www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277-7695
ISSN (P): 2349-8242
Impact Factor (RJIF): 6.34
TPI 2025; 14(12): 05-09

www.thepharmajournal.com
Received: 04-09-2025
Accepted: 09-10-2025

Kuruba Naveen Kumar
Department of Agronomy, College of Agriculture, University of Agricultural Sciences, Raichur, Karnataka, India

CM Kalibavi
Professor (Agronomy) & Head, Agricultural Extension Education Centre, Huvinahadagali, Vijayanagar, Karnataka, India

Basavanneppa MA
Organic Farming Research Institute, University of Agricultural sciences, Raichur, Karnataka, India

Shwetha BN
AICRP, Rice, Agriculture Research Station, Gangavathi, Karnataka, India

Ashok Kumar Gaddi
Professor, Department of Soil Science, Hagari, Karnataka, India

Corresponding Author:
Kuruba Naveen Kumar
Department of Agronomy, College of Agriculture, University of Agricultural Sciences, Raichur, Karnataka, India

Effect of foliar nutrition through organics on growth, yield and soil properties in finger millet (*Eleusine coracana* L.) under irrigation

Kuruba Naveen Kumar, CM Kalibavi, Basavanneppa MA, Shwetha BN and Ashok Kumar Gaddi

DOI: https://www.doi.org/10.22271/tpi.2025.v14.i12a.26328

Abstract
A field experiment was conducted at the Agricultural Research Station (ARS), Siruguppa, during *kharif* 2024 to study the effect of foliar nutrition through organics on growth, yield, and soil properties in finger millet (*Eleusine coracana* L.) under irrigation. The experiment evaluated the impact of various foliar nutrition treatments applied at 30 and 60 days after sowing (DAS), in combination with the recommended dose of fertilizers (RDF). The results revealed that the treatment RDF + foliar spray of urea @ 2% (T_6) recorded significantly higher growth parameters such as plant height and leaf area at 30, 60, 90 DAS, and at harvest. Among the organic foliar nutrition treatments, RDF + foliar spray of panchagavya @ 3% (T_3) resulted in significantly higher growth attributes, which was on par with RDF + foliar spray of vermiwash @ 5% (T_4) and RDF + foliar spray of jeevamrutha @ 5% (T_5). The lowest growth performance was observed under RDF + water spray (T_1). Similarly, the highest grain yield (2615 kg ha^{-1}) and straw yield (5361 kg ha^{-1}) were recorded with RDF + foliar spray of urea @ 2% (T_6), followed by the organic treatments, with panchagavya @ 3% (T_3) being superior among them. The lowest yield was obtained from RDF + water spray (T_1). Overall, the study indicated that foliar application of urea @ 2% was most effective for enhancing growth and yield of finger millet under irrigated conditions, while among the organic sources, panchagavya @ 3% proved to be a promising alternative.

Keywords: Finger millet, panchagavya, jeevamrutha, vermiwash

Introduction
Finger millet (*Eleusine coracana* L.) is a climate-resilient cereal widely cultivated in semi-arid regions due to its exceptional drought tolerance and nutritional benefits. It is rich in dietary fiber, proteins and essential amino acids, making it a highly nutritious "nutri-cereal" (Mishra *et al*., 2023) [6]. The grain also contains significant amounts of calcium, iron and B-complex vitamins, which contribute to health benefits such as diabetes prevention and bone health improvement.

Among different nutrient application methods, foliar feeding is considered one of the most efficient techniques, ensuring immediate nutrient availability at critical growth stages. Liquid organic manures, such as panchagavya, jeevamrutha and vermiwash, have been widely adopted due to their use of application and quick nutrient absorption by plants (Meena *et al*., 2021) [5]. Compared to solid organic fertilizers, liquid formulations provide readily available nutrients and improve soil microbial activity. Foliar application enables plants to absorb nutrients more rapidly through leaves, making it an effective solution to address acute deficiencies (Yadav *et al*., 2023) [11].

Materials and Methods
The field experiment was carried out under rainfed condition at the ARS, Siruguppa, Bellari, University of Agricultural Sciences, Raichur which is situated between 160 12' N latitude and 770 20' E longitude with an altitude of 389 metres above the mean sea level.

The experiment was laid out in a Randomized Complete Block Design (RCBD) comprising eight treatments replicated three times. There were eight treatments *viz*., T_1: RDF + water spray, T_2: RDF + Foliar spray of cow urine @ 5% at 30 and 60 DAS, T_3: RDF + Foliar spray of panchagavya @ 3% at 30 and 60 DAS, T_4: RDF + Foliar spray of vermiwash @ 5% at 30

and 60 DAS, T_5: RDF + Foliar spray of jeevamrutha@ 5% at 30 and 60 DAS, T_6: RDF + Foliar spray of urea @ 2% at 30 and 60 DAS, T_7: RDF + Foliar spray of gokrupamrutha @ 0.5% at 30 and 60 DAS, T_8: RDF + Foliar spray of waste decomposer @1% at 30 and 60 DAS. The crop used was finger millet (variety HR-1), spaced at 30 cm × 10 cm, with eight treatments and three replications. The gross plot size was 4.8 m × 3.6 m and the net plot size was 3.6 m × 3.2 m.

Results and Discussion

Yield parameters and yield of finger millet Finger length (cm)

The data related to finger length of finger millet revealed a significant response to foliar application of different organic nutrient sources was presented in table 1.

Among the treatments, the longest finger length (8.23 cm) was recorded with the application of RDF + foliar spray of urea @ 2% at 30 and 60 DAS. Among organic foliar nutrition significantly higher finger length was recorded in RDF + Foliar spray of panchagavya @ 3% at 30 and 60 DAS (7.51cm). However, it was on par with RDF + Foliar spray of vermiwash @ 5% at 30 and 60 DAS (7.31cm) and RDF + Foliar spray of jeevamrutha @ 5% at 30 and 60 DAS (7.10 cm), all applied at 30 and 60 DAS. On the contrary, the shortest finger length (5.78 cm) was recorded in the control treatment (RDF + water spray).

The enhanced finger length under urea application may be associated with the immediate nitrogen availability that promotes enhanced cell expansion, spikelet development and reproductive organ elongation during the panicle differentiation stage. Organic foliar sprays enhanced finger length which may be due to their supply of micronutrients, growth-promoting substances and beneficial microbial metabolites. However, their effect remained slightly lower compared to inorganic foliar nutrition. Similar results were reported by Nagar *et al*. (2022) [7].

Ear weight plant-1 (g)

The ear head weight of finger millet was significantly influenced by the foliar application of different organic nutrient sources was presented in table 1.

Among the treatments, the highest ear head weight (8.69 g) was recorded with the application of RDF + foliar spray of urea @ 2% at 30 and 60 DAS, among organic foliar nutrition significantly higher ear weight plant-1 was recorded in RDF + Foliar spray of panchagavya @ 3% at 30 and 60 DAS (7.75 g). However, it was on par with RDF + Foliar spray of vermiwash @ 5% at 30 and 60 DAS (7.51 g) and RDF + Foliar spray of jeevamrutha @ 5% at 30 and 60 DAS (7.25 g), all applied at 30 and 60 DAS. In contrast, the lowest ear head weight (6.05 g) was observed in the control treatment receiving RDF + water spray.

The improved ear head weight under foliar urea application can be attributed to increased nitrogen availability during critical reproductive stages, which may have supported greater sink strength, floret fertility and grain filling efficiency. The organic foliar nutrition sources such as panchagavya, vermiwash and jeevamrutha also improved ear head weight possibly due to their richness in plant growth regulators, micronutrients and beneficial microbial metabolites that enhance nutrient uptake and crop growth. However, their effect remained slightly inferior compared to inorganic foliar nitrogen application. Similar results were reported by Atish *et al.* (2020) [2].

Number of finger ear-1

The number of fingers per ear of finger millet was significantly influenced by the application of various foliar nutrition sources was presented in table 1.

Among the treatments, the maximum number of fingers ear-1 (8.98) was recorded with the application of RDF + foliar spray of urea @ 2% at 30 and 60 DAS. Among organic foliar nutrition significantly higher number of fingers ear-1 was recorded in RDF + Foliar spray of panchagavya @ 3% at 30 and 60 DAS (8.15). However, it was on par with RDF + Foliar spray of vermiwash @ 5% at 30 and 60 DAS (7.95) and RDF + Foliar spray of jeevamrutha @ 5% at 30 and 60 DAS (7.78), all applied at 30 and 60 DAS, foliar application at different stages of crop stages. Nonetheless, the minimum number of fingers ear-1 (6.56) was observed under the control treatment (RDF + water spray).

The enhanced number of fingers per ear under urea application may be attributed to the improved availability of nitrogen during the early panicle formation and spikelet initiation stages which plays a crucial role in floret differentiation and spike branching. The beneficial effects observed under organic foliar sprays could be associated with their rich composition of plant growth-promoting compounds, micronutrients and beneficial microbial consortia. These factors may have synergistically contributed to increased photosynthetic activity, hormonal balance and nutrient remobilization ultimately supporting better reproductive organ development. Similar results were reported by Atish *et al.* (2020) [2].

Grain weight ear-1 (g)

The grain weight per ear of finger millet was significantly influenced by the application of different foliar nutrition sources was presented in table 1.

Among the treatments, the highest grain weight per ear (4.25 g) was recorded with RDF + foliar spray of urea @ 2% applied at 30 and 60 DAS. Among organic foliar nutrition significantly higher grain weight per ear was recorded in RDF + Foliar spray of panchagavya @ 3% at 30 and 60 DAS (3.73 g). However, it was on par with RDF + Foliar spray of vermiwash @ 5% at 30 and 60 DAS (3.48 g) and RDF + Foliar spray of jeevamrutha @ 5% at 30 and 60 DAS (3.45 g), all applied at 30 and 60 DAS. The lowest grain weight per ear (2.45 g) was observed in the control treatment (RDF + water spray).

The improvement in grain weight per ear under foliar application of urea @ 2% may be attributed to the better availability of nitrogen during the reproductive phase, which enhanced photosynthetic activity, assimilate translocation, and grain filling efficiency. Organic foliar sprays such as panchagavya, vermiwash, and jeevamrutha also enhanced grain weight per ear due to their nutrient content, growth regulators, and microbial metabolites, though their effect remained slightly lower than that of inorganic foliar nitrogen application. Similar results were reported by Patel *et al.* (2021) [5].

Grain yield (kg ha^{-1})

The grain yield of finger millet was significantly influenced by the application of various foliar nutrition sources through foliar spray under the organic production system was

presented in table 1.

Among the treatments, the highest grain yield (2615 kg ha^{-1}) was recorded with RDF + foliar spray of urea at 2% applied at 30 and 60 DAS. Among organic foliar nutrition significantly higher grain yield was recorded in RDF + Foliar spray of panchagavya @ 3% at 30 and 60 DAS (2396 kg ha^{-1}). However, it was on par with RDF + Foliar spray of vermiwash @ 5% at 30 and 60 DAS (2348 kg ha^{-1}) and RDF + Foliar spray of jeevamrutha @ 5% at 30 and 60 DAS (2318 kg ha^{-1}), foliar applications at different stages during crop stages. The lowest grain yield (2002 kg ha^{-1}) was observed in the control treatment receiving RDF + water spray.

The improvement in grain yield under urea application may be attributed to better nitrogen availability, which promoted enhanced vegetative growth, efficient panicle initiation and increased grain filling, ultimately leading to higher productivity. Likewise, the application of organic foliar inputs may have enhanced enzymatic activity, nutrient assimilation and hormonal balance thereby improving physiological efficiency and yield-determining traits such as number of fingers, ear head weight and grain weight. These cumulative effects likely contributed to higher grain productivity. Similar results were reported by Anushka *et al*. (2022) [1].

Straw yield (kg ha^{-1}): The application of different foliar nutrition sources had a significant influence on the straw yield of finger millet was presented in table 1.

The highest straw yield (5361 kg ha^{-1}) was recorded under the application of RDF + foliar spray of urea @ 2% at 30 and 60 DAS. Among organic foliar nutrition significantly higher straw yield was recorded in RDF + Foliar spray of panchagavya @ 3% at 30 and 60 DAS (4888 kg ha- 1). However, it was on par with RDF + Foliar spray of vermiwash @ 5% at 30 and 60 DAS (4785 kg ha^{-1}) and RDF + Foliar spray of jeevamrutha @ 5% at 30 and 60 DAS (4710 kg ha^{-1}), foliar applications at different stages during crop stages. The lowest straw yield (4024 kg ha^{-1}) was observed in the control treatment receiving RDF + water spray.

The superior straw yield under foliar urea application may be attributed to the enhanced nitrogen availability which promoted vegetative growth, increased leaf area, tillering and improved dry matter accumulation in stem and leaves. Organic foliar sprays such as panchagavya, vermiwash and jeevamrutha also enhanced straw yield by providing essential nutrients, growth regulators and beneficial microbial metabolites that supported plant growth and biomass accumulation though their effect remained slightly lower than that of inorganic nitrogen application. Similar results were reported by Divya and Avinash (2015) [4].

Table 1: Ear length, number of fingers ear -1, ear weight plant-1, grain weight ear-1 and number of days to maturity of finger millet as influenced by different sources of foliar spray at different stages

Treatments	Finger length (cm)	Ear weight plant-1 (g)	Number of fingers ear-1	Grain weight ear-1 (g)	Grain yield (kg ha^{-1})	Straw yield (kg ha^{-1})
T_1: RDF + water spray	5.78	6.05	6.56	2.45	2002	4024
T_2: RDF + Foliar spray of cow urine @ 5% at 30 and 60 DAS	5.98	6.11	6.60	2.51	2025	4091
T_3: RDF + Foliar spray of panchagavya @ 3% at 30 and 60 DAS	7.51	7.75	8.15	3.73	2396	4888
T_4: RDF + Foliar spray of vermiwash @ 5% at 30 and 60 DAS	7.31	7.51	7.95	3.48	2348	4785
T_5: RDF + Foliar spray of jeevamrutha @ 5% at 30 and 60 DAS	7.10	7.25	7.78	3.45	2318	4710
T_6: RDF + Foliar spray of urea @ 2% at 30 and 60 DAS	8.23	8.69	8.98	4.25	2615	5361
T_7: RDF + Foliar spray of gokrupamrutha @ 0.5% at 30 and 60 DAS	6.32	6.32	6.96	2.75	2106	4241
T_8: RDF + Foliar spray of waste decomposer @1% at 30 and 60 DAS	6.15	6.18	6.85	2.68	2052	4155
S.Em. ±	0.23	0.23	0.25	0.10	69	141
C.D. (P=0.05)	0.69	0.70	0.76	0.31	210	426

Note: RDF: Recommended doses of fertilizers N: P2O5: K2O-100: 50: 50 kg ha^{-1} DAS: Days after sowing

Nutrient uptake by finger millet

Nitrogen, phosphorous and potassium uptake as influenced by different foliar sprays in finger millet at harvest was presented in table 2 and Fig. 1.

Nitrogen uptake at harvest (kg ha^{-1})

The nitrogen uptake by finger millet at harvest was significantly influenced by the application of different foliar nutrition sources.

Among the treatments, the highest nitrogen uptake (85.28 kg ha^{-1}) was recorded with RDF + foliar spray of urea @ 2% at 30 and 60 DAS. Among organic foliar nutrition significantly higher nitrogen uptake was recorded in RDF + Foliar spray of panchagavya @ 3% at 30 and 60 DAS (77.66 kg ha^{-1}). However, it was on par with RDF + Foliar spray of vermiwash @ 5% at 30 and 60 DAS (76.01kg ha^{-1}) and RDF + Foliar spray of jeevamrutha @ 5% at 30 and 60 DAS (75.66 kg ha^{-1}). The lowest nitrogen uptake (66.02 kg ha^{-1}) was recorded under the control treatment (RDF + water spray).

The enhanced nitrogen uptake under foliar urea application may be attributed to the immediate availability and efficient absorption of nitrogen through leaf surfaces, particularly during active vegetative and reproductive stages. Nitrogen is a critical component of amino acids, chlorophyll and nucleic acids, and its adequate supply enhances physiological processes such as photosynthesis and protein synthesis. Organic foliar sprays may have also facilitated better nutrient uptake through microbial activity and the presence of natural chelating agents and growth regulators thereby supporting improved nitrogen assimilation. Similar results were reported by Chandrakala (2008) [3].

Phosphorus uptake at harvest (kg ha^{-1})

The phosphorus uptake by finger millet at harvest was significantly influenced by the application of different sources of foliar nutrition. The treatment comprising RDF + foliar spray of urea @ 2% applied at 30 and 60 DAS recorded the highest phosphorus uptake (24.68 kg ha^{-1}), Among organic foliar nutrition significantly higher phosphorus uptake was recorded in RDF + Foliar spray of panchagavya @ 3% at 30 and 60 DAS (21.74 kg ha^{-1}). However, it was on par with RDF + Foliar spray of vermiwash @ 5% at 30 and 60 DAS

(20.53 kg ha^{-1}) and RDF + Foliar spray of jeevamrutha @ 5% at 30 and 60 DAS (20.25 kg ha^{-1}), at the same stages. In contrast, the lowest phosphorus uptake (13.63 kg ha^{-1}) was recorded in the control treatment receiving RDF + water spray.

The higher phosphorus uptake in treatments involving urea and organic foliar sprays can be ascribed to the increased availability and mobilization of phosphorus at the rhizosphere, along with enhanced root activity and membrane permeability. The foliar application during critical growth phases likely promoted the synthesis of organic acids and phosphatase enzymes that aid in phosphorus solubilization and translocation. Moreover, organic foliar sprays are known to stimulate beneficial microbial populations which play a crucial role in mineralizing organic phosphorus fractions into plant-available forms. Similar results were reported by Shwetha (2008) [9].

Potassium uptake at harvest (kg ha^{-1})

The potassium uptake by finger millet at harvest exhibited significant variation due to the application of different sources of foliar nutrition. The highest potassium uptake (69.54 kg ha^{-1}) was recorded in the treatment receiving RDF + foliar spray of urea @ 2% applied at 30 and 60 DAS. Among organic foliar nutrition significantly higher potassium uptake was recorded in RDF + Foliar spray of panchagavya @ 3% at 30 and 60 DAS (62.12 kg ha^{-1}). However, it was on par with RDF + Foliar spray of vermiwash @ 5% at 30 and 60 DAS (58.94 kg ha^{-1}) and RDF + Foliar spray of jeevamrutha @ 5% at 30 and 60 DAS (57.62 kg ha^{-1}) applied at corresponding stages. The control treatment (RDF + water spray) recorded significantly lower potassium uptake (43.65 kg ha^{-1}).

The observed enhancement in potassium uptake with foliar application of urea and organic inputs can be attributed to increased K availability and improved translocation facilitated by enhanced stomatal activity and nutrient absorption efficiency. Potassium is critical for cell turgor maintenance, enzyme activation and assimilate translocation. The presence of bioactive compounds and plant growth-promoting microorganisms in organic foliar sprays likely stimulated physiological processes that favor potassium uptake and redistribution, especially during peak demand periods of crop growth. Similar results were reported by Tharmaraj *et al.* (2011) [10].

Table 2: Nitrogen, phosphorous and potassium uptake (kg ha^{-1}) influenced by different foliar sprays in finger millet

Treatments	Uptake of N	Uptake of P	Uptake of K
T_1: RDF + water spray	66.02	13.63	43.65
T_2: RDF + Foliar spray of cow urine @ 5% at 30 and 60 DAS	66.97	14.03	44.01
T_3: RDF + Foliar spray of panchagavya @ 3% at 30 and 60 DAS	77.66	21.74	62.12
T_4: RDF + Foliar spray of vermiwash @ 5% at 30 and 60 DAS	76.01	20.53	58.94
T_5: RDF + Foliar spray of jeevamrutha @ 5% at 30 and 60 DAS	75.66	20.25	57.62
T_6: RDF + Foliar spray of urea @ 2% at 30 and 60 DAS	85.28	24.68	69.54
T_7: RDF + Foliar spray of gokrupamrutha @ 0.5% at 30 and 60 DAS	67.87	15.12	48.13
T_8: RDF + Foliar spray of waste decomposer @1% at 30 and 60 DAS	67.59	14.34	46.05
S.Em. ±	2.38	0.59	1.75
C.D. (P=0.05)	7.20	1.79	5.31

Note: RDF: Recommended doses of fertilizers N: P2O5: K2O-100: 50: 50 kg ha^{-1} DAS: Days after sowing

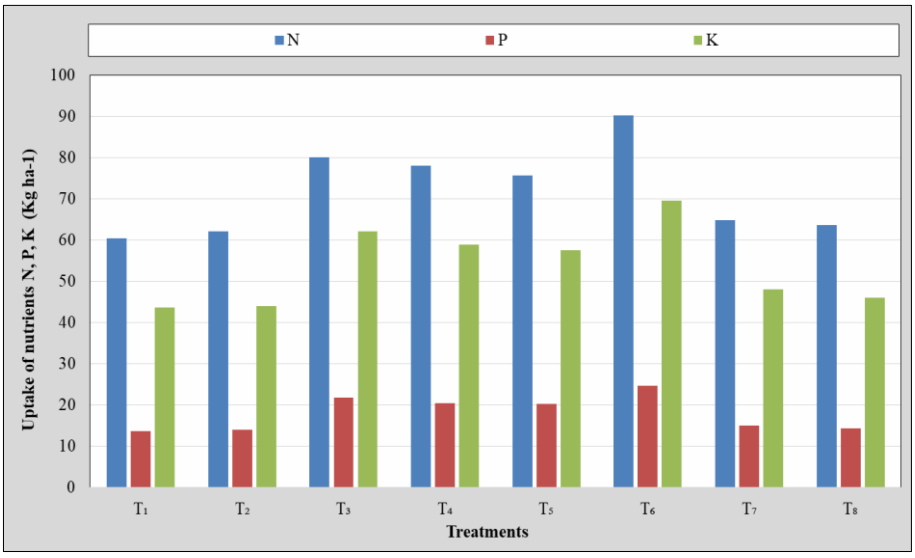

Fig 1: Nitrogen, phosphorous and potassium uptake (kg ha^{-1}) influenced by different foliar sprays in finger millet

Conclusion

The combined application of RDF with a foliar spray of conventional urea @ 2% at 30 and 60 DAS was found beneficial and optimum for gaining higher and remunerative yields. Among the organic treatments, RDF with foliar spray of panchagavya @ 3% at 30 and 60 DAS also improved yield and yield attributes. Furthermore, the RDF + foliar spray of conventional urea @ 2% at 30 and 60 DAS significantly improved soil nutrient status and nutrient uptake after harvest, while RDF + panchagavya @ 3% at 30 and 60 DAS recorded the highest nutrient uptake among organic foliar nutrition treatments.

References

1. Anushka P, Krishnan R, Somasundaram E, Chandrasekhar CN. Evaluation of foliar nutrition for yield maximization in foxtail millet (*Setaria italica* L.). Int J Plant Soil Sci. 2022;34(21):571-576.
2. Atish, Badiger B, Shivamurty D, Hunje R. Effect of foliar organic nutrients and time of application on seed yield and yield attributes of foxtail millet (*Setaria italica* L.). Int J Chem Stud. 2020;8(1):1718-1721.
3. Chandrakala M. Effect of FYM and fermented liquid manures on yield and quality of chilli. Res J Agric Sci. 2008;2(3):722-724.
4. Divya S, Avinash M. Effect of organic manures and liquid organic manures on growth, yield and economics of aerobic rice cultivation. Int J Agric Sci. 2015;11(1):183-188.
5. Meena R, Patel K, Sharma V. Effectiveness of liquid organic manures on crop growth and soil health. J Organic Farming Sustainability. 2021;9(3):132-140.
6. Mishra S, Reddy B, Kumari A. Nutritional and health benefits of finger millet (*Eleusine coracana* L.): A climate-resilient nutri-cereal. J Cereal Sci Health. 2023;18(2):88-97.
7. Nagar G, Meena DS, Meena BS, Sharma MK, Patidar BK, Yadav RK, *et al*. Effect of organic formulations on growth and yield of wheat in south eastern Rajasthan. Ann Agric Res. 2022;43(4):375-381.
8. Patel SP, Malve SH, Chavda MH, Vala YB. Effect of panchagavya and jeevamruttha on growth, yield attributes and yield of summer pearl millet. J Pharm Innov. 2021;10(12):105-109.
9. Shwetha BN. Effect of nutrient management through the organics in soybean-wheat cropping system [M.Sc. thesis]. Dharwad, Karnataka: Univ. Agric. Sci.; 2008.
10. Tharmaraj K, Ganesh P, Kolanjinathan K, Suresh KR, Anandan A. Influence of vermicompost and vermiwash on physico-chemical properties of rice cultivated soil. Curr Bot. 2011;2(3):18-21.
11. Yadav S, Meena BR, Meena SK, Singh N, Yadav R. Effect of liquid organic formulations on productivity and profitability of mung bean crop under semi-arid environment of Rajasthan. Int J Plant Sci. 2023;35(22):880-892.