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INFLUENCE OF CROPPING SYSTEMS AND NUTRIENT MANAGEMENT ON NUTRIENT UPTAKE, PROTEIN CONTENT, YIELD, PRODUCTIVITY AND NET RETURNS OF PEARLMILLET (*PENNISETUM GLAUCUM*)

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ABSTRACT

Field experiment was conducted to study the effect of cropping systems and nutrient management in pearlmillet on nutrient uptake, quality, yield and net returns. Highest nutrient uptake and protein content were observed with combined application of 60 kg N / ha + 40 kg P_2O_5 / ha + 10 t FYM / ha + biofertilizer. There were no significant influence observed on yield in both the years of experimentation whereas total productivity was found superior with pearlmillet-wheat system and highest net returns also. Among nutrient management practices yield and total productivity was found highest with 60 kg N / ha + 40 kg P_2O_5 / ha + 10 t FYM / ha + biofertilizer while highest net return was obtained with 60 kg N / ha + 40 kg P_2O_5 / ha + 5 t FYM / ha + biofertilizer.

Keywords : Nutrient uptake, yield, productivity, net returns.

Agricultural land is inelastic and hence the increment of grain productivity per unit area, time and input is the only option left with us. In limited moisture availability areas, among the different cropping systems the pearlmillet-based cropping systems, if properly selected, planned and judiciously managed may prove a milestone in foodgrain production. Application of high technologies like inorganic fertilizers, pesticides, herbicides and energy intensive farm power machinery no doubt has increased production but has deteriorated the soil productivity and environmental quality. Soil fertility is a pre-requisite to land productivity. It is thus of paramount importance to substitute the inorganic fertilizers and the system productivity become sustainable through integrated use of organic and inorganic sources of nutrients (Singh and Yadav, 1992). However, a very few literature are available on this aspect and the present study was an attempt in this direction.

MATERIALS AND METHODS

Field experiment was conducted at IARI, New Delhi during 2002-02 and 2003-04 under dryland conditions. The trial was laid out in split-plot design with three replications. There were 3 cropping systems (pearlmillet-wheat, pearlmillet- chickpea and pearlmillet-mustard) in main plots and 9 fertility levels (control, 30 kg N / ha + 20 kg P_2O_5, 60 kg N / ha + 40 kg P_2O_5 / ha, 5 t FYM / ha + biofertilizers (Azo. + VAM), 10 t FYM / ha + biofertilizer (Azo. + VAM), 30 kg N + 20 kg P_2O_5 / ha + 5 t FYM / ha + Bio., 30 kg N / ha + 20 kg P_2O_5 / ha + 10 t FYM / ha +Bio., 60 kg N / ha + 40 kg P_2O_5 / ha + 5 t FYM / ha + Bio., and 60 kg N / ha + 10 t FYM / ha + Bio.) in sub plots. Soil of the experimental field was sandy clay loam in texture, low in available nitrogen, medium in available phosphorus and fairly high in potassium. The pH and organic carbon content of the soil was 7.2 and 0.50%, respectively. Pearlmillet cultivar 'Pusa-415' and wheat 'HD-2687', chickpea 'BG-256' and mustard 'Bio-902' were used as experimental materials.

RESULTS AND DISCUSSION

A perusal of data (Table 1) revealed that during both the years of experimentation, nutrient uptake and quality were non significantly influenced by cropping systems whereas nutrient management significantly influenced these. The highest value of these parameters was recorded with 60 kg N / ha + 40

Table 1. Effect of cropping systems and nutrient management practice on total nutrient uptake and content of pearlmillet

Treatments	N uptake (kg/ha)		P uptake (kg/ha)		Protein (%)	
	2002	2003	2002	2003	2002	2003
Cropping systems						
Pearlmillet-wheat	110.19	138.17	37.63	46.33	11.18	11.75
Pearlmillet-chickpea	107.85	136.05	37.70	45.03	11.00	11.56
Pearlmillet-mustard	107.94	136.76	37.49	45.43	10.93	11.75
C.D. (P=0.05)	NS	NS	NS	NS	NS	NS
Nutrient management practices						
Control	71.65	86.13	24.37	29.07	10.12	10.56
30 kg N/ha + 20 kg P_2O_5/ha	105.33	137.35	36.39	45.07	10.87	11.75
60 kg N/ha + 40 kg P_2O_5/ha	121.32	150.31	41.49	49.12	11.37	12.00
5 t FYM/ha + bioferfilizer (Azo. + VAM)	94.68	120.76	32.44	39.70	10.75	11.25
10 t FYM/ha + biofertilizer (Azo. + VAM)	98.52	127.06	33.43	41.59	10.87	11.62
30 kg N/ha + 20 kg P_2O_5/ha + 5 t FYM/ha + Bio.	116.39	146.92	40.30	49.47	11.31	11.93
30 kg N/ha + 20 kg P_2O_5/ha + 10 t FYM/ha + Bio.	121.11	151.09	42.43	50.99	11.25	12.00
60 kg N/ha + 40 kg P_2O_5/ha + 5 t FYM/ha + Bio.	123.75	155.04	43.21	52.22	11.43	12.06
60 kg N/ha + 40 kg P_2O_5/ha + 10 t FYM/ha + Bio.	124.87	158.42	44.37	53.13	11.44	12.07
C.D. (p=0.05)	16.86	19.88	7.02	8.79	0.57	0.69

Table 2. Effect of cropping systems and nutrient management practices on grain yield, total productivity of systems and net returns of pearlmillet

Treatments	Grain yield (q/ha)		Total productivity in terms of pearlmilet grain equivalent (q/ha)		Net returns in terms of pearlmillet grain equivalent (Rs/ha)	
	2002	2003	2002	2003	2002	2003
Cropping systems						
Pearlmillet-wheat	24.18	27.92	69.16	72.51	36539	40760
Pearlmillet-chickpea	24.24	28.37	59.44	67.74	22960	30326
Pearlmillet-mustard	24.60	28.30	53.20	63.46	19423	30326
C.D. (P=0.05)	NS	NS	6.43	4.52		
Nutrient management practices						
Control	18.09	20.24	51.14	5713	21855	27081
30 kg N/ha + 20 kg P_2O_5/ha	23.95	27.88	59.15	66.29	26342	33231
60 kg N/ha + 40 kg P_2O_5/ha	26.75	30.39	59.15	69.68	27382	24512
5 t FYM/ha + bioferfilizer (Azo. + VAM)	21.78	25.58	56.93	63.77	24653	30880
10 t FYM/ha + biofertilizer (Azo. + VAM)	22.21	26.62	57.73	65.31	23941	30743
30 kg N/ha + 20 kg P_2O_5/ha + 5 t FYM/ha + Bio.	25.65	29.77	61.11	69.22	26235	44744
30 kg N/ha + 20 kg P_2O_5/ha + 10 t FYM/ha + Bio.	26.76	30.83	64/32	71.79	27441	32574
60 kg N/ha + 40 kg P_2O_5/ha + 5 t FYM/ha + Bio.	26.90	31.16	65.75	73.46	28445	33740
60 kg N/ha + 40 kg P_2O_5/ha + 10 t FYM/ha + Bio.	26.99	31.29	37.27	74.49	28371	35576
C.D. (p=0.05)	3.56	3.74	4.66	5.48		

kg P_2O_5,+ 10 t FYM/ha + biofertilizer followed by 60 kg N/ha + 40 kg P_2O_5/ha + 5 t FYM/ha + biofertilizer during both the years of experimentation. Higher NP uptake might be due to effective root system and increased concentration of nutrients in soil solution by more application of FYM, biofertilizer and chemical fertilizers. Cisse (1988) observed that application of organic manures in pearlmillet increased the major nutrients uptake after germination than in control. The protein content also increased with increase in level of fertilization alone or in combination with fertilizer. The similar results were reported by Kutty (1983).

Grain yield (Table 2) was not influenced by cropping systems in both the years of experimentation, while total productivity recorded significantly superior in pealmillet-wheat followed by perlmillet-chickpea and highest net returns also was obtained in pearlmillet-wheat. Nutrient management significantly influenced the grain yield and productivity due to various combinations of chemical fertilizer, FYM and biofertilizers. Maximum grain yield and productivity was recorded with 60 kg N/ha + 40 kg P_2O_5/ha + 10 FYM/ha + biofertilizer. Increased grain yield with increased nitrogen level was also recorded by Meena *et al.* (1988) and Sharma *et al.* (1999). Increase in yield might be due to higher N application resulted in vigorous vegetative growth and better carbohydrate utilization in addition to this FYM on decomposition adds several major and micronutrients and improvement in physical and chemical properties of soil, showed its impact on total productivity. Higher net returns in both the years were found maximum in pearlmillet-wheat due to better productivity and prevailing market prices and low cost of cultivation of the system. Maximum net returns in case of the nutrient management was obtained with 60 kg N/ha + 40 kg P_2O_5/ha + 5 t FYM/ha + biofertilizer, might be due to low cost of cultivation. These findings are supported by Hooda *et al.* (1991).

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