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EFFECT OF INTEGRATED NUTRIENT MANAGEMENT ON GROWTH, YIELD AND QUALITY OF PIGEONPEA (*CAJANAS CAJAN* L. MILLSP.) CV. PUSA 9.

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ABSTRACT

An experiment was conducted during 2008-09 at Agricultural Research Farm, Department of Agronomy, Institute of Agricultural Sciences, Banaras Hindu University, Varansi, (India) to study the effect of Integrated nutrient management on growth, yield and quality of pigeonpea cv. Pusa 9. The experiment was laid out in randomized block design replicated trice with eight treatments viz, T1 = 50% RDF, T2 = 100% RDF, T3 = 50% RDF + 5tFYM, T4 = 50% RDF + 5tFYM + Rh, T5 = 50%RDF + Rh + PSB, T6 = 100%RDF + 5t FYM, T7 = 100% RDF + 5tFYM + Rh + PSB, T8 = 100%RDF + Rh + PSB. The growth attributes like plant height, numbers of branches, and dry matter accumulation per plant were increased progressively with increasing fertility levels. The maximum grain yield (1837) and stalk Yield (553 kg /ha) was obtained with the application of 100%RDF + 5t FYM + Rh + PSB to pigeonpea. The quality attributes (NPK and protein content) of pigeonpea was significantly increased with fertility levels and maximum reported with 100%RDF + 5tFYM + Rh + PSBdifferent fertility levels, 100%RDF + 5tFYM + Rh + PSB was found more remunerative than that of other treatments. From this study it can be concluded that the application of 100%RDF + 5tFYM + Rh + PSB among different fertility levels plants showed favourable growth and quality characters with improved yields attributes leads higher grain yield.

INTRODUCTION

The pluses have been one of the neglected crops in Indian Agriculture. The need for rectifying this position has been acute in recent years because of steady fall in the output and availability of per capita pluses. In India where a large population is vegetarian, the cheap and best source of proteins is stills pluses. Pluses are integrated part of the cropping system of the farmers through counter because the crops fit well in crop rotation as well as in mixed cropping.Pigeonpea(Cajanas cajan L.)is the fifth prominent pulse crop in the world and in India after chickpea. It is one of the most important kharif pluses suitable for rain fed situation with an area of 3.6 mha (15.5%)production 2.7MT(18.6) and productivity 747 kg /ha (Maruthi *et al* .,2007).In India practice of integrated nutrient management is not very much popular ,but now the concept has been changed radically over the years. Integrated nutrient management takes care of physical, chemical and biological needs of the soil from the use of organic and inorganic fertilizers. It increases water holding capacity and the amount of nutrient in the soil. It is established that organic manureimproves the physical and biological properties of the soil including supply of almost all the essential nutrients for growth and development of plants. Under favourable environment integrated nutrient management might have helped in the production of new tissue and development of new shoot and ultimately increased the growth, yield attributes and finally yield of the crops. Organic manures have been reported to be beneficial in augmenting the yield of pigeon pea under integrated nutrient management (Gupta and Namdev, 1999) and Singh RS 2007). Beneficial effect of supplementation of inorganic fertilizer with organic manures and rhizobium inoculants significantly increased the grain yield of pigeonpea (Veeraswamy *et al.*, 1972).The paper deals with the study of the effect of integrated nutrient management on growth, yield and quality of pigeonpea.

MATERIALS AND METHODS

The present investigation was carried out at the Agricultural Research Farm, Department of Agronomy, Institute of Agricultural Sciences, Banaras Hindu University, Varanasi (India) during the kharif season of 2008-09.The soil of experiment was sandy clay loam in texture with 7.3 pH and

0.29 EC,having low levels of nitrogen(208.5 kg /ha),medium in available phosphorous (18.21 kg /ha) and potassium (185.02 kg/ha).The experiment was laid out in randomized block design .Agro - climatically the location of experiment site represents the sub-tropical climate and subjected to extremes of weather condition *i.e.* Heat of summer and cold in winter with normal annual rainfall is about 1081.4 mm.The total rainfall during the experiment was 386.4 mm, the maximum rain fall of 81 mm was recorded. Eight treatments viz, T1=50% RDF, T2=100% RDF, T3=50% RDF+5tFYM, T4=50%RDF+5t FYM+Rh,T5=50% RDF+Rh+PSB, T6=100% RDF+5tFYM, T7=100% RDF+5tFYM+Rh+ PSB,T8=100% RDF+Rh+ PSB was laid out in 24 well ploughed plot of 6 x 6 meter size with 75 cm row to row and 20 cm plant to plant spacing. This treatment were applied in late maturing variety of pigeonpea Pusa 9.The whole amount of NPK as given through Urea,SSPand MOP which contain 46% N, 16% P2o5 and 60% K2O respectively. The seed rate for pigeonpea20 kg /ha.The extra plants were thinned out at 30 days after sowing to maintain the plant to plant spacing of pigeonpea. The crops were harvested at physical maturity stage. The harvested material from each plot was carefully bundled, tagged and brought to the harvesting plot separately. The individual bundles were weight after complete drying and thre send.The grain yield was recorded separately after winnowing and cleaning. The stalk yield was calculated by sub strand grain yield from the bundled weight and was converted to kg /ha based on the net plot size harvest. Growth observation plant (height, number of primary branches) and yield attributes (number pods, weight of pods ,weight of grain/pod, test weight, shoot dry matter ,grain yield kg / ha, stalk yield kg /ha) were recorded at 60, 120, 180, DAS harvest stage. The harvest index calculated by dividing economic (grain) yield by total biological yield (grain + stalk) and multiplying the fraction by 100(Singh and Stoskops).The plant sample for quality attributes were collected at harvest stage. Nitrogen content of plant were determinate by modified Kjeldane method(Jackson 1973).Phosphorous was estimated by 0.5 N sodium bicarbonate extractable method and potassium content was estimated by Flame Photometric method as suggested by Jackson. Crude protein was obtained by multiplying the nitrogen content in pigeonpea grain by (AOAC).The result were obtained were presented in term of percentage on dry weight basis.

RESULTS AND DISCUSSION

Different growth attributes like plant height, branches per plant and dry matter per plant at various stages significantly increased with fertility levels. The response of application of different fertility level showed to these values for the all growth stages and the increase maximum with 100% RDF+5t FYM+ Rh+ PSB followed by 50 % RDF +5t FYM+ Rh + PSB (Table 1). The similar effect on growth attributes of pigeonpea were also reported by Patil, Singh and Pal (2007). The yield attributes like number of pods per plant, number of grains per pod test weight showed positive correlation with yield of pigeonpea. Application of fertility levels increased these parameters significantly increased. Application of higher dose of fertility *i.e.* 100%RDF+5tFYM+Rh+PSB increased higher yield than other levels. Semilar results were also reported by Singh et al. (2008). The grain and stalk yield was favourably affected by fertility levels. The grain yield show maximum with 100%RDF+5tFYM+Rh+PSB *i.e.*1837 kg /ha and 5531 kg /

Table 1: Growth attributes (plant height,no. of primary branches and dry matter) at various growth stages asinfluenced by different fertility levels

Treatments(Fretility levels)	Plant Height (in cm)				No.of primery branches				Dry matter (g/plant)			
	60 DAS	120 DAS	180 DAS	At Harvest	60 DAS	120 DAS	180 DAS	At Harvest	60 DAS	120 DAS	180 DAS	At Harvest
50 % RDF	112.30	188.3	193.70	194.43	5.73	13.63	14.87	15.11	19.10	73.90	142.65	198.27
100 % RDF	122.53	192.47	197.27	196.73	6.28	14.76	15.81	15.79	19.71	74.63	144.58	199.36
50 % RDF+5t FYM	131.47	198.93	208.70	207.70	6.47	15.63	16.43	16.50	20.82	77.42	146.75	200.34
50%RDF+5t FYM+Rh+PS	134.17	205.23	213.30	218.67	6.77	16.33	16.94	17.13	21.71	79.61	148.57	201.63
50 % RDF+Rh+PSB	118.17	189.43	194.97	194.30	5.86	13.90	15.31	15.30	19.32	74.33	143.77	198.70
100 %RDF+5t FYM	133.37	204.47	212.27	217.77	6.67	16.13	16.71	7.07	21.41	78.88	148.33	201.39
100%RDF+5t FYM+Rh+PS	137.80	208.27	218.03	221.40	6.90	16.70	17.50	17.30	22.25	80.43	151.50	203.81
100 % RDF+Rh+PSB	125.50	194.40	201.63	199.33	6.35	15.44	16.16	16.32	20.40	77.13	145.47	199.72
CD at 5%	1.36	7.98	10.13	2.52	0.13	0.61	0.23	0.26	0.21	0.31	2.62	0.61

Table 2: Yield attributes and yield of pigeonpeainfluenced by different fertility levels

Treatments(Fretility levels)	No.of pods/plant	Test weight(1000 grains)	Grain yield(kg/ha)	Stalk yield(kg/ha)	Harvest Index
50 % RDF	129.90	94.80	1235	3706	18.8
100 % RDF	135.87	96.42	1445	4548	19.0
50 % RDF+5t FYM	139.66	98.60	1649	4942	19.2
50%RDF+5t FYM+Rh+PSB	142.53	99.76	1800	5481	19.4
50 % RDF+Rh+PSB	132.70	95.31	1317	4337	19.0
100 %RDF+5t FYM	142.43	99.63	1763	5322	19.4
100%RDF+5t FYM+Rh+PSB	144.77	101.10	1837	5531	19.6
100 % RDF+Rh+PSB	136.86	97.32	1499	4624	19.2
CD at 5%	1.31	1.04	199.4	62.3	0.34

Table 3: Quality attributes (NPK and Protein content in Grain and Stalk) of pigeonpeainfluenced by different fertility levels

Treatments(Fretility levels)	Nitrogen		Phosphorous		Potassium		Protein	
	Grain	Stalk	Grain	Stalk	Grain	Stalk	Grain	Stalk
50 % RDF	2.7	0. 58	0.21	0.028	0.21	0.99	16.8	3.62
100 % RDF	2.9	0.60	0.22	0.031	0.22	0.98	18.1	3.75
50 % RDF+5t FYM	3.2	0.62	0.23	0.028	0.24	0.99	20.0	3.87
50%RDF+5t FYM+Rh+PSB	3.3	0.63	0.24	0.029	0.25	1.0	20.6	3.93
50 % RDF+Rh+PSB	2.8	0.59	0.21	0.025	0.22	0.99	17.5	3.68
100 %RDF+5t FYM	3.3	0.63	0.23	0.029	0.25	1.0	20.6	3.93
100%RDF+5t FYM+Rh+PSB	3.4	0.64	0.24	0.029	0.26	1.0	21.2	4.00
100 % RDF+Rh+PSB	3.2	0.61	0.22	0.028	0.23	0.98	20.0	3.81
CD at 5%	0.005	-	0.0012	0.00015	0.0006	-	0.106	0.004

ha grain and stalk yield respectively (Table 2). The increase in yields might be owing to beneficial effect of organics in improving the soil environment resulting in better absorption of moisture, nutrient and thus resulting in higher yields. Thus, the increase in growth, yield attributes and yield might be due to the beneficial effect of organics with balanced inorganic fertilizers. Under favourable environment integrated nutrient management might helped in the production of new tissue and development of new shoot and ultimately increased the growth; yield attributes and finally yield of the crops. Beneficial effects of supplementation of inorganic fertilizer with organic manures and rhizobium inoculants significantly increased the grain yield of pigeonpea were reported by Veeraswamy *et al*.(1973). The protein content of pigeonpea was significantly increased with fertility levels and maximum reported with 100%RDF+5tFYM+Rh+PSB because the protein content is directly related to N content. The maximum protein content in grain and stalk was 21.25 % and 4.0% respectively (Table 3). The microbial inoculants, bring about improvement in the nutrient availability either by fixation of atmospheric nitrogen and transformation of native unavailable phosphorous in to plant utilizable P. Biofertilizer on the other hand transform fixed and in soluble forms into soluble forms and make them readily available to plant (Arbad *et al*., 2008). Inoculation of biofertilizer increased nutrient uptake by plants and finally increased the quality of produce. The content of NPK in grain and stalk of pigeonpea have been increase with respect to fertility levels. The uptake of NPK increase by increase fertility level and maximum with 100%RDF+5tFYM+Rh+PSB (Table 3). The maximum nitrogen in grain and stalk was 3.4% and 0.64% respectively. Phosphorus content was observed in grain and stalk 0.24% and 0.029% respectively whereas the potassium content in grain and stalk was o.26% and 1.0% respectively. This might be due to higher content of nutrients under this fertility level, which is result of root proliferation by stimulating the cellular activities and translocation of certain growth stimulating compounds to roots.Thus, the extensive root system development with the balanced fertilization along with organic in adequate amount might have assisted the efficient absorption and utilization of other nutrients (Sutaria *et al*., 2010). Biofertilizer has been identified as a good supplement to chemical fertilizer to increase soil fertility and nutrient uptake by plants. Singh, *et al*. (2008) also reported the N and P content and uptake significantly increased with fertility levels.

It can be concluded that on the basis of maximum grain yield and net return of different fertility levels, 100%RDF+5t FYM+ Rh + PSB was found more remunerative than that of other treatments.

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