for growth, yield parameters and yield of summer finger millet while among the different foliar sprays the application of 75% RDF (45:23:23 NPK kg ha⁻¹) fb 2% foliar spray of 19:19:19 at tillering (45 DAS) and flowering (60 DAS) stage recorded the highest values for growth, yield parameters and yield of summer finger millet. The lowest values were observed with the treatment absolute control (water spray) at tillering (45 DAS) and flowering (60 DAS) stage. The cost of cultivation was highest for the treatment 75% RDF (45:23:23 NPK kg ha⁻¹) fb 2% foliar spray of KNO₃ at tillering (45 DAS) and flowering (60 DAS) stage (T₁₀) (Rs. 58645 ha⁻¹) and the highest B:C ratio was noted in the treatment RDF (60:30:30 NPK kg ha⁻¹) (T₂) (Rs.130036 ha⁻¹, Rs. 74760 ha⁻¹ and 2.35).

Key words: 19:19:19, KNO₃, B:C ratio water soluble fertilizers, Finger millet, Foliar spray, Growth and yield.

INTRODUCTION

Millets, commonly known as “Nutri-Cereals” owing to their high nutritional value. The United Nations has declared 2023 as the ‘International Year of Millets’ in response to the proposal from the Government of India, aiming to raise awareness and promote both the production and consumption of millets. Among different millets such as sorghum, pearl millet, finger millet, proso millet, foxtail millet, finger millet has great importance in Maharashtra farming.

Finger millet in Maharashtra is locally called as *nachani* or *ragi* which responds well to the use of fertilizers. Generally, it is grown in *kharif* season but the experiment has been taken in the summer season to assess the crop response to fertilizers in summer situations. Out of the total minor millets produced, finger millet (*Eleusine coracana* L.) (*ragi/nachani*) accounts for about 85% production in India (Divya, 2011). In India, finger millet is cultivated over an area of 1.19 million hectares with a production of 1.98 million tonne giving an average productivity of 1661 kg ha⁻¹. Karnataka accounts for 56.21% and 59.52% of area and production of finger millet followed by Tamil Nadu (9.94% and 18.27%), Uttarakhand (9.40% and 7.76%) and Maharashtra (10.56% and 7.16%), respectively. (Anonymous, 2018). Consumption of fertilizers in India was 139.00 kg ha⁻¹ in the year 2019-20 while in Maharashtra it was 149.5 kg ha⁻¹ in 2022-23 and for Pune division (Pune, Kolhapur, Sangli,

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Solapur and Satara) the use of total fertilizer was 961400 MT. (Anonymous, 2022-23).

Usually, the fertilizers are applied in soil in finger millet cultivation. But due to various factors, the fertilizer responses will be low in soil application. Therefore, foliar nutrition may be a better way to supplement the nutrients to the plant. Hence, field investigation was carried out to study the effect of foliar application of water-soluble fertilizers on growth and yield parameters of finger millet.

MATERIALS AND METHODS

Location

The agronomic field experiment was conducted during summer season of 2023 year to study the growth and yield

of summer finger millet (*Eleusine coracana*) as affected by foliar application of water-soluble fertilizers at Shirol Farm, Regional Sugarcane and Jaggery research Station, Kolhapur and lab work and analysis was carried out at Agronomy Section, RSCM College of Agriculture, Kolhapur.

Soil and climate

The soil of experimental plot was silty loam in texture with slightly acidic pH (6.93). The soil had medium amount of nitrogen ($301.56 \text{ kg ha}^{-1}$) and phosphorus (20.02 kg ha^{-1}) available, while potassium ($292.54 \text{ kg ha}^{-1}$) availability was at a moderately high level. During the experimental period during summer season of 2023 year the minimum temperature ranged from 12.8°C to 19.9°C , while the maximum temperature falls within the range of 29.6°C to 37.5°C and the daily evaporation observed during the experiment varies from 1.7 mm to 7.8 mm. Total rainfall received during the period of field experiment was 29.7 mm in 2 rainy days.

Experimental details

The experiment was laid out in a randomized block design with ten treatments replicated thrice. The finger millet variety *Phule Kasari* was sown directly by line sowing method with spacing of 60 cm $\times$ 10 cm on ridges. The ten treatments were viz. Absolute control (water spray) at tillering (45 DAS) and flowering (60 DAS) stage (T_1), RDF (60:30:30 NPK kg ha^{-1}) (T_2), 50% RDF *fb* 1% foliar spray of 19:19:19 at tillering (45 DAS) and flowering (60 DAS) stage (T_3), 50% RDF *fb* 2% foliar spray of 19:19:19 at tillering (45 DAS) and flowering (60 DAS) stage (T_4), 75% RDF *fb* 1% foliar spray of 19:19:19 at tillering (45 DAS) and flowering (60 DAS) stage (T_5), 75% RDF *fb* 2% foliar spray of 19:19:19 at tillering (45 DAS) and flowering (60 DAS) stage (T_6), 50% RDF *fb* 1% foliar spray of KNO_3 at tillering (45 DAS) and flowering (60 DAS) stage (T_7), 50% RDF *fb* 2% foliar spray of KNO_3 at tillering (45 DAS) and flowering (60 DAS) stage (T_8), 75% RDF *fb* 1% foliar spray of KNO_3 at tillering (45 DAS) and flowering (60 DAS) stage (T_9) and 75% RDF *fb* 2% foliar spray of KNO_3 at tillering (45 DAS) and flowering (60 DAS) stage (T_{10}). For the nutrient application of crop Urea, SSP and MOP fertilizers were used while for the foliar spraying water-soluble fertilizers 19:19:19 and KNO_3 (potassium nitrate) were used. The growth observations and yield parameters were recorded at harvest.

Observation determination

For growth observations the plant height was measured from the base of the plant to collar of last fully opened leaf. The total number of tillers, leaf area and dry matter accumulation was recorded periodically from five selected plants. For yield attributes length of all fingers from five observation plants was measured with the help of scale and it was divided by total number of earheads. Same procedure was followed for weight of earhead. For test weight 1000 grains were counted and their collective weight was measured in grams. For grain yield the air-dried grain

weight for each treatment was measured and then converted in a per hectare basis. The dried weight of straw from net plot was measured and then straw yield was calculated on a per-hectare basis. The cost of cultivation and B:C ratio of finger millet was estimated by using the data on various aspects such as wages rate of hired labours, irrigation charges, cost of seed, market rate of fertilizers and water-soluble fertilizers, hired charges of machinery with implements and selling price of grains of finger millet but not statistically analysed. Photographs of finger millet in different treatments were shown in Fig 1.

Statistical analysis

The experimental data was statistically analysed by using a standard method of "analysis of variance" as reported by Panse and Sukhatme (1967). Statistical analysis for economic studies including cost of cultivation and B:C ratio were not carried out in this study.

RESULTS AND DISCUSSION

Effect of foliar sprays of water-soluble fertilizers on growth of summer finger millet as influenced by the application of different treatments

The data regarding the growth parameters like plant height, number of tillers, dry matter accumulation and leaf area is presented in Table 1. The results shows that the significantly higher plant height (125.29 cm), number of tillers (9.80), dry matter accumulation plant⁻¹ (70.22 g) and leaf area (319.64 dm^2) at harvest were recorded with the application of RDF (60:30:30 NPK kg ha^{-1}) which was on par with the application of 75% RDF (45:23:23 NPK kg ha^{-1}) *fb* 2% foliar spray of 19:19:19 at tillering (45 DAS) and flowering (60 DAS) stage. The treatments in the next order were 75% RDF *fb* 2% foliar spray of KNO_3 at tillering (45 DAS) and flowering (60 DAS) stage, 75% RDF *fb* 1% foliar spray of 19:19:19 at tillering (45 DAS) and flowering (60 DAS) stage, 75% RDF *fb* 1% foliar spray of KNO_3 at tillering (45 DAS) and flowering (60 DAS) stage, 50% RDF *fb* 2% foliar spray of 19:19:19 at tillering (45 DAS) and flowering (60 DAS) stage, 50% RDF *fb* 2% foliar spray of KNO_3 at tillering (45 DAS) and flowering (60 DAS) stage, 50% RDF *fb* 1% foliar spray of 19:19:19 at tillering (45 DAS) and flowering (60 DAS) stage, 50% RDF *fb* 1% foliar spray of KNO_3 at tillering (45 DAS) and flowering (60 DAS) stage. The lowest results were shown by the treatment absolute control (water spray) at tillering (45 DAS) and flowering (60 DAS) stage. Photographs of finger millet in different treatments were shown in Fig 1.

The height of a plant typically reflects its vitality and growth. At harvest the maximum plant height of 125.29 cm was recorded by the application of 100% RDF (60:30:30 NPK kg ha^{-1}), the increment in the height may have resulted due to increased absorption of nutrient solution and nutrient pool which have triggered photosynthetic activities resulting into increment in cell division thereby elongation and increase in plant height. Similar results were documented

by Kumar *et al.* (2015), Reddy *et al.* (2018) and Prashanth *et al.* (2019).

Branches arise from the basal node of the stem or crown in millet are termed as tillers. The ability of tillering in cereals is seen in the number of phyllochrons of growth that they complete before entering the reproductive stage (Nemoto *et al.*, 1995 and Stoop *et al.*, 2002). Phyllochrons are periods of plant growth in which one or more phytomers (Unit of tiller, leaf and root) emerge from the plant meristematic tissue. This number increases during the vegetative growth phase and under ideal conditions. The application of RDF (60:30:30 NPK kg ha⁻¹) recorded the highest number of tillers per hill (9.80) while among the foliar sprays application treatment of 75% RDF *fb* 2% foliar spray of 19:19:19 at tillering (45 DAS) and flowering (60 DAS) stage noted highest number of tillers (9.60) at harvest. This may be due to better plant growth, better nutrition for the crops and the efficient utilization of foliar nutrients which stimulates vegetative growth. The rate of production of

number of tillers in finger millet is significantly dependent on nutrient supply. Increased tiller numbers with increased fertilizer application may be related to extra nutrients provided by foliar spray of water-soluble fertilizers. Similar results have been reported by Rahman *et al.* (2014), Reddy *et al.* (2018), Prashanth *et al.* (2019), Senthilkumar and Gokul (2020) and Senthamil (2022).

Significantly highest dry matter accumulation was observed in treatment RDF (60:30:30 NPK kg ha⁻¹) (*i.e.* 70.22 g) while among the foliar sprays the application treatment of 75% RDF *fb* 2% foliar spray of 19:19:19 at tillering (45 DAS) and flowering (60 DAS) stage (68.76 g) recorded the highest dry matter accumulation hill⁻¹. Similar findings are reported by Patil *et al.* (2015); Mudalagiriappa *et al.* (2016); Chavan *et al.* (2018) and Sharifi *et al.* (2018); Prashanth *et al.* (2019); Senthilkumar and Gokul (2020a); Senthilkumar and Gokul (2020b) and Singh *et al.* (2021).

The treatment RDF (60:30:30 NPK kg ha⁻¹) noted higher mean leaf area of 319.64 dm² plant⁻¹ at the time of harvest.

Table 1: Growth of summer finger millet at harvest as influenced by the application of different treatments.

Treatments	Plant height (cm)	Number of tillers	Dry matter accumulation plant ⁻¹ (g)	Leaf area plant ⁻¹ (dm ²)
T ₁ : Absolute control (water spray) at tillering (45 DAS) and flowering (60 DAS) stage	98.16	6.60	48.64	178.82
T ₂ : RDF (60:30:30 NPK kg ha ⁻¹)	125.29	9.80	70.22	319.64
T ₃ : 50% RDF (30:15:15 NPK kg ha ⁻¹) <i>fb</i> 1% foliar spray of 19:19:19 at tillering (45 DAS) and flowering (60 DAS) stage	115.92	7.93	61.27	200.84
T ₄ : 50% RDF (30:15:15 NPK kg ha ⁻¹) <i>fb</i> 2% foliar spray of 19:19:19 at tillering (45 DAS) and flowering (60 DAS) stage	116.86	8.40	62.11	238.38
T ₅ : 75% RDF (45:23:23 NPK kg ha ⁻¹) <i>fb</i> 1% foliar spray of 19:19:19 at tillering (45 DAS) and flowering (60 DAS) stage	120.85	8.90	63.46	276.40
T ₆ : 75% RDF (45:23:23 NPK kg ha ⁻¹) <i>fb</i> 2% foliar spray of 19:19:19 at tillering (45 DAS) and flowering (60 DAS) stage	122.23	9.60	68.76	311.85
T ₇ : 50% RDF (30:15:15 NPK kg ha ⁻¹) <i>fb</i> 1% foliar spray of KNO ₃ at tillering (45 DAS) and flowering (60 DAS) stage	109.61	7.80	61.00	198.93
T ₈ : 50% RDF (30:15:15 NPK kg ha ⁻¹) <i>fb</i> 2% foliar spray of KNO ₃ at tillering (45 DAS) and flowering (60 DAS) stage	116.41	8.13	61.39	224.85
T ₉ : 75% RDF (45:23:23 NPK kg ha ⁻¹) <i>fb</i> 1% foliar spray of KNO ₃ at tillering (45 DAS) and flowering (60 DAS) stage	118.90	8.47	63.14	263.27
T ₁₀ : 75% RDF (45:23:23 NPK kg ha ⁻¹) <i>fb</i> 2% foliar spray of KNO ₃ at tillering (45 DAS) and flowering (60 DAS) stage	121.35	9.40	65.36	288.10
S.Em. ±	4.94	0.32	2.13	14.58
LSD (P = 0.05)	14.67	0.96	6.32	43.33
General mean	116.56	8.50	62.53	250.11

It may be perhaps due to receiving comparatively more amount of nutrients through soil application and different foliar sprays thus enabling the plant to produce more leaf area and dry matter accumulation. Among the foliar sprays,

the application 75% RDF (45:23:23 NPK kg ha⁻¹) fb 2% foliar spray of 19:19:19 at tillering (45 DAS) and flowering (60 DAS) stage (311.85 dm²) recorded the highest mean leaf area per plant.



Fig 1: Photographs of finger millet in different treatments in the experiment.

Table 2: Yield parameters, yield, cost and B:C ratio of summer finger millet at harvest as influenced by the application of different treatments.

Treatments	Number of fingers earhead ⁻¹	Length of finger (cm)	Weight of earhead (g)	Test weight (g)	Grain yield (q ha ⁻¹)	Straw yield (q ha ⁻¹)	Cost of cultivation (` ha ⁻¹)	B:C ratio
T ₁ : Absolute control (water spray) at tillering (45 DAS) and flowering (60 DAS) stage	5.71	6.30	5.02	2.09	19.25	24.06	50810	1.45
T ₂ : RDF (60:30:30 NPK kg ha ⁻¹)	9.15	10.12	10.56	3.00	33.85	44.68	55276	2.35
T ₃ : 50% RDF (30:15:15 NPK kg ha ⁻¹) fb 1% foliar spray of 19:19:19 at tillering (45 DAS) and flowering (60 DAS) stage	7.50	7.76	6.63	2.43	23.22	29.72	55743	1.60
T ₄ : 50% RDF (30:15:15 NPK kg ha ⁻¹) fb 2% foliar spray of 19:19:19 at tillering (45 DAS) and flowering (60 DAS) stage	7.90	8.64	7.85	2.57	27.70	35.18	56943	1.86
T ₅ : 75% RDF (45:23:23 NPK kg ha ⁻¹) fb 1% foliar spray of 19:19:19 at tillering (45 DAS) and flowering (60 DAS) stage	8.30	8.88	8.92	2.70	29.18	36.85	56845	1.97
T ₆ : 75% RDF (45:23:23 NPK kg ha ⁻¹) fb 2% foliar spray of 19:19:19 at tillering (45 DAS) and flowering (60 DAS) stage	8.70	9.58	9.53	2.95	32.81	43.50	58045	2.17
T ₇ : 50% RDF (30:15:15 NPK kg ha ⁻¹) fb 1% foliar spray of KNO ₃ at tillering (45 DAS) and flowering (60 DAS) stage	7.42	7.68	6.57	2.41	21.80	27.90	56043	1.49
T ₈ : 50% RDF (30:15:15 NPK kg ha ⁻¹) fb 2% foliar spray of KNO ₃ at tillering (45 DAS) and flowering (60 DAS) stage	7.63	7.81	7.23	2.52	25.90	32.63	57543	1.72
T ₉ : 75% RDF (45:23:23 NPK kg ha ⁻¹) fb 1% foliar spray of KNO ₃ at tillering (45 DAS) and flowering (60 DAS) stage	8.10	8.70	8.14	2.67	28.67	36.41	57145	1.92
T ₁₀ : 75% RDF (45:23:23 NPK kg ha ⁻¹) fb 2% foliar spray of KNO ₃ at tillering (45 DAS) and flowering (60 DAS) stage	8.40	9.23	8.92	2.88	30.64	39.53	58645	2.00
S.E.m. ±	0.32	0.36	0.32	0.09	0.85	1.05	-	-
LSD (P = 0.05)	0.94	1.07	0.94	0.26	2.53	3.12	-	-
General mean	7.88	8.47	7.94	2.62	27.30	35.04	56304	1.85

Effect of foliar sprays of water-soluble fertilizers on yield parameters and yield of summer finger millet as influenced by the application of different treatments

The data regarding the yield parameters, grain yield and straw yield as impacted by various treatments are shown in Table 2. Photographs of finger millet in different treatments were shown in Fig 1. The yield contributing parameters like number of fingers earhead⁻¹, length of finger (cm), weight of earhead (g) and test weight (g) showed the similar trend as like of the growth parameters. Significantly the highest number of fingers earhead⁻¹ (9.15), length of finger (10.12 cm), weight of earhead (10.56 g) and test weight of finger millet (3.00 g) were shown by the application of RDF (60:30:30 NPK kg ha⁻¹) while among different foliar sprays the application of 75% RDF (45:23:23 NPK kg ha⁻¹) fb 2% foliar spray of 19:19:19 at tillering (45 DAS) and flowering (60 DAS) stage recorded the highest number of fingers earhead⁻¹ (8.70), length of finger (9.58 cm), weight of earhead (9.53 g) and test weight of finger millet (2.95 g).

The different treatments showed significant differences among them. The RDF (60:30:30 NPK kg ha⁻¹) showed the highest grain yield (33.85 q ha⁻¹) and straw yield (44.68 q ha⁻¹) over all the treatments while among the different foliar treatments the application of 75% RDF (45:23:23 NPK kg ha⁻¹) fb 2% foliar spray of 19:19:19 at tillering (45 DAS) and flowering (60 DAS) stage showed the highest grain yield (32.81 q ha⁻¹) and straw yield (43.50 q ha⁻¹). The treatments in the next order were 75% RDF fb 2% foliar spray of KNO₃ at tillering (45 DAS) and flowering (60 DAS) stage, 75% RDF fb 1% foliar spray of 19:19:19 at tillering (45 DAS) and flowering (60 DAS) stage, 75% RDF fb 1% foliar spray of KNO₃ at tillering (45 DAS) and flowering (60 DAS) stage, 50% RDF fb 2% foliar spray of 19:19:19 at tillering (45 DAS) and flowering (60 DAS) stage, 50% RDF fb 2% foliar spray of KNO₃ at tillering (45 DAS) and flowering (60 DAS) stage, 50% RDF fb 1% foliar spray of 19:19:19 at tillering (45 DAS) and flowering (60 DAS) stage, 50% RDF fb 1% foliar spray of KNO₃ at tillering (45 DAS) and flowering (60 DAS) stage. The lowest results were shown by the treatment absolute control (water spray) at tillering (45 DAS) and flowering (60 DAS) stage.

The findings are in conformity with those reported by Patil *et al.* (2015), Bulbule *et al.* (2018), Reddy *et al.* (2018), Senthilkumar and Gokul (2020)b, Singh *et al.* (2021) and Krishnasree *et al.* (2022). This might be due to the fact that the full recommended dose of fertilizers (RDF) provides a more balanced and sufficient supply of nutrients, which promotes better growth and development of the plant. The foliar fertilization not only enhances N, P and K content of plant but also carbon balance of the plant resulting in increased yields. (Gupta, 1988). It has been noted that, foliar application of water-soluble fertilizers shows instant uptake of nutrients by the plants resulting in significant and quick improvement in crop growth. Further the growth parameters viz. plant height, number of tillers, dry matter accumulation

and leaf area were noted higher values in these treatments which ultimately had influenced the yield attributes like number of fingers, length of finger, weight of earhead and the test weight and consequently higher grain and straw yield.

Effect of foliar sprays of water-soluble fertilizers on cost of cultivation and B:C ratio of summer finger millet as influenced by the application of different treatments

The cost of cultivation and B:C ratio for any treatment was determined by adding all the cost with each operation performed during experiment but not statistically analysed. The cost of cultivation was highest in treatment 75% RDF (45:23:23 NPK kg ha⁻¹) fb 2% foliar spray of KNO₃ at tillering (45 DAS) and flowering (60 DAS) stage (₹ 58645 per ha⁻¹) and lowest in absolute control (water spray) at tillering (45 DAS) and flowering (60 DAS) stage (₹ 50810 per ha⁻¹). The reason of the high cost of cultivation may be due to higher cost of the water-soluble fertilizer i.e. KNO₃ which is costlier as compared to 19:19:19 and the cost incurred for foliar spraying. The lowest cost of cultivation was due to the no use of fertilizer through soil or foliar application. This was followed by 75% RDF (45:23:23 NPK kg ha⁻¹) fb 2% foliar spray of 19:19:19 at tillering (45 DAS) and flowering (60 DAS) stage (₹ 58045 per ha⁻¹), 50% RDF (30:15:15 NPK kg ha⁻¹) fb 2% foliar spray of KNO₃ at tillering (45 DAS) and flowering (60 DAS) stage (Rs. 57543 per ha⁻¹), 75% RDF (45:23:23 NPK kg ha⁻¹) fb 1% foliar spray of KNO₃ at tillering (45 DAS) and flowering (60 DAS) stage (₹ 57145 per ha⁻¹), 50% RDF (30:15:15 NPK kg ha⁻¹) fb 2% foliar spray of 19:19:19 at tillering (45 DAS) and flowering (60 DAS) stage (₹ 56943 per ha⁻¹), 75% RDF (45:23:23 NPK kg ha⁻¹) fb 1% foliar spray of 19:19:19 at tillering (45 DAS) and flowering (60 DAS) stage (₹ 56845 per ha⁻¹), 50% RDF (30:15:15 NPK kg ha⁻¹) fb 1% foliar spray of KNO₃ at tillering (45 DAS) and flowering (60 DAS) stage (₹ 56043 per ha⁻¹), 50% RDF (30:15:15 NPK kg ha⁻¹) fb 1% foliar spray of 19:19:19 at tillering (45 DAS) and flowering (60 DAS) stage (T3) (₹ 55743 per ha⁻¹) and RDF (60:30:30 NPK kg ha⁻¹) (T2) (₹ 55276 per ha⁻¹) in that sequence.

Benefit cost ratio gives perception regarding benefit derived from the cost associated with using particular inputs. The higher benefit cost ratio was noted with RDF (60:30:30 NPK kg ha⁻¹) (2.35) which was followed by 75% RDF (45:23:23 NPK kg ha⁻¹) fb 2% foliar spray of 19:19:19 at tillering (45 DAS) and flowering (60 DAS) stage (2.17), 75% RDF (45:23:23 NPK kg ha⁻¹) fb 2% foliar spray of KNO₃ at tillering (45 DAS) and flowering (60 DAS) stage (2.00), 75% RDF (45:23:23 NPK kg ha⁻¹) fb 1% foliar spray of 19:19:19 at tillering (45 DAS) and flowering (60 DAS) stage (1.97), 75% RDF (45:23:23 NPK kg ha⁻¹) fb 1% foliar spray of KNO₃ at tillering (45 DAS) and flowering (60 DAS) stage (1.92), 50% RDF (30:15:15 NPK kg ha⁻¹) fb 2% foliar spray of 19:19:19 at tillering (45 DAS) and flowering (60 DAS) stage (1.86), 50% RDF (30:15:15 NPK kg ha⁻¹) fb 2% foliar spray of KNO₃ at tillering (45 DAS) and flowering (60 DAS) stage (1.72), 50% RDF (30:15:15 NPK kg ha⁻¹) fb 1% foliar spray of 19:19:19 at tillering (45 DAS) and flowering (60

DAS) stage (1.60) and 50% RDF (30:15:15 NPK kg ha⁻¹) fb 1% foliar spray of KNO₃ at tillering (45 DAS) and flowering (60 DAS) stage (1.49) in that order. The absolute control (water spray) at tillering (45 DAS) and flowering (60 DAS) stage (1.45) noted the least benefit cost ratio. The study by Premshekhar and Rajashree (2009), Patil *et al.* (2015), Mudalagiriappa *et al.* (2016), Reddy *et al.* (2018) and Bulbule *et al.* (2018) and also yielded same comparable results.

CONCLUSION

The growth, yield parameters and yield of summer finger millet were significantly influenced by application different treatments. The treatment RDF (60:30:30 NPK kg ha⁻¹) recorded the highest values for growth, yield parameters and yield of summer finger millet while among the different foliar sprays the application of 75% RDF (45:23:23 NPK kg ha⁻¹) fb 2% foliar spray of 19:19:19 at tillering (45 DAS) and flowering (60 DAS) stage recorded the highest values for growth, yield parameters and yield of summer finger millet. The lowest values were observed with the treatment absolute control (water spray) at tillering (45 DAS) and flowering (60 DAS) stage. It could be concluded that, 25% of RDF can be reduced to obtain better yield which can be compensated with application of foliar spray of 19:19:19 or potassium nitrate (KNO₃) at critical growth stages viz. tillering and flowering which is equally effective with (RDF) 60:30:30 NPK kg ha⁻¹. B:C ratio were recorded highest with the application of 60:30:30 NPK kg ha⁻¹, while application of 75% RDF fb 2% foliar spray of 19:19:19 at tillering (45 DAS) and flowering (60 DAS) stage and 75% RDF fb 2% foliar spray of KNO₃ at tillering (45 DAS) and flowering (60 DAS) stage were comparatively remunerative and economical viable practice and would be beneficial for farmers. Based on the B:C ratio it could be concluded that, 25% of RDF can be reduced to obtain better monetary returns which can be compensated with application of foliar spray of 19:19:19 or potassium nitrate (KNO₃) at critical growth stages viz., tillering and flowering which is equally effective with (RDF) 60:30:30 NPK kg ha⁻¹.

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Author contributions

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They have thoroughly reviewed and approved the final manuscript for submission to the ARCC journals guidelines, ensuring collective accountability for its content.

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Personal interests

The authors declare that no personal relationships or obligations exist that could potentially bias the research outcomes or their interpretation.

Research objectivity

The design, execution and analysis of this study were conducted impartially and ethically, with a primary focus on scientific accuracy and transparency.

Conflict of interest

The authors further declare that all findings and recommendations presented in this manuscript are based solely on the data and analyses conducted during the study, without external influence or bias. The authors of the manuscript declare that there are no conflicts of interest regarding the publication of this research paper.

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