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EFFECT OF IPNS AND FOLIAR NUTRITION ON NUTRIENT UPTAKE OF CORIANDER AND FERTILITY STATUS OF ALFISOLS IN TAMIRABARANI COMMAND AREA

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Abstract

A field experiment was conducted at Agricultural College and Research Institute, Killikulam, during Rabi season 2017-18 to study the effect of IPNS and foliar nutrition on yield and quality of coriander and its impact on the properties of Alfisols of Tamirabarani command area. The experiment was laid out in Randomized Block Design (RBD) with thirteen treatments and three replications. The treatments consists of absolute control (T_1), STCR-IPNS alone (T_2), FYM on 100 percent N equivalent basis alone (T_3), along with T_2, T_3 foliar spray of amino acids, micronutrients, moringa and aloevera leaf extract alone and also in combinations. The treatment that received FYM + foliar spray of amino acids, micronutrients, moringa and aloe vera leaf extracts (T_{13}) recorded higher uptake of nitrogen (14.89 kg ha^{-1} in seed and 16.04 kg ha^{-1} in stover), phosphorus (3.72 kg ha^{-1} in seed and 4.07 kg ha^{-1} in stover) and potassium (16.72 kg ha^{-1} in seed and 23.10 kg ha^{-1} in stover) in coriander at post harvest stage. The soil fertility status as evidenced by available nitrogen (177 kg ha^{-1}), available phosphorus (15.4 kg ha^{-1}) and available potassium (279 kg ha^{-1})at post harvest stage was higher in the treatment that received STCR-IPNS + foliar spray of amino acids, micronutrients, moringa and aloe vera leaf extracts (T_{12}).

Keywords: "STCR-IPNS; Foliar nutrition; FYM; Nutrient uptake; Available nutrients"

1. Introduction

In recent years, to accomplish the nutrient demand of crops and to achieve higher yield usage of inorganic fertilizers has been increased. In India on an average 130.8 Kg $ha^{-1}$of nutrients were used every year (Anonymous, 2017). Due to inordinate and imbalance utilization of fertilizers and continuous cultivation of crops the physical and chemical fertility of the soil was depleted. Adoption of Integrated Plant Nutrient System will pave way to sustain the soil fertility and crop productivity.

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IPNS refers to usage of all potential sources of inorganic, organic and biological sources to provide all plant nutrients and to sustain soil fertility within the available farming and economic conditions. Application of organic manures builds up the soil organic matter and increase the activity of microbes which maintains the soil health. Such combined application of organic of inorganic fertilizers benefits the soil by supplying nutrients, improves physical and biological properties and increase the nutrient and water retention capacities. Coriander is one of the major crops grown in Thoothukudi district which has more economic value and less nutrient requirement crop. IPNS technology is the best way to improve the nutrient uptake of coriander and to sustain the soil fertility status.

2. Materials and Method

A field experiment was conducted at Agricultural College and Research Institute, Killikulam, during Rabi season 2017-18 to study the effect of STCR- IPNS and foliar nutrition on yield and quality of coriander in Alfisols of Tamirabarani command area. The soil of the experimental field was sandy clay loam in texture belonging to Killikulam soil series and taxonomically grouped as Typic Hapustalfs (Soil Taxonomy, 1975). It was neutral in pH, low in available nitrogen (204 kg ha^{-1}), medium in available phosphorus (16.5kg ha^{-1}) and high in available potassium (287 kg ha^{-1}). The Available sulphur (25.22 mg kg^{-1}) was in sufficient level and among the micronutrients DTPA Zinc (0.63 mg kg^{-1}) and DTPA Iron (2.35 mg kg^{-1}) was deficient and other nutrients like DTPA Manganese (2.99 mg kg^{-1}) and DTPA Copper (1.5 mg kg^{-1}) are at sufficient level. The experiment was laid out in Randomized Block Design (RBD) with thirteen treatments and three replications. The treatments consists of absolute control (T_1),STCR-IPNS based recommendation (T_2), FYM on N equivalent basis (T_3), the treatments T_4, T_6, T_8, T_{10} includes STCR-IPNS + foliar spray of amino acids (T_4), micronutrients (T_6), aloe vera leaf extract (T_8) and moringa leaf extract (T_{10}). For the treatments T_5, T_7, T_9, T_{11}, FYM on 100 percent N equivalent basis along with foliar spray of amino acids (T_5), micronutrients (T_7), aloe vera leaf extract (T_9) and moringa leaf extract (T_{11}). The treatment T_{12}, consists of STCR-IPNS recommendation + foliar spray of amino acids+ micronutrients + aloe vera leaf extract+ moringa leaf extract and the treatment T_{13} consists of FYM on 100 percent N equivalent basis along with foliar spray of amino acids+ micronutrients + aloe vera leaf extract+ moringa leaf extract was applied.

STCR-IPNS recommendation of 86 kg ha^{-1} diammonium phosphate, 33 kg ha^{-1} muriate of potash and 440 kg ha^{-1} FYM and for the treatment FYM alone 4 tonnes of FYM was applied in their respective plots to

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supply 20:40:20 quantities of recommended dose of N, P_20_5, K_2O. Foliar application of amino acids (20 ppm), micronutrients (Fe 1.0%, Zn 0.5% & B 0.2%), moringa leaf extract (20 ppm) and aloe vera leaf extracts (20 ppm) was given at 25, 40 and 55 days after sowing. Coriander variety CO (CR) 4 was used as test crop. Data on various characters studied during the course of investigation was statistically analysed as suggested by Gomez and Gomez, (1984).

3. Results and Discussion

3.1 NPK uptake

The increase in uptake of NPK by coriander was mainly due to higher dry matter production with higher nutrient content of these major nutrients (Table1). At post harvest stage the nitrogen uptake varied from 4.00 kg ha^{-1} to 14.89 kg ha^{-1} and 4.58 kg ha^{-1} to 16.04 kg ha^{-1} in seed and stover respectively; the phosphorus uptake ranged from 1.43 kg ha^{-1} to 3.72 kg ha^{-1} and 1.73kg ha^{-1} to 4.07 kg ha^{-1} in seed and stover respectively and the potassium uptake varied from 5.70 kg ha^{-1} to 16.72 kg ha^{-1} and 8.32 kg ha^{-1} to 23.10 kg ha^{-1} in seed and stover respectively. The greater nutrient uptake was found in the treatment FYM + foliar spray of amino acids, micronutrients; moringa and aloe vera leaf extract (T_{13}) followed by the treatment that received STCR-IPNS + foliar spray of amino acids, micronutrients, moringa and aloe vera leaf extracts.

The increased NPK uptake by coriander with application of organics along with foliar application of amino acids, micronutrients and plant extract may be due to improvement in the soil environment which encouraged proliferation of roots resulting in more absorption of water and nutrients from rhizosphere (Naher *et al.*, 2016). Application FYM + foliar spray of amino acids, micronutrients; moringa and aloe vera leaf extracts registered the highest NPK uptake in coriander as compared to individual application of micronutrients, moringa and aloevera leaf extract through foliar spray.

Organic manures, during decomposition release nutrients which became available to the plants and thus increased NPK concentration. The higher nutrient uptake with organic manure might be attributed to solubilization of native nutrients, chelation of micronutrient complex, intermediate organic molecules produced during decomposition of added organic manures, their mobilization and accumulation of nutrients by crop plants. Micronutrients and plant extracts applied through foliage would have been easily absorbed and translocated to the plants directly without spending energy for their transport and without any loss in transit,

resulted in increased NPK uptake by the crop. (Dubey *et al.* (2012), Verma *et al.* (2016) and Javiya *et al.* (2017)).

3.2 Sulphur uptake

At post harvest stage sulphur uptake ranged from 1.11 to 1.62 g kg^{-1} (Table 2). The treatment FYM + foliar spray of amino acids, micronutrients, moringa and aloe vera leaf extract (T_{13}) and the treatment STCR-IPNS + foliar spray of amino acids, micronutrients; moringa and aloe vera leaf extracts (T_{12}) recorded higher sulphur uptake of 1.62 g kg^{-1}. Due to the higher dry matter production the uptake was also in increased range. The similar results were reported by (Solanki *et al.*, 2017)

3.3 Micronutrients uptake

At post harvest stage the uptake of zinc in stover and seed ranged from 1.35 to 2.96 g kg^{-1} and 1.22 to 3.00 g kg^{-1} respectively (Table 3). The uptake of iron in stover and seed varied from 4.14 to 8.44 g kg^{-1} and 3.87 to 8.82 g kg^{-1} respectively. Both follow the same trend. The higher uptake was recorded in the treatment FYM + foliar spray of amino acids, micronutrients, moringa and aloe vera leaf extract (T_{13}) followed by STCR-IPNS + foliar spray of amino acids, micronutrients; moringa and aloe vera leaf extracts (T_{12}). These results were in accordance with (Said-Al Ahl and Omer, 2009).

3.4 Effect of IPNS and foliar nutrition on available nutrient status of coriander

The profound influence of organic and inorganic sources on the alkaline $KMnO_4$-N, Olsen-P and NH_4OAc-K content in the Alfisols was given in Table 4.

At post harvest stage the available nitrogen status varied from 151 kg ha^{-1} to 177 kg ha^{-1}, the available phosphorus status ranged from 8.6 kg ha^{-1} to 15.4 kg ha^{-1} and the available potassium status varied from 229 kg ha^{-1} to 279 kg ha^{-1}. The results indicated that the treatment STCR-IPNS + foliar spray of amino acids, micronutrients, moringa and aloe vera leaf extracts rated best in recording the highest available N,P and K contents in the soil and it was found to be on par with the treatment FYM + foliar spray of amino acids, micronutrients; moringa and aloe vera leaf extracts.

Addition of mineral fertilizers has increased available NPK content in the soil over organic manures but it has no positive effect on soil properties. Inorganic sources sustain the crop demand in initial stage while organic source owing to their slow release contributed at the later stage. The addition of organics stimulated the growth and activity of microorganisms, which increased the nutrient release. The organic acids released by the

manures might have decomposed the native nutrients and it also reduced the potassium interaction in the soil and thus increased the availability of potassium. These findings are in conformity with the earlier work of Dinesh Kumar *et al.* (2010) and Dubey *et al.* (2013).

4. Conclusion

Overall, from the experimental results it can be concluded that application of organics on 100 percent N equivalent basis along with foliar spray of amino acids (20 ppm), micronutrients (Fe 1%; Zn 0.5%; B 0.2%), moringa leaf extract (20 ppm) and aloevera leaf extract (20 ppm) spray at critical stages of crop growth (25, 40 and 55 DAS) was found to be optimum for getting higher nutrient uptake by coriander and the available nutrients status was higher in STCR-IPNS along with foliar spray of amino acids, micronutrients, moringa and aloevera leaf extract due to application of both organic manures and inorganic fertilizers. Hence, based on the availability of organic manures either organics on 100 percent N equivalent basis or STCR-IPNS along with foliar spray of amino acids, micronutrients, moringa and aloevera leaf extract can be recommended to coriander variety CO (CR) 4 to sustain the soil fertility status

References

[1] Anonymous. (2017). Annual review of fertiliser production and consumption *Indian Journal of Fertilisers*.

[2] Dinesh Kumar, M., Devaraju, K., Madaiah, D., & Shivakumar, S. (2010). Effect of integrated nutrient management on yield and nutrient content by cardamom (*Elettaria cardamomum* L. Maton.). *Karnataka Journal of Agricultural Sciences*, *22*(5).

[3] Dubey, P., Pandey, C., Bhardwaj, S., & Khanday, A. (2013). Effect of Integrated Nutrient Management on some soil health indices and seed yield of fenugreek (*Trigonella foenum-graecum* L.). *Pantnagar Journal of Research*, *11*(1), 145-149.

[4] Dubey, P., Pandey, C., Khanday, S., & Mishra, G. (2012). Effect of integrated nutrient management on nutrient uptake, protein content and yield of fenugreek. *International Journal of Food, Agriculture and Veterinary Sciences*, *2*(1), 1-12.

[5] Gomez, K. A. and Gomez, A. A.1984. *Statistical procedures for agricultural research*: John Wiley & Sons, New York, 680.

[6] Javiya, P., Solanki, J., Kaneria, S., & Rupareliya, V. (2017). Response of Coriander (*Coriandrum sativum* L.) to Nitrogen and Phosphorus in South Saurashtra Condition. *International Journal of Pure Appliedand Bioscience*, *5*(4), 860-866.

[7] Naher, M. S., Fahim, A., & Wadud, M. (2016). Crop productivity and nutrient uptake of fenugreek (*Trigonella foenum-graecum* L.) as influenced by Integrated Nutrient Management. *SAARC Journal of Agriculture*, *14*(1), 71-79.

[8] Said-Al Ahl, H., & Omer, E. (2009). Effect of spraying with zinc and iron on growth and chemical composition of coriander (*Coriandrum sativum* L.) harvested at three stages of development. *Journal of Medicinal Food Plants*, *1*(2), 30-46.

[9] Soil Taxonomy. 1975. Soil Survey Staff. *USDA. Soil Conservation Service*, Washington DC USA.

[10] Solanki, J., Javiya, P., Savaliya, N., & Hirpara, D. (2017). Response of coriander (*Coriandrum sativum* L.) To different levels of potassium and sulphur. *International Journal of Current Science*, *5*(5), 1884-1887.

[11] Verma, P., Singh, R., & Parmar, A. (2016). Effect of Integrated nutrient management on nutrient uptake by turmeric and available nutrient status of soil. *Technofame-A Journal of Multidisciplinary Advance Research*, *5*(02), 11-14.

Table 1. Effect of IPNS and foliar nutrition on nutrient uptake of coriander at post harvest stage (Mean value of three replications)

Treatments	Nitrogen uptake Kg ha^{-1}		Phosphorus uptake Kg ha^{-1}		Potassium uptake Kg ha^{-1}	
	Stover	Seed	Stover	Seed	Stover	Seed
T_1 - Control	4.58	4.00	1.73	1.43	8.32	5.70
T_2 - STCR-IPNS	7.65	6.75	2.31	1.92	11.79	7.80
T_3 - 100% N through FYM	7.87	6.96	2.36	1.96	12.13	7.94
T_4 - T_2 + FS- Amino Acids	9.27	8.24	2.64	2.25	13.69	9.23
T_5 - T_3 + FS- Amino Acids	9.76	8.69	2.76	2.35	14.35	9.61
T_6 - T_2 + FS- Micronutrients	11.91	10.73	3.16	2.75	17.52	11.59
T_7 - T_3 + FS- Micronutrients	12.26	11.28	3.21	2.84	18.00	12.10
T_8 - T_2 + FS- ALE	10.63	9.54	2.86	2.48	15.15	10.27
T_9 - T_3 + FS- ALE	10.72	9.90	2.87	2.55	15.27	10.60
T_{10} - T_2 + FS- MLE	13.62	12.44	3.48	3.10	19.32	13.21
T_{11} - T_3 + FS- MLE	13.86	12.84	3.52	3.18	19.67	13.61
T_{12} - T_2 + FS- A A +MN + ALE+ MLE	15.56	14.29	3.96	3.62	22.22	15.64
T_{13} - T_3 + FS- A A +MN + ALE+ MLE	16.04	14.89	4.07	3.72	23.10	16.72
S Ed	0.33	0.30	0.09	0.08	0.51	0.36
CD (0.05 %)	0.67	0.61	0.18	0.16	1.02	0.72

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Table 2. Effect of IPNS and foliar nutrition on sulphur uptake (g kg $^{-1}$) of coriander at post harvest stage (Mean value of three replications)

Treatments	Sulphur uptake (g kg $^{-1}$)
T_1 - Control	1.11
T_2 - STCR-IPNS	1.18
T_3 - 100% N through FYM	1.15
T_4 - T_2 + FS- Amino Acids	1.30
T_5 - T_3 + FS- Amino Acids	1.29
T_6 - T_2 + FS- Micronutrients	1.42
T_7 - T_3 + FS- Micronutrients	1.43
T_8 - T_2 + FS- ALE	1.27
T_9 - T_3 + FS- ALE	1.29
T_{10} - T_2 + FS- MLE	1.50
T_{11} - T_3 + FS- MLE	1.50
T_{12} - T_2 + FS- A A +MN + ALE+ MLE	1.62
T_{13} - T_3 + FS- A A +MN + ALE+ MLE	1.62
S Ed	0.04
CD (0.05 %)	0.08

Table 3. Effect of IPNS and foliar nutrition on micronutrients uptake (g kg^{-1}) of coriander at post harvest stage (Mean value of three replications)

Treatments	Zinc uptake		Iron uptake	
	Stover	Seed	Stover	Seed
T_1 - Control	1.35	1.22	4.14	3.87
T_2 - STCR-IPNS	1.75	1.60	5.16	5.03
T_3 - 100% N through FYM	1.73	1.65	5.30	5.11
T_4 - T_2 + FS- Amino Acids	1.88	1.79	5.85	5.69
T_5 - T_3 + FS- Amino Acids	2.01	1.89	6.03	5.89
T_6 - T_2 + FS- Micronutrients	2.36	2.35	6.94	7.10
T_7 - T_3 + FS- Micronutrients	2.45	2.48	7.10	7.37
T_8 - T_2 + FS- ALE	2.08	2.10	6.36	6.26
T_9 - T_3 + FS- ALE	2.01	2.10	6.22	6.50
T_{10} - T_2 + FS- MLE	2.43	2.47	7.51	7.57

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T_{11} - T_3 + FS- MLE	2.52	2.57	7.56	7.82
T_{12} - T_2 + FS- A A +MN + ALE+ MLE	2.84	2.88	8.23	8.53
T_{13} - T_3 + FS- A A +MN + ALE+ MLE	2.96	3.00	8.44	8.82
S Ed	0.07	0.06	0.20	0.20
CD (0.05 %)	0.14	0.13	0.40	0.41

Table 4. Effect of IPNS and foliar nutrition on soil available nutrients status (kg ha^{-1})

(Mean value of three replications)

Treatments	Available nitrogen (kg ha^{-1})	Available phosphorus (kg ha^{-1})	Available potassium (kg ha^{-1})
T_1 - Control	151	8.6	229
T_2 - STCR-IPNS	167	13.8	259
T_3 - 100% N through FYM	165	10.9	254
T_4 - T_2 + FS- Amino Acids	169	13.6	267
T_5 - T_3 + FS- Amino Acids	166	10.5	253
T_6 - T_2 + FS- Micronutrients	169	14.3	275
T_7 - T_3 + FS- Micronutrients	167	11.2	266
T_8 - T_2 + FS- ALE	169	13.9	268
T_9 - T_3 + FS- ALE	164	11.3	261
T_{10} - T_2 + FS- MLE	170	14.3	270
T_{11} - T_3 + FS- MLE	168	11.7	265
T_{12} - T_2 + FS- A A +MN + ALE+ MLE	177	15.4	279
T_{13} - T_3 + FS- A A +MN + ALE+ MLE	174	11.2	276
S Ed	1.83	0.22	4.17
CD (0.05 %)	3.79	0.46	8.62

