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Evaluation of P and S enriched organic manures and their effect on seed yield and quality of coriander (*Coriandrum sativum* Linn.)

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ABSTRACT

A field experiment was conducted for two subsequent seasons (2004-2006) at Agriculture Research Station, Durgapura, Jaipur in irrigated coarse textured micro farming situation to test the compatibility of phosphorus and sulphur enriched organic manures (FYM and VC) by natural resources like HGPR (34/74), gypsum and bio inoculants to recommended fertilizer and their effect on the seed yield of coriander (Var. RCr-41). Experimental soil was low in organic carbon, available nitrogen and sulphur medium in phosphorus and potash. Twelve treatments were replicated thrice in randomized block design. Two year pooled data clearly revealed that phosphorus and sulphur enriched compost or vermicompost by HGPR and gypsum gave statistically at par (17.01 and 17.60 q/ha) seed yield of coriander to direct application of phosphatic fertilizer and gypsum (16.26 and 16.31 q/ha). Results clearly indicate that enrichment of organic manure (FYM and vermicompost) with HGPR, gypsum and bio inoculants gave more economic return (2.06 and 2.16). Similar results were also observed in Stover yield. Essential oil and protein content were maximum in P and S enriched compost or vermicompost. Nutrient content (N P K and S) in soil after the harvest of the crop were also maximum in P and S enriched organic manure. Enrichment of organic manures, using HGPR, gypsum and bio fertilizers is a step forward to organic farming, eco-friendly technique which improves soil health and provides an alternative source of phosphatic and sulphur fertilizers.

Key words : Coriander, Enriched vermicompost, Gypsum, Phosphorus, Sulphur.

INTRODUCTION

The state of Rajasthan is the largest producer of seed spices like cumin, coriander, fennel and fenugreek. Nearly 40-50 per cent of the area and production of coriander of our country is contributed by the state of Rajasthan. Production of spices in Rajasthan is largely in the hands of small and marginal farmers and level of production in most of the spices is low. The lower productivity is due to low nutrient status and imbalance which poses a major threat to sustain soil health and crop productivity. In view of high cost of chemical fertilizers and environmental pollution and to maintain long term productivity it has become urgent need for value addition of organic waste with some natural resources like high grade rock phosphate and gypsum to fulfill requirement of plants. Thus composting and vermicomposting of organic wastes with high grade rock phosphate, gypsum and bioinoculants was done to evaluate its effect on yield and quality of coriander.

MATERIALS AND METHODS

P and S enriched compost and vermicompost was prepared by using farm wastes. Organic wastes and HGPR were mixed and kept for twenty days. These materials were composted and vermicomposted with gypsum and PSB for three months. Temperature and moisture were maintained during decomposition. Nutrient content of compost and vermicompost were determined by standard methods. Field experiments were conducted for two subsequent seasons (2004-2006) at Agricultural Research Station, Durgapura, Jaipur. The experimental soil was loamy sand (Typic ustipsamment) and 85 % sand, 5 % silt, 7.5 % clay, pH (1:2) 8.2 , EC dSm^{-1} 0.19, bulk density 1.5 g cc^{-1} and OC 0.18 per cent. Available N, P_2O_5, K_2O and S status was 180, 34, 190 kg ha^{-1} and 8 mg kg^{-1}, respectively. Soils were low in Zn and Mn (0.7 and 3.1 mg kg^{-1}) but sufficient in Fe and copper (4.68 and 0.25 mg kg^{-1}). There were twelve treatments combination of P and S enriched compost and vermicompost . Nitrogen and Potash were applied through urea and muriate of potash. Coriander (variety Rcr- 41) was grown as test crop.

At maturity the crop was harvested and yield of seed and straw was recorded. Soil samples (0-15 cm depth) were collected and analyzed by standard methods (Jackson, 1973). Seeds were analyzed for protein and essential oil.

RESULTS AND DISCUSSION

Analysis of P and S enriched compost and vermicompost clearly show that nutrients mineralisation is more in vermicomposted material (Table 1).

Two years pooled data clearly revealed that phosphorus and sulphur enriched compost or vermicompost by HGPR and gypsum gave statistically at

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Table 1: Nutrient content of the P and S enriched compost and vermicompost

Sr. No.	Nutrient content	P & S enriched compost	P &S enriched vermicompost
1.	Nitrogen (%)	1.2	1.5
2.	Phosphorus (%)	1.9	2.4
3.	Potassium (%)	1.1	1.6
4.	Calcium (%)	3.0	4.0
5.	Sulphur (%)	1.0	1.5
6.	Zinc (mg kg^{-1})	50	90
7.	Manganese (mg kg^{-1})	210	300
8.	Copper (mg kg^{-1})	28.1	35
9.	Iron (mg kg^{-1})	6000	8100

par seed yield of coriander (17.01 and 17.60 qha^{-1}) to direct application of phosphatic fertilizer and gypsum 16.26 and 16.31 qha^{-1} (Table 2). Similar positive effect of phosphate rich organic manure on the yield of fenugreek was observed (Jackson, 1973).

Increase in nutrient content of P and S enriched compost and vermicompost (Table 2) and increase in the yield clearly show increase in solubility of gypsum during decomposition with organic matter. These results are in conformity with the (Mondal, 1976) that addition of FYM to calcium sulphate increases the solubility from 30.7 to 36.5 meq/l. Economic return also reflects its impact (2.06 and 2.16). Similar results were obtained for stover yield.

Essential oil and protein content were found maximum in P and S enriched compost and vermicompost treatment (Table 3). This reflects quality improvement of seed, which is most important parameter.

Table 2: Effect of P and S enriched compost and vermicompost on the seed yield of coriander

Sr. No.	Treatments	Seed yield q ha^{-1}			B:C ratio
		2004-05	2005-06	Pooled	
1.	RD of P +10t FYM ha^{-1}	19.33	9.70	14. 51	1.65
2.	RD of P +5t VC ha^{-1}	19.46	9.93	14.69	
3.	RD of P and S +10t FYM ha^{-1}	21.23	11.30	16.26	1.94
4.	RD of P and S +5t VC ha^{-1}	21.46	11.17	16.31	1.95
5.	P enriched FYM 10t ha^{-1}	19.20	9.27	14.23	
6.	P enriched VC 5t ha^{-1}	19.60	9.33	14.46	
7.	RD of P+S enriched FYM 10t ha^{-1}	22.13	11.20	16.66	1.99
8.	RD of P+S enriched VC 5t ha^{-1}	22.53	11.17	16.84	2.03
9.	P and S enriched FYM 10t ha^{-1}	22.93	11.10	17.01	2.06
10.	P and S enriched VC 5t ha^{-1}	23.20	12.00	17.60	2.16
11.	RD of HGPR + 10t FYM ha^{-1}	14.80	7.33	11.06	
12.	RD of HGPR +PSB +10t FYM ha^{-1}	15.60	8.00	11.80	
	S.E.±	0.752	0.55	0.783	
	C.D. (P=0.05)	2.207	1.60	2.22	
	C.V. %	6.48	9.41		

Table 3 : Effect of P and S enriched compost and vermicompost on the essential oil and protein content of coriander

Sr. No.	Treatments	Content (%)	
		Protein	Essential oil
1.	RD of P +10t FYM ha^{-1}	1.70	0.44
2.	RD of P +5t VC ha^{-1}	1.72	0.45
3.	RD of P and S +10t FYM ha^{-1}	1.75	0.47
4.	RD of P and S +5t VC ha^{-1}	1.78	0.48
5.	P enriched FYM 10t ha^{-1}	1.72	0.46
6.	P enriched VC 5t ha^{-1}	1.74	0.47
7.	RD of P+S enriched FYM 10t ha^{-1}	1.87	0.48
8.	RD of P+S enriched VC 5t ha^{-1}	1.93	0.49
9.	P and S enriched FYM 10t ha^{-1}	1.92	0.52
10.	P and S enriched VC 5t ha^{-1}	1.96	0.53
11.	RD of HGPR + 10t FYM ha^{-1}	1.62	0.43
12.	RD of HGPR +PSB +10t FYM ha^{-1}	1.63	0.44

Increase in available nitrogen, phosphorus and potash status of soil after harvest of crop in the treatment P and S enriched vermicompost (Table 4) which clearly shows the multiplication of soil microbes which could convert organically bound N to inorganic form (Bhardwaj, and Oman war, 1994). Increase in available phosphorus of soil could be attributed to the influence of organic manure, which enhances the labile P in the soil, by complexing Ca, Mg and Al.

The organic materials also form a cover on

Table 4 : Effect of P and S enriched compost and vermicompost on the soil nutrient status after harvest

Sr. No.	Treatments	Kg ha^{-1}		mg kg^{-1}	
		N	P_2O_5	K_2O	S
1.	RD of P +10t FYM ha^{-1}	180	33.5	190	8.0
2.	RD of P +5t VC ha^{-1}	181	34.0	195	8.4
3.	RD of P and S +10t FYM ha^{-1}	183	35.5	192	8.5
4.	RD of P and S +5t VC ha^{-1}	182	37.5	198	8.8
5.	P enriched FYM 10t ha^{-1}	184	36.5	198	9.0
6.	P enriched VC 5t ha^{-1}	190	38.0	199	9.2
7.	RD of P+S enriched FYM 10t ha^{-1}	192	38.5	200	10.0
8.	RD of P+S enriched VC 5t ha^{-1}	194	39.0	210	10.5
9.	P and S enriched FYM 10t ha^{-1}	210	40.5	220	10.1
10.	P and S enriched VC 5t ha^{-1}	220	42.0	230	10.1
11.	RD of HGPR + 10t FYM ha^{-1}	182	33.0	200	9.0
12.	RD of HGPR +PSB +10t FYM ha^{-1}	183	35.0	210	9.5

sesquioxides and thus reduce the phosphate fixing capacity of the soil and increase the available P in soil solution.

Conclusion:

– Composting and vermicomposting of HGPR(34/74), Gypsum along with bioinoculants is a best way of value addition of organic matter.

– Results are in conformity to the alternative source of chemical fertilizer for sustainable production of coriander.

– Moreover this eco-friendly technique will take care of soil health and will upgrade nutrient status of the soil.

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