



P-ISSN: 2349-8528

E-ISSN: 2321-4902

IJCS 2018; 6(3): 1699-1702

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Received: 07-03-2018

Accepted: 09-04-2018

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Impacts of Foliar Application of Speciality Fertilizers on nutrient uptake of Chickpea (*Cicer Arietinum* L.)

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Abstract

A field experiment was conducted on the research farm of Soil Science and Agricultural Chemistry Department, VNMKV, Parbhani during *Rabi* 2012-13 to study the effect of foliar application of speciality fertilizers on nutrient uptake of chickpea (cv. Akash) production. The experiment was planned in randomized block design. There were total eight treatments given *viz.*: T₁- Absolute control (No fertilizer), T₂- Only RDF through soil (25:50:0 NPK kg ha⁻¹), T₃- Recommended Dose of Fertilizer (RDF) + Water spray (3 sprays), T₄ - RDF + KNO₃-50 % (3.8 kg ha⁻¹) (2 sprays) at 30 and 45 DAS, T₅- RDF + Speedfol pulses-50 % (5 kg ha⁻¹) (2 sprays) at 30 and 45 DAS, T₆- RDF + KNO₃-100 % (7.5 kg ha⁻¹) (2 sprays) at 30 and 45 DAS, T₇- RDF + Speedfol pulses-100 % (10 kg ha⁻¹) (2 sprays) at 30 and 45 DAS and T₈- RDF + Grade-II (5 gm lit⁻¹) (3 sprays) at 30, 45 and 60 DAS. Among the treatments the treatment T₅ (RDF + Speedfol pulses-50 % (5 Kg ha⁻¹) (2 sprays) at 30 and 45 DAS) and T₈- RDF + Grade-II (5 gm lit⁻¹) (3 sprays) at 30, 45 and 60 DAS, showed maximum nutrient uptake. The highest N content in plant (3.02 %) and grain (3.21 %), P content in plant (0.38%) and in grain (0.78%), K content in plant (1.34%) and in grain (0.68 %) of chickpea, S content in plant (0.54 mg kg⁻¹) and in grain (2.02 mg kg⁻¹), Cu content in plant (55.23 mg kg⁻¹) and in grain (21.56 mg kg⁻¹) Fe content in plant (45.42 mg kg⁻¹) and in grain (41.50 mg kg⁻¹), Mn content in plant (57.10 mg kg⁻¹) and in grain (41.10 mg kg⁻¹), Zn content in plant (131.47 mg kg⁻¹) and in grain (71.37 mg kg⁻¹), Mo content in plant (1.11 mg kg⁻¹) and in grain (14.80 mg kg⁻¹), B content in plant (4.86 mg kg⁻¹) and in grain (10.26 mg kg⁻¹) and the benefit cost ratio was maximum (2.48) in treatment T₅ (RDF + Speedfol pulses-50% (5 kg ha⁻¹) (2 sprays at 30 and 45 DAS). Thus, in addition to RDF, the foliar application of speciality fertilizers, potassium nitrate and Grade -II is benefited for higher nutrient uptake and it is also benefited for cost benefit in chickpea.

Keywords: Foliar application, nutrient uptake, spadesful, chickpea, speciality fertilizers

Introduction

Chickpea (*Cicer arietinum*) is the important grain legume crop of Indian subcontinent. India ranks first in production of chickpea in world contributing 25-28 % world's total crop production. Chickpea is the third most important pulse crop in the world after dry bean and dry peels. Area under chickpea production during 2010-2011 is 7.37 M ha, total production is 5.89 MT and yield increases up to 800 kg ha⁻¹. Chickpea is one of the important *rabi* pulse crop which has high digestible dietary protein for millions of people in the developing countries, particularly in South Asia, who are largely vegetarian either by choice or because of economic reasons. Being rich source of protein, chickpea meets 80% of its nitrogen requirement from symbiotic nitrogen fixation and can fix up to 140 kg N ha⁻¹ from air. It leaves substantial amount of residual nitrogen for subsequent crops and adds plenty of organic matter to maintain and improve soil fertility. Because of its deep tap root system, chickpea can withstand drought conditions by extracting water from deeper layers in the soil profile.

Speciality fertilizers are having specific characteristics *viz.*, 100% water soluble, safe and effective, provide entire spectrum of nutrients needed for a wide variety of plants, source for immediate availability, formulated to be compatible with most common pesticides and fungicides and uniform in analysis.

Materials and Methods

A field experiment was carried out during *rabi* 2012-13 using chickpea (cv. Akash) at the departmental research farm of Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani. The experiment was laid out in randomized block design with three replications. The experimental

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soil was fine, smecticcalcareous, Iso-hyperthermic, typic haplusterts. It was alkaline in reaction (pH 7.70), safe in soluble salt concentration (EC 0.28 dSm⁻¹) and low in organic carbon content (0.29 %). The free calcium carbonate was (6.50) %. available N (156.8 kg ha⁻¹), Olsen's available P (18.41 kg ha⁻¹), 1M ammonium acetate exchangeable available K (760.48 kg ha⁻¹) and S content was (15.3) mg kg⁻¹. While, the micronutrient status like DTPA zinc, iron, manganese, copper, boron and molybdenum content were 1.40, 2.31, 12.48, 2.1, 0.8 and 0.13 mg kg⁻¹ respectively. Growth and yield contributions characters were recorded at different growth stages. In each plot, 5 random plants were selected to be record biometric observations on growth and yield attributes. Five plants uprooted from the observation unit for recording the dry matter studies and after removing the roots, plant samples were kept in well labeled brown paper bag. First the samples are dried in shade and after that kept in oven at 65°C ± 2°C, and then weight of dry matter was taken and expressed on per plant basis. All the data were subjected to analysis of variance.

Effect of application of speciality fertilizer on uptake of nutrients after harvest of chickpea

The data presented in Table 1. Indicated the uptake of nutrients by plant and grains.

N uptake (kg ha⁻¹)

The data in respect of uptake of phosphorus by chickpea is presented in Table 1. Based on the observation it is found that the uptake varied from plant uptake of N varied in range from 43.59 to 81.66 kg ha⁻¹ and in grain from 22.76 to 42.85. Scrutiny of data revealed that the nitrogen uptake by chickpea was relatively higher due to foliar application of speciality fertilizer. The maximum uptake of nitrogen recorded with T₅ (RDF + Speedfol pulses-50% (5 kg ha⁻¹) (2 sprays) at 30 and 45 DAS) followed by T₇ (RDF + Speedfol pulses-100% (10 kg ha⁻¹) (2 sprays) at 30 and 45 DAS), T₆ (RDF + KNO₃-100% (7.5 kg ha⁻¹) (2 sprays) at 30 and 45 DAS), T₄ (RDF + KNO₃- 50% (3.8 kg ha⁻¹) (2 sprays) at 30 and 45 DAS) and T₈ (RDF + Grade-II (5 gm lit⁻¹) (3 Sprays) at 30, 45 and 60 DAS), T₃ (RDF + water spray), T₂ (Only RDF through soil (25:50:0 NPK kg ha⁻¹) and T₁ (Absolute control). The role of nitrogen fertilizer in improving growth and dry matter accumulation which led to increasing the uptake of nutrients. Similar observations were recorded by Venkatesh and Basu (2011) [1] in chickpea crop on Inceptisol by using 2% urea at 75 DAS.

P uptake (kg ha⁻¹)

The data in respect of uptake of phosphorus by chickpea is presented in Table 1. Based on the observation it is found that

the uptake in plant varied between 4.53 to 10.41 kg ha⁻¹ and in grain 3.85 to 10.41 kg ha⁻¹. The maximum uptake of P was noted in T₅ (RDF + Speedfol pulses-50% (5 kg ha⁻¹) (2 sprays) at 30 and 45 DAS) followed by T₇ (RDF + Speedfol pulses-100% (10 kg ha⁻¹) (2 sprays) at 30 and 45 DAS), T₆ (RDF + KNO₃-100% (7.5 kg ha⁻¹) (2 sprays) at 30 and 45 DAS), T₄ (RDF + KNO₃- 50% (3.8 kg ha⁻¹) (2 sprays) at 30 and 45 DAS) and T₈ (RDF + Grade-II (5 gm lit⁻¹) (3 Sprays) at 30, 45 and 60 DAS).

The results achieved in this work are particularly compatible with those obtained by Manjula Devi and Pillai (1997) [2] in black gram during *kharif* season by using 2 % urea spray and Manivannan and Thanunathan (2003) [3] in black gram crop by using micronutrient spray at 15, 30 and 45 DAS on Vertisol.

K uptake (kg ha⁻¹)

The data of potassium absorption by chickpea as influenced by various treatments is compiled in Table 1. From the data it was observed that the total potassium uptake by chickpea in plant was varied in between 22.88 to 27.33 kg ha⁻¹ and in grain 4.49 to 7.19 was noted with T₅ (RDF + Speedfol pulses-50% (5 kg ha⁻¹) (2 sprays) at 30 and 45 DAS) followed by T₆ (RDF + KNO₃-100% (7.5 kg ha⁻¹) (2 sprays) at 30 and 45 DAS), T₇ (RDF + Speedfol pulses-100% (10 kg ha⁻¹) (2 sprays) at 30 and 45 DAS), T₄ (RDF + KNO₃-50% (3.8 kg ha⁻¹) (2 sprays) at 30 and 45 DAS) and T₈ (RDF + Grade-II (5 gm lit⁻¹) (3 Sprays) at 35, 45 and 60 DAS).

The similar findings were reported by Deshmukh M G (2012) [4] in Chickpea, the total potassium uptake by chickpea was in range between 26.47 to 67.85 kg ha⁻¹. The maximum uptake of potassium in plant 57.83 kg ha⁻¹ and in grain 10.01 kg ha⁻¹ was with T₄ (RDF + 1.5% Starter and 1.5% Booster -2 sprays each), grown on Vertisols of Marathwada region.

S uptake (kg ha⁻¹)

The data on uptake of sulphur is influenced by foliar application of speciality fertilizers presented in Table 1. The uptake of sulphur varied in range from 7.53 to 10.28 kg ha⁻¹ and in grain 11.68 to 19.69 kg ha⁻¹ The maximum uptake of sulphur was observed in treatment T₅ (RDF + Speedfol pulses-50% (5 kg ha⁻¹) (2 sprays) at 30 and 45 DAS) followed by T₇ (RDF + Speedfol pulses-100% (10 kg ha⁻¹) (2 sprays) at 30 and 45 DAS), T₈ (RDF + Grade-II (5 gm lit⁻¹) (3 Sprays) at 35, 45 and 60 DAS).

The time of foliar application of nutrients coincides with the flowering and seed setting stage, wherein nutrient requirement of the crop is higher. This might be the reason for higher uptake of nutrients. Similar results were recorded by Pandrangi *et al.* (1991) [5] in green gram crop by using 40 kg P ha⁻¹ + 0.5% SSP at Akola.

Table 1: Effect of application of specialty fertilizer on N and P uptake (kg ha⁻¹) by chickpea

T. No.	Treatment Details	N (kg ha ⁻¹)			P (kg ha ⁻¹)			K (kg ha ⁻¹)			S (kg ha ⁻¹)		
		Plant	Grain	Total	Plant	Grain	Total	Plant	Grain	Total	Plant	Grain	Total
T ₁	Absolute control (No fertilizer)	43.59	22.76	66.36	4.53	3.85	8.36	22.88	4.49	27.36	7.53	11.68	19.21
T ₂	Only RDF through soil (25:50:0 NPK kg ha ⁻¹)	53.91	30.24	84.15	6.78	5.87	12.65	24.36	5.00	29.36	8.98	15.77	24.75
T ₃	RDF + water spray	58.75	30.73	89.48	7.31	6.11	13.42	25.61	5.22	30.83	9.55	15.94	25.49
T ₄	RDF + KNO ₃ -50% (3.8 kg ha ⁻¹) (2 sprays) at 30 and 45 DAS	64.07	37.90	101.97	7.06	8.64	15.71	28.21	7.92	36.13	10.93	22.59	33.52
T ₅	RDF + Speedfol pulses-50% (5 kg ha ⁻¹) (2 sprays) at 30 and 45 DAS	81.66	42.85	124.51	10.27	10.41	20.68	36.32	9.07	45.39	14.60	26.96	41.56
T ₆	RDF + KNO ₃ -100% (7.5 kg ha ⁻¹) (2 sprays) at 30 and 45 DAS	73.73	40.38	114.11	8.47	9.35	17.83	33.65	8.46	42.28	11.56	19.61	31.17
T ₇	RDF + Speedfol pulses-100% (10 kg ha ⁻¹) (2 sprays) at 30 and 45 DAS	77.11	41.20	118.31	9.80	9.98	19.81	33.92	8.34	42.17	12.90	22.69	35.59
T ₈	RDF + Grade-II (5 gm lit ⁻¹) (3 Sprays) at 35, 45 and 60 DAS	62.35	35.25	97.60	6.04	6.45	12.48	27.33	7.18	34.37	10.28	19.69	29.97
	SE ±	0.021	0.349	0.343	0.141	0.027	0.136	0.136	0.074	0.192	0.150	0.126	0.168
	CD (5%)	0.064	1.061	1.042	0.428	0.083	0.415	NS	NS	NS	NS	NS	NS

Effect of application of speciality fertilizer on uptake of micronutrients (Cu, Fe, Mn, Zn, Mo, B) after harvest of chickpea

Cu uptake (g ha⁻¹)

The data on uptake of Cu by chickpea as influenced by speciality fertilizer treatments narrated in Table 2. The data indicated that the Cu uptake by chickpea was in plant was varied from 27.53 to 119.19 g ha⁻¹ and in grain was 9.70 to 24.83 g ha⁻¹. Further it was found that the Cu uptake in plant and grain was higher with the treatment T₈ (RDF + Grade-II (5 gm lit⁻¹) (3 Sprays) at 35, 45 and 60 DAS) followed by T₇ (RDF + Speedfol pulses-100% (10 kg ha⁻¹) (2 sprays) at 30 and 45 DAS) and T₅ (RDF + Speedfol pulses-50% (5 kg ha⁻¹) (2 sprays) at 30 and 45 DAS) in both plant and grain.

The similar findings were reported by Deshmukh M G (2012)^[4] in Chickpea, where the Cu uptake by chickpea was varied in range from 317.30 to 1604.72 mg ha⁻¹ in plant and from 139.89 to 282.19 mg ha⁻¹ in grain, grown on Vertisols of Marathwada region.

Fe uptake (g ha⁻¹)

The data on Fe uptake as influenced by foliar feeding of speciality fertilizer is presented in Table 2. The plant uptake of Fe varied from 45.23 to 98.01 g ha⁻¹ in plant and from 63.81 to 145.81 g ha⁻¹ in grain, respectively. The highest Fe uptake was found in treatment T₈ (RDF + Grade-II (5 gm lit⁻¹) (3 Sprays) at 35, 45 and 60 DAS) followed by T₇ (RDF + Speedfol pulses-100% (10 kg ha⁻¹) (2 sprays) at 30 and 45 DAS) and T₅ (RDF + Speedfol pulses-50% (5 kg ha⁻¹) (2 sprays) at 30 and 45 DAS) in both plant and grain. Increase in uptake may be due to increased in dry matter production.

Similar results obtained by Manjula devi and Pillai (1997)^[2] in black gram crop during *Kharif* season by using 2% urea spray.

The similar findings were reported by Deshmukh M G (2012)^[4] in Chickpea, where the uptake of Fe varied from 514.79 to 1170.61 mg ha⁻¹ in plant and from 250.20 to 576.15 mg ha⁻¹ in grain, grown on Vertisols of Marathwada region.

Mn uptake (g ha⁻¹)

The data on Mn uptake as influenced by foliar feeding of speciality fertilizer is presented in Table 2. It was observed that the uptake of Mn varied from 20.97 to 123.22 g ha⁻¹ in plant and from 161.5 to 473.4 g ha⁻¹ in grain respectively. The maximum uptake of Mn was recorded in treatment T₈ (RDF + Grade-II (5 gm/lit) (3 Sprays) at 35, 45 and 60 DAS) followed by T₇ (RDF + Speedfol pulses-100% (10 kg ha⁻¹) (2 sprays) at 30 and 45 DAS) and T₅ (RDF + Speedfol pulses-50% (5 kg ha⁻¹) (2 sprays) at 30 and 45 DAS) in both plant and grain. The similar findings were reported by Deshmukh M G^[4] (2012) in Chickpea, the uptake of Mn varied from 260.20 to 1649.57 mg ha⁻¹ in plant and from 208.80 to 663.76 mg ha⁻¹ in grain, grown on Vertisols of Marathwada region

Zn uptake (g ha⁻¹)

The data on Zn uptake as influenced by foliar feeding of speciality fertilizer is presented in Table 2. the uptake of Zn varied from 121.37 to 284.70 g ha⁻¹ in plant and from 335.63 to 822.14 g ha⁻¹ in grain respectively. The maximum uptake of Zn was recorded in treatment T₈ (RDF + Grade-II (5 gm lit⁻¹) (3 Sprays) at 35, 45 and 60 DAS) followed by T₇ (RDF + Speedfol pulses-100% (10 kg ha⁻¹) (2 sprays) at 30 and 45 DAS) and T₅ (RDF + Speedfol pulses-50% (5 kg ha⁻¹) (2 sprays) at 30 and 45 DAS) in both plant and grain. Increased the uptake of micronutrients due to foliar application of same nutrient is possibly due to nutrients applied through foliage would have easily absorbed and translocated in plant without any loss. Similar results reported by Patel^[9] *et al* (2009) in Maize crop by using mixture of Grade III containing (Fe 6% + Mn 1% + Zn 4% + Cu 0.3% + B 0.5%).

The similar findings were reported by Deshmukh M G^[4] (2012) in Chickpea, the uptake of Zn varied from 1341.28 to 5161.44 mg ha⁻¹ in plant and from 422.27 to 963.96 mg ha⁻¹ in grain respectively. The maximum uptake of Zn was recorded in treatment T₆ (RDF + 1% multi micronutrient grade II – 4 sprays), grown on Vertisols of Marathwada region.

Table 2: Effect of application of speciality fertilizer on Cu, Fe, Mn, Zn uptake (g ha⁻¹) of chickpea

T. No.	Treatment Details	Cu (g ha ⁻¹)			Fe (g ha ⁻¹)			Mn (g ha ⁻¹)			Zn (g ha ⁻¹)		
		Plant	Grain	Total	Plant	Grain	Total	Plant	Grain	Total	Plant	Grain	Total
T ₁	Absolute control (No fertilizer)	27.53	9.70	37.24	45.23	18.58	63.81	20.97	161.5	371.33	121.37	335.63	460.0
T ₂	Only RDF through soil (25:50:0 NPK kg ha ⁻¹)	42.54	14.79	57.34	53.51	26.32	79.84	27.42	214.6	488.94	143.25	443.90	587.12
T ₃	RDF + water spray	50.48	15.67	66.16	52.04	26.46	78.50	34.08	240.1	581.05	149.62	458.14	607.76
T ₄	RDF + KNO ₃ -50% (3.8 kg ha ⁻¹) (2 sprays) at 30 and 45 DAS	89.22	20.87	110.10	67.35	35.47	102.83	53.58	354.0	889.84	191.58	707.23	898.11
T ₅	RDF + Speedfol pulses-50% (5 kg ha ⁻¹) (2 sprays) at 30 and 45 DAS	112.21	24.69	136.91	94.00	41.13	135.14	120.86	428.5	1637.22	276.34	819.69	1096.41
T ₆	RDF + KNO ₃ -100% (7.5 kg ha ⁻¹) (2 sprays) at 30 and 45 DAS	108.92	22.43	131.36	84.17	36.92	121.09	85.54	361.5	1216.99	233.35	715.35	948.69
T ₇	RDF + Speedfol pulses-100% (10 kg ha ⁻¹) (2 sprays) at 30 and 45 DAS	113.42	24.77	138.19	97.34	39.90	137.24	122.69	417.6	1644.58	284.17	801.46	1094.66
T ₈	RDF + Grade-II (5 gm lit ⁻¹) (3 Sprays) at 35, 45 and 60 DAS	119.19	24.83	144.02	98.01	47.80	145.81	123.22	473.4	1705.68	284.70	822.14	1105.84
	SE ±	0.143	0.046	0.167	0.134	0.326	0.319	0.137	0.999	2.104	2.539	1.508	4.312
	CD (5%)	NS	NS	NS	NS	NS	NS	NS	3.031	NS	7.702	4.576	NS

Mo uptake (g ha⁻¹)

The data on Mo uptake as influenced by foliar feeding of speciality fertilizer is presented in Table 3. the uptake of Mo is 0.85 to 2.39 g ha⁻¹ in plant and in grain from 7.71 to 17.04 g ha⁻¹. It was recorded in treatment T₈ (RDF + Grade-II (5 gm lit⁻¹) (3 Sprays) at 35, 45 and 60 DAS) followed by T₇ (RDF + Speedfol pulses-100% (10 kg ha⁻¹) (2 sprays) at 30 and 45

DAS) and T₅ (RDF + Speedfol pulses-50% (5 kg ha⁻¹) (2 sprays) at 30 and 45 DAS) in both plant and grain.

El-Ghamry *et al* (2009)^[6] in Wheat crop by using foliar application of B + Mo + Zn @ 50+25+250 mg l⁻¹.

B uptake (mg kg⁻¹)

The data on Fe uptake as influenced by foliar feeding of

speciality fertilizer is presented in Table 3. the uptake of B varied from 5.68 to 10.48 mg ha⁻¹ in plant and from 4.53 to 11.61 mg ha⁻¹ in grain. Finding is in conformation with Lalitha *et al* (2008) [7] in Niger crop by using K₂SO₄ + H₃BO₃ at 60 DAS through foliar application. The time of foliar application of nutrients coincides with the flowering and seed setting stage, wherein nutrient requirement of the crop is higher. This might be the reason for higher uptake of nutrients.

Table 3: Effect of application of speciality fertilizer on Mo and B uptake (g ha⁻¹)

T. No.	Treatment Details	Mo (g ha ⁻¹)			B (g ha ⁻¹)		
		Plant	Grain	Total	Plant	Grain	Total
T ₁	Absolute control (No fertilizer)	0.85	7.71	8.56	5.68	4.53	10.21
T ₂	Only RDF through soil (25:50:0 NPK kg ha ⁻¹)	1.09	10.28	11.37	7.11	6.07	13.18
T ₃	RDF + water spray	1.09	10.58	11.65	7.29	6.84	14.13
T ₄	RDF + KNO ₃ -50% (3.8 kg ha ⁻¹) (2 sprays) at 30 and 45 DAS	1.41	13.22	14.70	8.13	9.66	17.79
T ₅	RDF + Speedfol pulses-50% (5 kg ha ⁻¹) (2 sprays) at 30 and 45 DAS	2.19	15.35	17.51	10.32	11.30	21.63
T ₆	RDF + KNO ₃ -100% (7.5 kg ha ⁻¹) (2 sprays) at 30 and 45 DAS	2.00	13.84	15.84	9.60	9.90	19.51
T ₇	RDF + Speedfol pulses-100% (10 kg ha ⁻¹) (2 sprays) at 30 and 45 DAS	2.19	15.69	17.88	10.07	11.06	21.15
T ₈	RDF + Grade-II (5 gm lit ⁻¹) (3 Sprays) at 35, 45 and 60 DAS	2.39	17.04	19.55	10.48	11.61	22.29
	SE ±	0.017	0.126	0.115	0.010	0.069	0.006
	CD (5%)	0.052	0.384	NS	0.031	0.211	NS

Effect of speciality fertilizer on Economics of chickpea production

The highest gross return, net return and benefit cost ratio were recorded with treatment T5 (RDF + Speedfol pulses-50% (5 kg ha⁻¹) (2 sprays) at 30 and 45 DAS) followed by T4 (RDF + KNO₃-50% (3.8 kg ha⁻¹) (2 sprays) at 30 and 45 DAS) T6 (RDF + KNO₃-100% (7.5 kg ha⁻¹) (2 sprays) at 30 and 45 DAS) and T7 (RDF + Speedfol pulses-100% (10 kg ha⁻¹) (2 sprays) at 30 and 45 DAS), and T8 (RDF + Grade-II (5 gm lit⁻¹) (3 Sprays) at 35, 45 and 60 DAS). The benefit cost ratio varied in range from 1 to 2.48 and was maximum in treatment T5 (RDF + Speedfol pulses-50% (5 kg ha⁻¹) (2 sprays) at 30 and 45 DAS).

The variation in gross return, net return and benefit cost ratio was mainly due to variation in chickpea grain yield. The increased in B:C ratio due to foliar application at various growth stages may be due to the enhanced grain yield. Similar results were also obtained in different crops by, Shinde and Bhilare (2003) [8] in chickpea by using DAP through foliar application, Patel *et al* (2009) [9] in Cowpea by using foliar application of ZnSO₄ @ 0.5%, and Palaniappan *et al* (1999) [10] in Tomato and Chilli with speciality fertilizer foliar application and Deshmukh MG (2012) [4] in chickpea grown on vertisols of Marathwada region.

Conclusions

The total of uptake nutrients significantly increased with graded dose of speciality fertilizers @ RDF + Speedfol Pulses - 50% (5 kg ha⁻¹) (2 sprays each) and RDF + Grade-II (5 gm lit⁻¹) (3 Sprays) i.e. macronutrients N from 66.36 to 124.51 kg ha⁻¹, P from 8.36 to 20.68 kg ha⁻¹, K from 27.36 to 45.39 kg ha⁻¹ and secondary nutrient viz; S from 19.21 to 41.56 mg ha⁻¹ and micronutrients Cu from 37.24 to 144.02 mg ha⁻¹, Fe from 63.81 to 145.81 mg ha⁻¹, Mn from 37.13 to 170.56 mg ha⁻¹, Zn from 46.0 to 110.58 mg ha⁻¹, Mo from 8.55 to 19.55 mg ha⁻¹ and B from 10.21 to 22.29 mg ha⁻¹ by chickpea.

The benefit cost ratio varied from 1 to 2.48 and was maximum (2.48) in treatment T5 (RDF + Speedfol pulses-50% (5 kg ha⁻¹) (2 sprays- at 30 and 45 DAS).

Overall, foliar application of RDF + Speedfol Pulses - 50% (5 kg ha⁻¹) (2 sprays each) or potassium nitrate and RDF+

The similar findings were reported by Deshmukh M G (2012) [4] in Chickpea, the uptake of B varied from 67.15 to 121.03 mg ha⁻¹ in plant and from 57.78 to 131.32 mg ha⁻¹ in grain and found maximum in Uptake of Mo varied from 102.67 to 289.82 mg ha⁻¹ in plant and in grain from 97.95 to 189.74 mg ha⁻¹ was recorded in treatment T₆ (RDF + 1% multi micronutrient grade II – 4 sprays), grown on Vertisols of Marathwada region.

Grade-II (5 gm lit⁻¹) (3 Sprays) along with recommended dose of fertilizer was found superior for yield and quality of produce along with restoration of soil fertility.

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