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Effect of micronutrient application on content and uptake of nutrient in green gram (*Vigna radiata* L.)

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Abstract
The present investigation entitled “Micronutrient Management in Green Gram (*Vigna radiata* L.)” during *Kharif* season of the year, 2023-2024 at a field experiment was conducted at experimental field College of Agriculture Latur. The experiment was layout in RBD with three replications and a recommended variety of green gram BM 2003-2 as a test crop along with ten treatments. Significantly higher uptake of N, P, K, Fe and Zn was found in green gram with treatment T_9 (application of RDF + 25 kg ha^{-1} $FeSO_4$ + 25 kg ha^{-1} $ZnSO_4$ + 10 Kg Borax). Available soil nutrient status in post-soil samples after harvest was comparably found maximum than initial soil samples.

Keywords: Micronutrient application, green gram (*Vigna radiata* L.), nutrient content

1. Introduction

The well-known domesticated legume crop known as green gram (*Vigna radiata* L.) is farmed all over the world. In affluent countries, it is a high-value commodity crop with excellent nutritional value, and in underdeveloped countries, it provides a significant economic boost for marginal farmers. The genus Vigna, species radiata, subfamily *Papilionaceae*, and family Fabaceae are home to green grams. With over 650 genera and 20,000 species, this family is widely distributed and ranks third among all flowering plant families (Doyle, 1994) [3].

Iron (Fe) is one of the essential micronutrients that enhances plant growth and reproduction. It was the first nutrient element discovered as essential for plant life. In the plant system, it plays an important role in a series of metabolic activities involving respiratory enzymes and various photosynthesis reactions. It also plays an important role in legumes including green gram for nodule formation and nitrogen fixation. Zinc (Zn) plays an important role in activating the enzymatic systems, zinc is essential for the synthesis of chlorophyll and carbohydrates. Zinc deficiency reduces the nutritional value, yield, and production of green gram crops. Among the micronutrients, Zn and Fe nutrition can affect the susceptibility of plants to drought. Boron plays important roles in some of the metabolic processes such as nucleic acid metabolism, carbohydrate biosynthesis, photosynthesis, protein metabolism and has a role in cell wall synthesis and plasma membrane integrity. Boron affects fertilisation by increasing the pollen producing capacity of anthers and pollen viability and also help in pollen tube growth.

2. Materials and Methods

A field experiment was conducted at Departmental research farm of Soil Science, College of Agriculture, Latur during *Kharif* 2023-2024 on green gram (variety BM-2003-2). The experimental soil was clayey in texture, slightly alkaline in reaction, low in available nitrogen, available phosphorous, high in available potassium and deficient in DTPA-Fe and Zn.

Latur district of Maharashtra state is situated between 18°05’-18°75’ North latitude and between 76°25’ to 77°25’ East longitude on the Balaghat plateau with mean sea level height 633.85 meters and derived from Deccan trap rock, basaltic rich in

Magnesium and dominated by smectite mineral. This area falls under the assured rainfall zone. The annual average precipitation is 750 to 800 mm. Most of the rains are received during July to October from the South-West monsoon. The rainfall pattern and temperature and humidity variation during the period of experimentation.

Table 1: Treatment details.

Sr. No	Symbol	Treatment
1	T1	RDF (25 kg N:50 kg P_2O_5:25 kg K_2O)
2	T2	RDF + Soil application Grade-I micro-nutrient @ 25 kg ha^{-1}.
3	T3	RDF + Foliar application Grade-II micro-nutrient @ 0.5% at 25 and 40 DAS.
4	T4	RDF + Soil application Grade-I micro-nutrient @ 25 kg ha^{-1} + Foliar application Grade-II micro-nutrient @ 0.5% at 25 and 40 DAS
5	T5	RDF + Soil application $FeSO_4$ @ 25kg ha^{-1}
6	T6	RDF + Soil application $ZnSO_4$ @ 25kg ha^{-1}
7	T7	RDF + Soil application Borax @ 10kg ha^{-1}
8	T8	RDF + Soil application $FeSO_4$ + $ZnSO_4$ @ 25kg ha^{-1}
9	T9	RDF + Soil application $FeSO_4$ + $ZnSO_4$ @ 25kg ha^{-1} + Borax @ 10kg ha^{-1}
10	T10	RDF + Foliar application $FeSO_4$ + $ZnSO_4$ @ 0.5% + Borax 0.2% at 25 to 40 DAS.

*S.A.-Soil Application, **F.A.-Foliar Application

3. Results and Discussion

3.1. Effect of micronutrient application on content and uptake of nutrients by green gram

The data related to the content and uptake of nitrogen, phosphorus, potassium, iron and zinc as influenced by the application of micronutrient sources with certain treatments has shown below.

3.1.1 Nitrogen content and uptake by green gram

The data on the content and uptake of N as influenced by the application of micronutrients after harvest of green gram, are presented in table 2 and fig. 1.

Nitrogen concentration in green gram at harvest stage was not significantly influenced by micronutrient fertilization. The highest N concentration (3.60% in seed and 1.78% in straw) was observed with the application of (RDF + Soil application $FeSO_4$ + $ZnSO_4$ @ 25 kg ha^{-1} + Borax @ 10 kg ha^{-1}) (T_9) whereas lowest N concentration was observed with T_1 (RDF) (3.50% in seed and 1.70% in straw). The N concentration increased at both stages of growth due to zinc and iron fertilization. At the harvest stage the N concentration in seed was higher as compared to that of haulm. This might be due to the translocation of larger portions of N from other parts of the plant to the seed.

The uptake of N in green gram seed and straw ranged from 35.97 kg ha^{-1} to 51.47 kg ha^{-1} and 23.97 kg ha^{-1} to 33.97 kg ha^{-1}, respectively. The highest uptake of N (51.47 kg ha^{-1}) in seed and (33.97 kg ha^{-1}) was observed with in treatment T_9 (RDF + Soil application $FeSO_4$ + $ZnSO_4$ @ 25 kg ha^{-1} + Borax @ 10 kg ha^{-1}) and found at par with treatment T_8, T_4 and superior over rest of the treatments. Whereas, the minimum uptake of N in seed (35.97 kg ha^{-1}) and in straw (23.97 kg ha^{-1}) was recorded in treatment T_1 (RDF).

Total nitrogen uptake (85.44 kg ha^{-1}) of green gram was found maximum with treatment T_9 (RDF + Soil application $FeSO_4$ + $ZnSO_4$ @ 25 kg ha^{-1} + Borax @ 10 kg ha^{-1}). Total N uptake was found at par with treatment T_8 and found superior over rest treatments. Whereas, the minimum total uptake of N (59.94 kg ha^{-1}) was recorded with treatment T_1 (RDF). This might be due to the increase in N uptake which could be attributed to enhanced vigor of crop growth with increased utilization and translocation of N into plants and synergistic effect between N and Zn in soil system resulting in the enhancement of yield. Similar findings were reported by Lokhande in green gram in pigeon pea.

Table 2: Effect of micronutrient application on nitrogen content, nitrogen uptake in seed and straw and total uptake of green gram after harvest.

Treatments	Seed		Straw		Total Uptake (kg ha^{-1})
	Content (%)	Uptake (kg ha^{-1})	Content (%)	Uptake (kg ha^{-1})	
T1: RDF	3.50	35.97	1.70	23.97	59.94
T2: RDF + S.A. Grade-I micro-nutrient @ 25 kg ha^{-1}.	3.56	44.68	1.74	31.14	75.82
T3: RDF + F.A. Grade-II micro-nutrient @ 0.5% at 25 and 40 DAS.	3.50	37.36	1.71	25.53	62.89
T4: RDF + S.A. Grade-I micro-nutrient @ 25 kg ha^{-1} + F.A. Grade-II micro-nutrient @ 0.5% at 25 and 40 DAS	3.57	46.86	1.75	31.64	78.50
T5: RDF + S.A. $FeSO_4$ @ 25 kg ha^{-1}	3.54	40.66	1.73	28.79	69.45
T6: RDF + S.A. $ZnSO_4$ @ 25 kg ha^{-1}	3.52	38.83	1.72	27.15	65.98
T7: RDF + S.A. Borax @ 10 kg ha^{-1}	3.51	38.94	1.70	25.39	64.32
T8: RDF + S.A. $FeSO_4$ + $ZnSO_4$ @ 25 kg ha^{-1}	3.58	49.36	1.76	32.50	81.87
T9: RDF + S.A. $FeSO_4$ + $ZnSO_4$ @ 25 kg ha^{-1} + Borax @ 10kg ha^{-1}	3.60	51.47	1.78	33.97	85.44
T10: RDF + F.A. $FeSO_4$ + $ZnSO_4$ @ 0.5% + Borax 0.2% at 25 to 40 DAS.	3.51	37.89	1.72	25.44	63.34
S.E(m) ±	0.03	2.56	0.02	0.85	2.71
CD at 5%	NS	7.60	NS	2.54	8.05

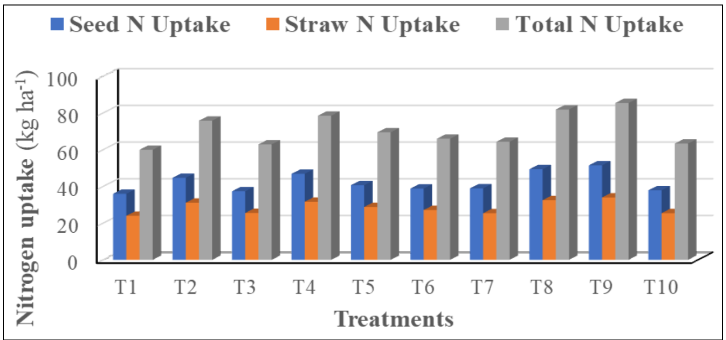

Fig 1: Effect of micronutrient application on nitrogen uptake (kg ha^{-1}) in seed and straw and total uptake of green gram after harvest

3.1.2 Phosphorus content and uptake by green gram
The data on the content and uptake of P as influenced by the application of micronutrients after the harvest of green grams has presented in table 3 and fig. 2.

The P content in green gram seed and straw varied between 0.39% to 0.45% and 0.34% to 0.41%, respectively. The highest P content in seed (0.45%) and in straw (0.41%) was recorded with application of treatment T_9 (RDF + Soil application $FeSO_4$ + $ZnSO_4$ @ 25 kg ha^{-1} + Borax @ 10 kg ha^{-1}) and was found at par with treatment T_8, T_4, T_2, T_5 and T_6 which was superior over rest of the treatments. Whereas, the minimum content of P in seed (0.39%) and in straw (0.34%) was recorded with treatment T_1 (RDF).

The uptake of P in green gram seed and straw ranged from 3.98 kg ha^{-1} to 6.47 kg ha^{-1} and 4.77 kg ha^{-1} to 7.87 kg ha^{-1}, respectively. The highest uptake of P seed (6.47 kg ha^{-1}) and in straw (7.87 kg ha^{-1}) was recorded in treatment T_9 (RDF + Soil application $FeSO_4$ + $ZnSO_4$ @ 25 kg ha^{-1} + Borax @ 10 kg ha^{-1}) and was found at par with treatment T_8, T_4 which was superior over rest of the treatments. Whereas, the minimum uptake of P in seed (3.98 kg ha^{-1}) and in straw (4.77 kg ha^{-1}) recorded in treatment T_1 (RDF).

Total P uptake of green gram (14.34 kg ha^{-1}) was maximum in treatment T_9 (RDF + Soil application $FeSO_4$ + $ZnSO_4$ @ 25 kg ha^{-1} + Borax @ 10 kg ha^{-1}) and was found at par with treatment T_8 (13.34 kg ha^{-1}) and superior over rest of the treatments. Whereas, the minimum total uptake of P (8.74 kg ha^{-1}) was recorded in treatment T_1 (RDF).

Though the phosphorus concentration was significantly influenced by zinc and iron fertilization the significant increase in phosphorus uptake might be due to the maximum production of dry matter. These results are in close agreement with those reported by Ranpariya *et al.* (2017) [9] in mung bean, Lokhande in green gram crop in pigeon pea.

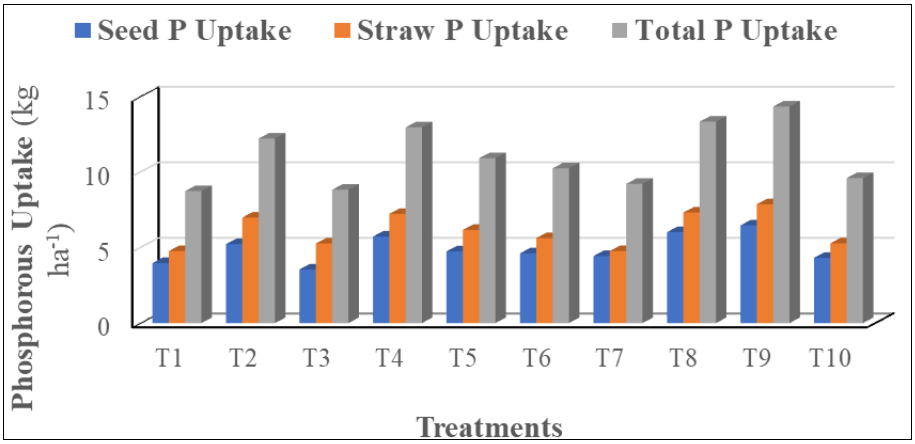

Fig 2: Effect of micronutrient application on phosphorus uptake (kg ha^{-1}) in seed and straw and total uptake of green gram after harvest

Table 3: Effect of micronutrient application on phosphorus content, phosphorus uptake in seed and straw and total uptake of green gram after harvest

Treatments	Seed		Straw		Total Uptake (kg ha^{-1})
	Content (%)	Uptake (kg ha^{-1})	Content (%)	Uptake (kg ha^{-1})	
T1: RDF	0.39	3.98	0.34	4.77	8.74
T2: RDF + S.A. Grade-I micro-nutrient @ 25 kg ha^{-1}.	0.42	5.23	0.39	6.99	12.22
T3: RDF + F.A. Grade-II micro-nutrient @ 0.5% at 25 and 40 DAS.	0.33	3.55	0.35	5.27	8.83
T4: RDF + S.A. Grade-I micro-nutrient @ 25 kg ha^{-1} + F.A. Grade-II micro-nutrient @ 0.5% at 25 and 40 DAS	0.44	5.73	0.40	7.23	12.96
T5: RDF + S.A. $FeSO_4$ @ 25 kg ha^{-1}	0.41	4.75	0.37	6.17	10.92
T6: RDF + S.A. $ZnSO_4$ @ 25 kg ha^{-1}	0.41	4.62	0.36	5.63	10.25
T7: RDF + S.A. Borax @ 10 kg ha^{-1}	0.40	4.44	0.32	4.77	9.22
T8: RDF + S.A. $FeSO_4$ + $ZnSO_4$ @ 25 kg ha^{-1}	0.44	6.02	0.40	7.32	13.34
T9: RDF + S.A. $FeSO_4$ + $ZnSO_4$ @ 25 kg ha^{-1} + Borax @ 10kg ha^{-1}	0.45	6.47	0.41	7.87	14.34
T10: RDF + F.A. $FeSO_4$ + $ZnSO_4$ @ 0.5% + Borax 0.2% at 25 to 40 DAS.	0.40	4.32	0.36	5.28	9.60
SE (m) ±	0.02	0.37	0.01	0.19	0.43
CD at 5%	0.04	1.09	0.04	0.58	1.28

3.1.3 Potassium Content and uptake by green gram
The data regarding content and uptake of K as influenced by the application of micronutrients after the harvest of green gram has presented in table 4 and fig. 3.

Potassium concentration in green gram at the harvest stage was significantly influenced by micronutrient fertilization. The highest K concentration 2.41% in seed and 1.43% in straw was observed with the application of RDF + Soil application $FeSO_4$ + $ZnSO_4$ @ 25 kg ha^{-1} + Borax @ 10 kg ha^{-1} (T_9) and lowest with T_1 2.15% in seed and 1.35% in straw respectively. The K concentration increased at both stages of growth due to zinc and iron fertilization. At the harvest stage the K concentration in seed was higher as compared to that of straw.

Similar results were observed by Lokhande in green gram, in pigeon pea and Ranpariya *et al.* (2017) [9] in mung bean stated that zinc and iron fertilization increased the K concentration in plants and remain non-significant. The fall in K concentration at the harvest stage (haulm and seed) might be due to the dilution effect and limited nutrient availability as the crop growth advanced. The K concentration in seed was low as compared to straw. This might be due to the low mobility of K from haulm to seed.

The uptake of K in green gram seed and straw ranged from 22.20 kg ha^{-1} to 34.47 kg ha^{-1} and 18.98 kg ha^{-1} to 27.24 kg ha^{-1}, respectively. The highest uptake of K was observed in green gram seed (34.47 kg ha^{-1}) and straw (27.24 kg ha^{-1}) was recorded in treatment T_9 (RDF + Soil application $FeSO_4$ + $ZnSO_4$ @ 25 kg ha^{-1} + Borax @ 10 kg ha^{-1}) and was found at par with treatment T_8 and T_4 which was found superior over rest of the treatments. Whereas, the minimum uptake of K in seed (22.20 kg ha^{-1}) and in straw (18.98 kg ha^{-1}) recorded with treatment T_1 (RDF).

Total K uptake of green gram (61.71 kg ha^{-1}) was found maximum in treatment T_9 (RDF + Soil application $FeSO_4$ + $ZnSO_4$ @ 25 kg ha^{-1} + Borax @ 10 kg ha^{-1}) and was found at par with treatment T_8 59.06 kg ha^{-1} and superior over rest of the treatments. Whereas, the minimum total uptake of K (41.17 kg ha^{-1}) was recorded in treatment T_1 (RDF).

Table 4: Effect of micronutrient application on potassium content, potassium uptake in seed and straw and total uptake of green gram after harvest.

Treatments	Seed		Straw		Total Uptake (kg ha^{-1})
	Content (%)	Uptake (kg ha^{-1})	Content (%)	Uptake (kg ha^{-1})	
T1: RDF	2.15	22.20	1.35	18.98	41.17
T2: RDF + S.A. Grade-I micro-nutrient @ 25 kg ha^{-1}.	2.37	29.77	1.40	25.10	54.87
T3: RDF + F.A. Grade-II micro-nutrient @ 0.5% at 25 and 40 DAS.	2.30	24.62	1.37	20.40	45.03
T4: RDF + S.A. Grade-I micro-nutrient @ 25 kg ha^{-1} + F.A. Grade-II micro-nutrient @ 0.5% at 25 and 40 DAS	2.39	31.39	1.41	25.43	56.82
T5: RDF + S.A. $FeSO_4$ @ 25 kg ha^{-1}	2.36	27.10	1.38	22.94	50.05
T6: RDF + S.A. $ZnSO_4$ @ 25 kg ha^{-1}	2.34	25.87	1.36	21.44	47.30
T7: RDF + S.A. Borax @ 10 kg ha^{-1}	2.33	25.83	1.36	20.31	46.14
T8: RDF + S.A. $FeSO_4$ + $ZnSO_4$ @ 25 kg ha^{-1}	2.39	32.89	1.42	26.17	59.06
T9: RDF + S.A. $FeSO_4$ + $ZnSO_4$ @ 25 kg ha^{-1} + Borax @ 10kg ha^{-1}	2.41	34.47	1.43	27.24	61.71
T10: RDF + F.A. $FeSO_4$ + $ZnSO_4$ @ 0.5% + Borax 0.2% at 25 to 40 DAS.	2.33	25.17	1.38	20.41	45.59
SE (m) ±	0.03	1.80	0.01	0.61	1.94
CD at 5%	0.09	5.33	0.04	1.82	5.77

This might be due to the synergistic interaction between zinc and potassium. Many zinc-dependent enzymes are involved in carbohydrate metabolism in general and leaves in particular, impartment of K in stomata regulation, phloem export of assimilation from the source i.e. the leaves into the sink organs, maintained water balance in the soil-plant-atmosphere continuum. A similar trend was found by Lokhande who reported the highest total K uptake with the application of 100% N + 60 kg ha^{-1} P_2O_5 + 25 kg ha^{-1} $ZnSO_4$ in green gram crop. reported of highest uptake application of RDF + $ZnSO_4$ @ 25 kg ha^{-1} + 2 sprays of $ZnSO_4$ @ 0.5% at 30 and 45 DAS in pigeon pea.

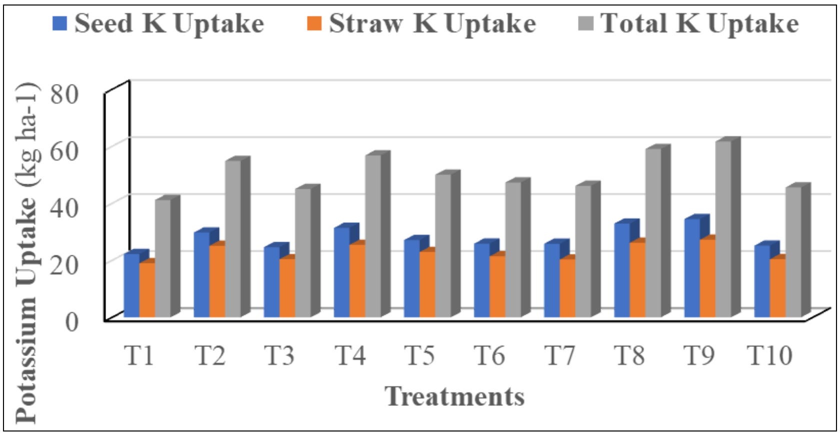

Fig 3: Effect of micronutrient application on potassium uptake (kg ha^{-1}) in seed and straw and total uptake of green gram after harvest.

3.1.4 Iron content and uptake by green gram

The data regarding content and uptake of Fe as influenced by the application of micronutrients after the harvest of green gram has presented in table 5 and fig 4.

The highest Fe content in seed (116.13 mg kg^{-1}) and in straw (75.62 mg kg^{-1}) was recorded with the application of treatment T_9 (RDF + Soil application $FeSO_4$ + $ZnSO_4$ @ 25 kg ha^{-1} + Borax @ 10 kg ha^{-1}) followed by treatment T_5, T_4 and T_2 and superior over rest of the treatments. Whereas, the minimum Fe content in seed (107.51 mg kg^{-1}) and straw (67.70 mg kg^{-1}) recorded in treatment T_1 (RDF).

The uptake of Fe in green gram seed and straw ranged from (1104.21 to 1658.76 kg ha^{-1}) and (955.24 to 1440.38 kg ha^{-1}), respectively. The highest uptake of Fe was observed in green gram seed (1658.76 kg ha^{-1}) and straw (1440.38 kg ha^{-1}) with treatment T_9 (RDF + Soil application $FeSO_4$ + $ZnSO_4$ @ 25 kg ha^{-1} + Borax @ 10 kg ha^{-1}) and was found at par with treatment T_8, T_4 and also found superior over the rest of the treatments. Whereas, the minimum uptake of Fe in seed (1104.21 kg ha^{-1}) and in straw (955.24 kg ha^{-1}) recorded in treatment T_1 (RDF).

Table 5: Effect of micronutrient application on iron content, iron uptake in seed and straw and total uptake of green gram after harvest.

Treatments	Seed		Straw		Total Uptake (g ha^{-1})
	Content (mg kg^{-1})	Uptake (g ha^{-1})	Content (mg kg^{-1})	Uptake (g ha^{-1})	
T1: RDF	107.51	1104.21	67.70	955.24	2059.45
T2: RDF + S.A. Grade-I micro-nutrient @ 25 kg ha^{-1}.	113.27	1421.39	73.33	1315.32	2736.71
T3: RDF + F.A. Grade-II micro-nutrient @ 0.5% at 25 and 40 DAS.	112.20	1199.11	71.13	1062.68	2261.79
T4: RDF + S.A. Grade-I micro-nutrient @ 25 kg ha^{-1} + F.A. Grade-II micro-nutrient @ 0.5% at 25 and 40 DAS	114.49	1504.18	74.20	1341.41	2845.59
T5: RDF + S.A. $FeSO_4$ @ 25 kg ha^{-1}	115.37	1325.06	75.04	1250.19	2575.26
T6: RDF + S.A. $ZnSO_4$ @ 25 kg ha^{-1}	107.72	1190.20	69.00	1087.85	2278.04
T7: RDF + S.A. Borax @ 10 kg ha^{-1}	107.69	1195.94	68.73	1026.38	2222.32
T8: RDF + S.A. $FeSO_4$ + $ZnSO_4$ @ 25 kg ha^{-1}	115.40	1590.27	75.19	1389.11	2979.38
T9: RDF + S.A. $FeSO_4$ + $ZnSO_4$ @ 25 kg ha^{-1} + Borax @ 10kg ha^{-1}	116.13	1658.76	75.62	1440.38	3099.14
T10: RDF + F.A. $FeSO_4$ + $ZnSO_4$ @ 0.5% + Borax 0.2% at 25 to 40 DAS.	113.07	1221.53	73.03	1080.94	2302.47
SE (m) ±	0.80	83.8	0.93	31.1	83.6
CD at 5%	2.37	248.9	2.78	92.5	248.4

Total Fe uptake by green gram (3099.14 kg ha^{-1}) was observed maximum in treatment T_9 (RDF + Soil application $FeSO_4$ + $ZnSO_4$ @ 25 kg ha^{-1} + Borax @ 10 kg ha^{-1}) and was found at par with treatment T_8 which was superior over rest of the treatments. Whereas, the minimum total uptake of Fe (2059.45 kg ha^{-1}) was recorded in treatment T_1 (RDF). The increase in iron uptake by green gram might be due to increased nutrient concentration and higher dry matter production which further increased the uptake. The significant effect might be due to the application of ferrous sulphate which brings significant improvement in active Fe and total Fe content which was attributed to the greater availability of iron in its ferrous form and better absorption and translocation of reduced Fe within the plants. Higher active iron content with foliar spray might be due to the maintenance of Fe in soluble form (Fe^{++}) due to the acidity of citric acid. Similar findings were observed by Gahlot *et al.* (2020) [5] in mung bean crop. in green gram.

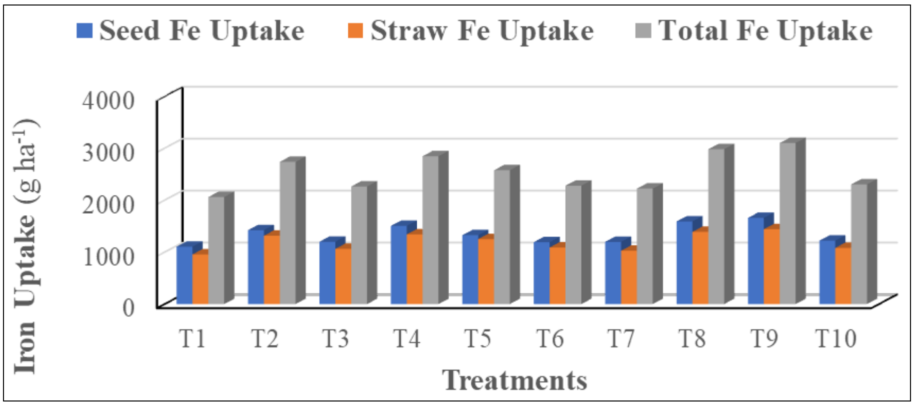

Fig 4: Effect of micronutrient application on iron uptake (g ha^{-1}) in seed and straw and total uptake of green gram after harvest.

3.2.5 Zinc content and uptake by green gram

The data related to content and uptake of Zn as influenced by the application of micronutrients after the harvest of green gram has presented in table 6 and fig 5.

The highest Zn content in seed (43.81 mg kg^{-1}) and in straw (29.06 mg kg^{-1}) was recorded with the application of treatment T_9 (RDF + Soil application $FeSO_4$ + $ZnSO_4$ @ 25 kg ha^{-1} + Borax @ 10 kg ha^{-1}) followed by treatment T_8, T_6, T_4, T_2 and superior over rest of the treatments. Whereas, the minimum content of Zn in seed (29.51 mg kg^{-1}) and in straw (22.00 mg kg^{-1}) was observed in treatment T_1 (RDF).

The uptake of Zn in green gram seed and straw ranged from 301.83 kg ha^{-1} to 625.72 kg ha^{-1} and 310.01 kg ha^{-1} to 553.59 kg ha^{-1}, respectively. The highest uptake of Zn (625.72 kg ha^{-1}) and (553.59 kg ha^{-1}) was observed in green gram seed and straw recorded with the application of treatment T_9 (RDF + Soil application $FeSO_4$ + $ZnSO_4$ @ 25 kg ha^{-1} + Borax @ 10 kg ha^{-1}) and was found at par with treatment T_8 and superior over the rest of the treatments. Whereas, the minimum uptake of Zn in seed (301.83 kg ha^{-1}) and in straw (310.01 kg ha^{-1}) observed in treatment T_1 (RDF).

Total Zn uptake of green gram (1179.30 kg ha^{-1}) was maximum with treatment T_9 (RDF + Soil application $FeSO_4$ + $ZnSO_4$ @ 25 kg ha^{-1} + Borax @ 10 kg ha^{-1}) followed by the treatment T_8 and superior over rest of the treatments. Whereas, the minimum total uptake of Fe (611.84 kg ha^{-1}) was recorded in treatment T_1 (RDF).

This might be due to the application of Zn to deficient soil increased the availability of Zn in the rhizosphere at a level below where the optimum requirement of the crop is fulfilled. The favorable effect of zinc on photosynthesis and metabolic processes augmented the production of photosynthates and their translocation to different plant parts including seed and straw which ultimately increased the concentration of nutrients in the grain and straw. As the uptake of the nutrient is a function of its concentration and dry matter production by the crop, higher the zinc concentration in the produce and higher biomass might be the pertinent reason for the increase in the uptake of zinc by green gram due to zinc and iron fertilization. Similar findings were observed by Gahlot *et al.* (2020) [5] in mung bean.

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