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Research Article

Effect of Direct Application of Recommended Fertilizer Levels on Growth and Yield Parameters of *Rabi* Green Gram under Little Millet-Green Gram Cropping Sequence

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ABSTRACT

A field experiment was conducted during kharif and rabi seasons of 2016-17 and 2017-18 at Rajendrapur Farm, Krishi Vigyan Kendra, Navsari Agricultural University, Waghai (Dist.Dangs), Gujarat to study the residual effect of integrated nutrient management in little millet on production potential of succeeding green gram crop under little millet-green gram cropping system. The treatment consisted of integrated nutrient management viz. T_1 – 100% RDF, T_2 – 50% RDN through chemical fertilizer + 50% RDN through biocompost, T_3 – 50% RDN through chemical fertilizer + 50% RDN through vermicompost, T_4 – 75% RDN through chemical fertilizer + 25% RDN through biocompost and T_5 – 75% RDN through chemical fertilizer + 25% RDN through vermicompost to little millet in kharif season as main plot treatments replicated four times in randomized block design. During rabi season each main plot treatment was split into four sub plot treatments with four levels of recommended dose of fertilizers viz. S_1 -control, S_2 - 50% RDF and S_3 – 75% RDF, and S_4 – 100% RDF to green gram resulting in twenty treatment combinations replicated four times in split plot design. The experiment was conducted on same site without changing the randomization of the treatment for the successive year to assess the residual effects. Thus, application of 75% RDF reported promising effect on growth, yield and yield attributing characters of green gram in little millet-green gram cropping sequence under South Gujarat condition.

Key words: *Green gram, Cropping sequence, Seed yield*

INTRODUCTION

Green gram is an important pulse crop of India as it is grown an area of 4.33 million hectares with total production of 2.16 million tonnes and productivity of 500 kg/ha, major green gram producing states are Odisha, Madhya Pradesh, Rajasthan, Maharashtra, Gujarat and Bihar. In Gujarat, it is cultivated in about 1.79 lakh hectares with an annual production of 0.84 lakh tonnes and average productivity of 469 kg /ha[3].

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In India, small millets are cultivated on 6.19 lakh ha with production of 4.42 lakh tones with a productivity of 714 kg/ha. In Gujarat, small millets occupies an area about 0.22 lakh ha with a production of 0.28 lakh ha with a productivity of 1273 kg/ha[2]. The major little millet growing states are Karnataka, Andhra Pradesh and Tamil Nadu. In Gujarat, little millet cultivated mainly in hilly, dry land and tribal area of Dang, Valsad, Navsari and Panchmahal districts.

In South Gujarat, there is a possibility to intensify the system through introduction of mungbean (Green gram) as a catch crop during *rabi* season, which is also helpful in improving soil nutrient status. In intensified cropping system, which has high turnover of nutrients, poor recycling of organic sources and application of high analysis fertilizers caused deficiency of several micronutrients in soil and also lead to environmental pollution. Organics alone do not produce spectacular increase in crop yields due to their low nutrient status. Therefore, to maintain soil productivity on a sustainable basis, blending of organic and inorganic sources of nutrient needs to be adopted. Continuous use of crop residues and organics help to build up soil humus and beneficial microbes besides, improvement in soil physical properties. Whereas, chemical fertilizers provide one or more essential plant nutrient which the soil cannot supply in adequate quantities. Thus, judicious combination of organics and chemical fertilizers help to maintain soil productivity.

Presently emphasis has been given to cultivate more than one crop on same piece of land as mixed/intercrop or sequence, as it has been prove by research that preceding crop affect the growth and yield of succeeding crop. But generally in crop sequence cereal crops is taken after legumes crops. As the legume crops requires less amount of fertilization and it restore the soil fertility. Now it is time to judge the cereal-legume crop sequence instead of legume-cereal crop sequence.

MATERIAL AND METHODS

The investigation was conducted at the Rajendrapur Farm, Krishi Vigyan Kendra, Navsari Agricultural University, Waghai (Dist-Dangs) during the years 2016-17 and 2017-18. The soil of the experimental field was clayey in texture, medium in organic carbon (0.70%), available nitrogen (282.73 kg/ha) and available phosphorus (46.83 kg/ha) whereas high in available potassium (373.28 kg/ha). The soil was slightly acidic in reaction (pH 6.8). The treatment consisted of integrated nutrient management *viz*. T_1 – 100% RDF (40:20:00 NPK kg/ha) , T_2 – 50% RDN through chemical fertilizer + 50% RDN through biocompost, T_3 – 50% RDN through chemical fertilizer + 50% RDN through vermicompost, T_4 – 75% RDN through chemical fertilizer + 25% RDN through biocompost and T_5 – 75% RDN through chemical fertilizer + 25% RDN through vermicompost to little millet in *kharif* season as main plot treatments replicated four times in randomized block design. Organic manures (biocompost and vermicompost) were applied to little millet as per treatments and evenly spread and mixed in that particular bed. The little millet was fertilized as per treatments. The nitrogen was applied through Urea (46% N) whereas; phosphorus was applied through single superphosphate (16% P_2O_5). The 50% dose of nitrogen and full dose of phosphorus were applied at the time of transplanting and remaining 50 % dose of nitrogen was applied 30 days after transplanting. In case of phosphorus fertilizer, the quantity of phosphorus from bio-compost and vermicompost was counted and deducted from the quantity of recommended dose of phosphorus and remaining phosphorus was applied in the form of single superphosphate. After the harvesting of little millet the green gram was grown as succeeding crop on 19th November 2016 and 16th November 2017. During *rabi* season each main plot treatment was split into four sub-plot treatments with four levels of recommended dose of fertilizer *viz.*, S_1 -control, S_2 50% RDF (10:15:00 NPK kg/ha), S_3 -75% RDF (15:30:00 NPK kg/ha) and S_4 100% RDF (20:40:00 NPK kg/ha) to green gram resulting in twenty treatment combinations replicated four times in split plot

design. The experiment was conducted on same site without changing the randomization of the treatment for the successive year to assess the residual effects. The data recorded were statistically analyzed using MSTATC Software. The purpose of analysis of variance was to determine the significant effect of treatments on finger millet. LSD test at 5 per cent probability level was applied when analysis of variance showed significant effect for treatments.

RESULTS AND DISCUSSION

Growth

Data regarding growth characteristics *viz.*, plant height, number of branches/plant and dry matter accumulation/plant was presented in Table 1. On pooled data basis, these characters influenced significantly at all growth stages due to the effect of direct application of levels of RDF to green gram.

On pooled basis, green gram fertilized with 100% RDF (S_4) and 75% RDF (S_3) were recorded statistically higher values of plant height at 30 DAS, 60 DAS and at harvest during pooled result. Number of branches/plant of green gram was found significantly more at 30 DAS, 60 DAS and at harvest with the application of 100% RDF and it was at par with 75% RDF during pooled analysis. Dry matter accumulation per plant were recorded at 30 DAS, 60 DAS and at harvest, significantly maximum dry matter accumulation per plant were recorded with application of 100% RDF (S_4), which was statistically at par with (S_3) 75% RDF during pooled result.

Also, increase in dry matter accumulation/plant might be attributed due to better growth of plant in terms of plant height and number of branches/plant recorded with this treatment. Similar results regarding growth parameters influenced by various RDF treatments to green gram were reported by Patel[7] and Sindhi[9].

Yield and yield attributes

The entire yield attributes *viz.*, number of pods per plant, seed index (100 seed weight), seed yield per plant, as well as seed and stover yields (Table 2) were significantly influenced under application of 100% RDF and 75% RDF, which was remained at par each other during pooled. The beneficial effect of higher fertilization on vegetative growth was reflected in increasing the yield contributing characters.

On pooled data basis, significantly higher values of seed yield and stover yield of green gram were recorded with 100% RDF and 75% RDF over control, Higher values of yield attributes was might be due to better growth of plant in terms of plant height, number of branches and dry matter accumulation which resulted in adequate supply of photosynthates for development of sink. Thus, the overall better growth performance and higher values of the yield attributes reflected into higher seed and stover yields under this treatment. Similar findings regarding effect of RDF on yield attribute and yield of green gram were reported by Rajkhowa *et al.*[8], Ambhore[1], Jat *et al.*[5], Gorade *et al.*[4], and Patel *et al*.[6].

Table 1: Effect of direct application of recommended fertilizer levels on growth parameters of *rabi* green gram (2 year Pooled data)

Treatments	Plant height (cm)			Number of branches/plant			Dry matter accumulation/plant (g)		
	30 DAS	60 DAS	At harvest	30 DAS	60 DAS	At harvest	30 DAS	60 DAS	At harvest
I). Main plot treatment (*kharif* little millet)									
T_1: 100% RDF	22.00	41.06	63.92	2.05	3.93	4.27	3.33	17.59	23.74
T_2: 50% RDN through	22.60	50.81	73.43	2.14	4.40	4.85	3.65	19.59	25.93

chemical fertilizer + 50 % RDN through biocompost									
T_3: 50% RDN through chemical fertilizer + 50% RDN through vermicompost	22.78	52.08	75.07	2.18	4.61	5.00	3.69	20.27	26.56
T_4: 75% RDN through chemical fertilizer + 25% RDN through biocompost	22.33	44.16	67.10	2.09	4.04	4.39	3.47	18.32	24.85
T_5: 75% RDN through chemical fertilizer + 25% RDN through vermicompost	22.57	45.78	68.93	2.13	4.15	4.49	3.49	18.68	25.12
SEm+	0.58	0.79	0.81	0.03	0.08	0.08	0.07	0.36	0.32
CD (P=0.05)	NS	2.31	2.36	NS	0.23	0.24	0.19	1.04	0.93
CV (%)	10.28	9.55	6.56	10.61	11.05	10.11	10.38	10.66	7.17
II). Sub plot treatment (*rabi* green gram)									
S_1 : Control	21.58	36.36	59.48	2.04	3.51	3.88	3.07	16.47	22.93
S_2 : 50% RDF	22.19	43.33	65.68	2.10	3.98	4.28	3.32	17.80	24.27
S_3 : 75% RDF	22.65	53.04	76.24	2.14	4.66	5.04	3.82	20.32	26.59
S_4 : 100% RDF	23.41	54.39	77.37	2.21	4.76	5.20	3.89	20.98	27.17
SEm+	0.34	0.61	0.61	0.03	0.06	0.07	0.05	0.26	0.26
CD (P=0.05)	0.94	1.72	1.71	0.08	0.17	0.18	0.15	0.72	0.72
CV (%)	9.60	8.24	5.51	9.32	9.45	8.94	9.28	8.53	6.40
Interaction (M x S)									
SEm+	0.71	1.36	1.6	0.04	0.14	0.15	0.12	0.57	0.57
CD (P=0.05)	NS	NS	NS	NS	NS	NS	NS	NS	NS
General mean	22.46	46.78	69.69	2.12	4.23	4.60	3.53	18.89	25.24

Table 2: Effect of direct application of recommended fertilizer levels on yield attributes and yield of *rabi* green gram

Treatments	Number of pods/plant	Seed index (g)	Seed yield/plant(g)	Seed yield (kg/ha)	Stover yield (kg/ha)
I). Main plot treatment (*kharif* little millet)					

T_1: 100% RDF	17.65	2.97	4.38	860	2102
T_2: 50% RDN through chemical fertilizer + 50 % RDN through biocompost	20.21	3.26	5.21	953	2404
T_3: 50% RDN through chemical fertilizer + 50% RDN through vermicompost	21.18	3.39	5.49	991	2513
T_4: 75% RDN through chemical fertilizer + 25% RDN through biocompost	18.55	3.05	4.81	909	2228
T_5: 75% RDN through chemical fertilizer + 25% RDN through vermicompost	19.16	3.13	4.95	921	2270
SEm+	0.35	0.06	0.11	14.66	41.11
CD (P=0.05)	1.02	0.17	0.31	42.48	119.98
CV (%)	10.21	10.29	12.13	9.64	10.09
II). Sub plot treatment (*rabi* green gram)					
S_1 : Control	15.53	2.69	3.44	761	1834
S_2 : 50% RDF	17.12	2.98	4.35	882	2165
S_3 : 75% RDF	22.00	3.45	5.99	1019	2574
S_4 : 100% RDF	22.76	3.53	6.10	1046	2639
SEm+	0.30	0.05	0.07	12.39	29.37
CD (P=0.05)	0.85	0.13	0.21	34.86	82.66
CV (%)	9.83	9.14	9.48	8.59	8.06
Interaction (M x S)					
SEm+	0.67	0.10	0.17	26.49	65.67
CD (P=0.05)	NS	NS	NS	NS	NS
General mean	19.35	3.16	4.97	927	2303

CONCLUSION

On the basis of experimental results, green gram crop should be nourished with 75% RDF through chemical fertilizer reported promising effect on yield and yield attributing characters on green gram in little millet-green gram cropping sequence under South Gujarat condition.

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