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Effect of Biofertilizer based Organic Nutrient Management in Soil Health and Productivity Enhancement of Pea (*Pisum sativum*) in North East India

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ABSTRACT: In organic farming system the use of biofertilizer plays a significant role due to its sustainability to improve the soil health, microbial activity, soil fertility and productivity of crops. The farmer of North East India mostly uses imbalance fertilizer in their crop field either by organic or by inorganic means. Moreover, the Hilly part of this region mostly use organic matter in imbalance dose in their crop field. So, the productivity of vegetable crop is very less compare to other part of India. This study on 'Effect of Biofertilizer based organic nutrient management in soil health and productivity enhancement of pea (*Pisum sativum)* in North East India' evaluates the impact of organic matters along with biofertilizers on properties of soil, availability of nutrients, growth and yield parameter of pea for contributing a better understanding of sustainable agricultural practices in the region as well as for profit maximization in vegetable cultivation. The study was done through field study, analysis of different parameters of growth and yield of pea, soil testing and through statistical evaluations. For the present study a FLD programme was done in the Farmers Field of Ri-Bhoi District to demonstrate a Technology with comparison to local Farmer practices. The Treatments comprises were T1: FYM @ 5 t/ha + @400 kg/ha+ vermicompost @ 5 t/ha + Rhizobium 10kg/ha + PSB10kg/ha + Organic Mulch and T2: Farmers Practice (FYM 5t/ha). The pea variety taken was Aman which was covered in 1 ha. of Land in five villages namely Thadnongiew, Umeit, Kyrdem, Nonglakhiet and Nongpoh. The results of the FLD revels that the T1 gives higher yield of 28.6 q/ha with B:C ratio of 2.69 as compare to Farmers practice i.e., 16.8 q/ ha with B: C ratio of 1.82. The organic carbon, available nitrogen, available phosphorus and available potassium were significantly higher in the treated plot as compare to Farmers practice. The results of the FLD revels the feasibility of adoption of Biofertilizer based organic nutrient management practices in North East India as a sustainable approach for increase the productivity of crop as well as for enhancement of soil health for the development of socio-economic status of this region.

Keywords: Biofertilizer, Organic Nutrient Management, Pea, Crop Productivity. Sustainable Agriculture.

INTRODUCTION

The hilly terrains and land conditions of the State Meghalaya holds huge potential for development of organic horticultural sector with cultivation of high value horticultural crops like fruits and vegetables along with spices and other plantation crops due to its diverse geo-climatic situation (Bordoloi, 2021a; Bhuyan, 2021). Due to the increasing market demand, the favourability of vegetable crop cultivation is increasing day by day among the Farmers of Meghalaya. Organic Farming is getting popularity in India in general and North Eastern Region of India in particular due to its increasing market demand as well as for its positive impacts towards environmental sustainability. Most of the Farmers of this region already following the Organic Farming from ages which was achieved by wisdom and maximum of the crop land is organic by default without certification (Bordoloi *et al.*, 2020; Bordoloi, 2021b). Moreover, by considering the demands of organic produce the Farmers of this region also become fond of doing Organic Farming for getting good returns. But the productivity is very less in this region due to lack of modernization of Agriculture. Most of the Farmers of this region uses imbalance fertilizers in organic or inorganic means which is a major cause of low productivity of crops (Rajkhowa *et al.* 2019; Bordoloi, 2021 c; Sanjay-Swami *et al.*, 2021). The application of biofertilizer with organic fertilizers have recorded higher yield of crop and it has increased its popularity due to its capacity of enhancement of soil fertility and reduce the rate of chemical fertilizer to higher productivity of crop in a sustainable manner (Babu *et al.* 2015, Bordoloi, 2021d, Bordoloi and Islam 2020; Bordoloi, 2021 e). Integrated nutrient management approach also very much successful in this region (Bordoloi, 2020; Bordoloi, 2021f; Sanjay-Swami and Singh 2020). Various researches show the positive impact of Biofertilizer along with organic manures for

increase the productivity of crop and for improving the soil health in North Eastern Region of India (Kumar *et al.*, 2020; Bordoloi, 2022 b).

Moreover, Pea (*Pisum sativum*), is a major legume crop in this area and maximum of the Farmers prefer to grow pea crop after wet rice. It is a vital leguminous crop which serves as a dietary source of proteins as well as plays a crucial role in soil health development (Bordoloi and Arunachalam 2022; Kumar *et al.*, 2015; Satya and Sanjay-Swami 2020; Bordoloi, 2021 g). Considering the above in view a technology was demonstrated in different location of District Ri-Bhoi of Meghalaya to showcasing the technology of 'Biofertilizer based organic nutrient management in soil health and productivity enhancement of pea (*Pisum sativum*) in North East India' to assesses the impact of organic matters along with biofertilizers on properties of soil, availability of nutrients, the growth and yield parameter of pea for contributing a better understanding of sustainable agricultural practices in the region as well as for profit maximization in vegetable cultivation in North Eastern Hill Region.

METHODOLOGY

A technology was demonstrated as FLD during 2021-22 with five replications in the Ri-Bhoi District of Meghalaya under ICAR-KVK Ri-Bhoi, Umiam, Meghalaya. The soil of the study side is sandy loam and acidic. The altitudes of the study areas were between 835 to 915 amsl and it is falls under humid subtropical area.It is lies between the North Latitudes 25.15/ and 26.15/ and East Longitudes 91.45/ and 92.15/. The average rainfall recorded is in between the range of 1000 mm to 2500 mm. The study included two treatments: T1: FYM @ 5 t/ha + @400 kg/ha+ vermicompost @ 5 t/ha + Rhizobium 10kg/ha + PSB10kg/ha. + Organic Mulch and T2: Farmers Practice (FYM 5t/ha). The pea variety taken was Aman which was covered in 1 ha. of Land in five villages namely Thadnongiew, Umeit, Kyrdem, Nonglakhiet and Nongpoh.Soil samples were collected from the experimental plot for analysis of soil parameters like pH, organic carbon content, nutrient availability (N, P, K), etc. and pea yield parameters were recorded in the harvesting stage and analysed. The training was conducted for trained the Farmers and to make awareness about the technology.

RESULTS AND DISCUSSION

A. Crop Productivity Enhancement

The Biofertilizer based organic nutrient management showed higher growth and pod yield compared to the control group i.e., Farmers practice. The T1 i.e., FYM @ 5 t/ha + @400 kg/ha+ vermicompost @ 5 t/ha + Rhizobium 10kg/ha + PSB10kg/ha. + Organic Mulch gives higher yield of 28.6 q/ha with B:C ratio of 2.69 as compare to T2: Farmers practice (FYM 5t/ha) i.e. 16.8 q/ ha with B: C ratio of 1.82 (Table 1). Similar results of increased the yield and B:C ratio of crop after organic nutrient management is recorded by Bordoloi (2022 b).

B. Soil Nutrient Availability

The Biofertilizer along with other organic manure application increase the nutrient content of the soil after the Treatment. The T1 i.e., FYM @ 5 t/ha + @400 kg/ha+ vermicompost @ 5 t/ha + Rhizobium 10kg/ha + PSB10kg/ha. + Organic Mulch shows127.08 % increase in organic carbon (kg/ha), 128.74%increase in available nitrogen, 175.18% increase in available phosphorus and 141.6% increase in available potassium as compare to Farmers practice i.e., T2 (Table 2). Similar results of increased the nutrient content of soil after organic nutrient management is recorded by Bordoloi (2022 b).

Table 1: Effect of Biofertilizer based Organic Nutrient Management on Yield of Pea cultivation.

Av. Yield (q/ha.)		% increase	Econ. of demo. (Rs./ha.)				Econ. of check (Rs./ha.)			
Demo	Check		GC	GR	NR	BCR	GC	GR	NR	BCR
28.6	16.8	170.24	42,500	114400	71,900	2.69	37,000	67200	30,200	1.82

Table 2: Effect of Biofertilizer based Organic Nutrient Management on Soil Nutrient availability in Pea cultivation.

pH		Organic Carbon (kg/ha)		Available Nitrogen (kg/ha)		Available Phosphorus (kg/ha)		Available potassium (kg/ha)	
Demo.	Check	Demo.	Check	Demo.	Check	Demo.	Check	Demo.	Check
5.14	5.22	1.22	0.96	398.45	309.50	17.92	10.23	196.32	138.65
Percent Increase (%)		127.08		128.74		175.18		141.6	

CONCLUSIONS

The use of beneficial microorganism by biofertilizers, generate and release the nutrients which increases the soil fertility required for crop growth and development. Moreover, it improves the soil structure and promote nutrient cycling and helps for organic matter breakdown. The present demonstration clearly stated that the biofertilizer based organic nutrient management can significantly increase the Pea crop yield and nutrient availability of the soil for plant uptake. So, the technology can be successfully used for promoting organic farming in North East Hilly region of India as a sustainable approach for profit maximization and for economic upliftment of the region. Further researches are required to examine the long-term effects of biofertilizer application on soil health and crop productivity in different locations of North Eastern region. The large-scale adoption of biofertilizer-based organic nutrient management practices will be possible

through large scale dissemination of the demonstrated Technology as well as by introduction of new technology to nearby areas for sustainable agriculture for achieving a productive and resilient agricultural system.

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