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RESEARCH PAPER

Growth and yield of pearl millet and chickpea as influenced by different sources and doses of organic manure under pearl millet-chickpea cropping system

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Abstract : An experiment was laidout during three years from 2009-10 to 2011-12 at Regional Research Station, Kali, Aligarh, C.S. Azad university of Agriculture and Technology, Kanpur. The main objective was to findout the suitable organic source for enriching soil health, increasing grain yield of pearl millet and residual effect of applied organic sources on chickpea yield under pearl millet-chickpea cropping system. eight organic sources *i.e.*, control, 2.5 t FYM/ha, 5.0 t FYM/ha, 7.5 t FYM/ha, 1.0 t vermicompost/ha, 2.0 t vermicompost/ha, 3.0 t vermicompost/ha and 2.5 t FYM + 1.0 t vermicompost/ha were tested under pearl millet-chickpea cropping system. the pooled results of three years displayed that the application of 7.5 t FYM/ha gave significantly higher grain yield of pearl millet (1912 kg/ha). The lowest grain yield of pearl millet recorded at control (1204 kg/ha). Significantly maximum seed yield of chickpea was recorded under residual effect of 7.5 t FYM/ha by 1376 kg/ha, while lowest yield noted at control (703 kg/ha). Application of 7.5 t FYM/ha gave higher pearl millet equivalent yield (6161 kg/ha), net return (Rs. 31971/ha) and BCR (1:4.48) in comparison to other tested source of organic manure.

Key Words : Inhabiting, Sodic soils, Soil profile, Staple cereal, Vermicompost

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INTRODUCTION

Pearl millet is one of the important rainfed food grain crop of the arid and semi-arid region. It forms a staple cereals in the diets of millions of farmers inhabiting these region. In india, pearl millet grain is consumed as human food, the most important use of flour being for making flat, rounded, unleavened bread, called *Chapatti*, *Roti* or *Bhakri*. The cracked grain may also be cooked into porridge. Whole grain preparations are widely used and have better acceptability. Pearl millet is mostly grown as rainfed monsoon crop on well drained light textured soils. It does well on soils having available soil moisture storage capacity of 150 mm/m of soil profile. Pearl millet is a better substitute for paddy in saline sodic soils. In U.P. its area, production and productivity are 9.19 lakh hectare, 18.68 lakh mt and 20.33 q/ha, respectively

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(Anonymous, 2015), which are higher over maize and jowar.

Similarly, chickpea is grown in winter on conserved soil moisture and therefore, respond to rains received during crop growth but does not tolerate excessive moisture regimes. Its well branched tap root grows deep in soil profile with stored moisture for sustaining growth. In U.P. about 5.58 lakh ha chickpea is grown with total production of 1.77 lakh mt and productivity of 3.17 q/ha (Anonymous, 2016).

In northern states, chickpea is cultivated as a second crop of the double cropping system in areas receiving mean annual rainfall of 1000 mm or above. In less rainfall areas fallow-chickpea mono-cropping is also practiced. In Bundelkhand region of uttar Pradesh farmers have traditionally been growing only lentil or chickpea. Experimental studies of Varanasi showed that pearl millet-chickpea cropping system is proven better under double cropping system (Singh, 1985).

In a long term study conducted at Jodhpur, it was found that application of 40 tonnes of farm yard manure/ ha once in two years gave highest moisture use efficiency followed by 40 kg N/ha every year (Singh *et al.,* 1981). The effect of fertility treatments on the yield of pearl millet grain displayed that the yields obtained with 20 kg N/ha every year and from 40 kg N/ha once in 2 years were about the same, suggesting higher risk cover under the farmers treatment. Similarly, it makes little difference in yield, whether 20 tonnes of FYM is applied once in 2 years or 10 tonnes of FYM is supplemented with 10 kg N/ha every year, the mean yield of the 5 years period being the same (15.1 to 15.4 q/ha). It is also worth while to mention here that application of 40 t FYM once in 2 years gave highest grain yield by 17.80 q/ha (Singh *et al.,* 1981).

Keeping the above points in view, the present study was under taken to findout the suitable organic source for improving soil health, increasing grain yield of pearl millet and residual effect of applied organic sources on chickpea yield under pearl millet-chickpea cropping system.

MATERIAL AND METHODS

The present study was laidout during rainy and autumn season of 2009-10 to 2011-12 at Regional Research Station, Kalai, Aligarh, C.S. Azad University of Agriculture and technology, Kanpur. The soil of experimental site was sandy loam having pH 7.5, organic carbon 0.23 per cent, total nitrogen 0.02 per cent, available phosphorus 13.9 kg/ha and available potash 115 kg/ha, therefore, the fertility status was poor. The pH was determined by electrometric glass electrode method (Piper, 1950), while organic carbon was determined by Colorimetric method (Datta *et al.,* 1962). Total nitrogen was analysed by Kjeldahl's method as discussed by Piper (1950). The available phosphorus and potassium were determined by Olsen's method (Olsen *et al.,* 1954) and Flame photometric method (Singh, 1971), respectively. Eight organic sources *i.e.,* control, 2.5 t FYM/ha, 5.0 t FYM/ha, 7.5 t FYM/ha, 1.0 t vermicompost/ha, 2.0 t vermicompost/ha, 3.0 t vermicompost/ha and 1.0 t vermicompost + 2.5 t FYM/ha were tested under pearl millet-chickpea cropping system. The all the sources of organic carbon were applied in pearl millet and its residual effect was studied in chickpea. The experiment was laid out in Randomized Block Design with three replications and same layout was used for chickpea to see the residual effect of different organic sources. The pearl millet variety RHB-121 and chickpea variety KGD-1168 were planted in pearl millet-chickpea cropping system. The pearl millet was planted in the second fortnight of July 2009, 2010 and 2011 and harvested after complete maturity. Chickpea was planted in the last week of October 2009, 2010 and 2011 and harvested in first fortnight of April 2010, 2011 and 2012. The recommended agronomical practices were followed in both the crops. The pearl millet was grown as rainfed crop and no irrigation was given, while, two irrigations were given to chickpea.

The pooled data of the three years were statistically analysed with standard method as described by Gomez and Gomez (1984). The results of the study are discussed on mean value of three years.

RESULTS AND DISCUSSION

The pooled results obtained from the experiment are reported and discussed under appropriate heads :

Effect on pearl millet :

Pooled results of three year (Table 1) display that the different doses of FYM and vermicompost applied to pearl millet did not influence to the plant stand of pearl millet, counted at harvest. The variation due to different doses of FYM and vermicompost applied to pearl millet was observed on days to 50 per cent flowering. Among the eight treatments under study, sowing of pearl millet

with 7.5 t FYM registered 50 per cent flowering at 46 days, while control prolonged the day of 50 per cent flowering (51 days).

The significant variation was also found in plant height. The significantly highest plant height was measured under vermicompost 3t/ha (186 cm) closely followed by 2.5 t/ha FYM + 1.0 t vermicompost/ha (184 cm) and vermicompost 1.0 t/ha (183 cm), while lowest plant height measured at 2.5 t FYM/ha (174 cm).

The results revealed that sowing of pearl millet at 7.5 t FYM/ha recorded remarkably higher values of total tillers/plant and effective tillers/plant, while lowest values of both type tillers was noted at control. The panicle length of pearl millet was found insignificant and almost equal length was measured under all the sources and different doses of organic manure. The 1000-grain weight was significantly higher under treatment T_4 (7.3 g) closely followed by T_7 (7.0 g).

The variations in growth and yield parameters were due to variation in availability of nutrients from organic sources. Similar observations have also been reported by Parihar *et al.* (2009) and Kanzaria *et al.* (2010).

The grain yield recorded under 7.5 t FYM/ha was significantly higher as compared to other tested treatments. The increase in grain yield of pearl millet with sowing under T_4 may be attributed to significant increase in effective tillers/plant and weight of 1000-grain. Improvement in these parameters accompanied with good availability of major and micro-nutrients which showed improvement in grain yield of pearl millet. These results confirm the findings of Parihar *et al.* (2009) and Kanzaria *et al.* (2010).

The results displayed the highest grain yield of pearl millet at 7.5 t FYM/ha because maximum plant nutrient available under this treatment had maintained better source-sink relationship. It means amount of dry matter or photosynthates produced by source organs translocated toward sink organs (economic part) and produced higher grain yield. The sowing of pearl millet under aforementioned treatment had higher test weight

Table 1 : Effect of organic manure sources on growth, yield traits and grain yield of pearl millet (pooled data of three years)

Organic source		Plant stand at harvest (,000/ha)	Days to 50% flowering	Plant height (cm)	Total tillers/plant	Effective tillers/plant	Panicle length/plant (cm)	1000-seed weight(g)	Yield kg/ha)
T_1	Control	142	51	181	3.7	2.4	20	5.7	1204
T_2	2.5 t FYM/ha	143	49	174	4.1	2.5	21	6.1	1284
T_3	5.0 t FYM/ ha	144	48	175	4.7	3.3	22	6.7	1589
T_4	7.5 t FYM/ ha	147	46	177	5.4	3.5	23	7.3	1912
T_5	1.0 t V.C// ha	141	50	183	4.6	2.7	21	6.2	1314
T_6	2.0 t V.C// ha	143	47	175	4.7	3.1	22	6.6	1556
T_7	3.0 t V.C// ha	145	47	186	5.2	3.3	22	7.0	1095
T_8	2.5 t FYM + 1.0 t V.C// ha	146	47	184	4.8	3.1	22	6.7	1593
	C.D. (P=0.05)	NS	1.21	7.90	0.51	0.20	NS	0.31	59

Note: V.C. = Vermicompost NS= Non-significant

Table 2: Grain yield of gram, equivalent yield of pearl millet and economics under different treatments (pooled data of three years)

Organic source		Grain yield of gram (kg/ha)	Pearl millet equivalent yield (kg/ha)	Cost of cultivation (Rs./ha)	Gross return (Rs./ha)	Net return (Rs./ha)	BCR
T_1	Control	703	3508	25310	34404	9094	1 :2.80
T_2	2.5 t FYM/ha	1026	4465	25250	42904	17654	1 :3.41
T_3	5.0 t FYM/ ha	1184	5247	26002	50255	24253	1 :3.91
T_4	7.5 t FYM/ ha	1376	6161	26750	58721	31971	1 :4.48
T_5	1.0 t V.C// ha	980	4277	25100	41198	16098	1 :3.29
T_6	2.0 t V.C// ha	1158	5135	25700	49198	23498	1 :3.86
T_7	3.0 t V.C// ha	1258	5687	26300	54303	28003	1 :4.19
T_8	2.5 t FYM + 1.0 t V.C// ha	1155	5158	25850	49488	23638	1 :3.86
	C.D. (P=0.05)	34	-	-	-	-	-

Note: V.C. = Vermicompost

Fig. 1 : Studies on organic farming in pearl millet- gram crop sequence T_4= Residual effect of FYM@7.5t/ha

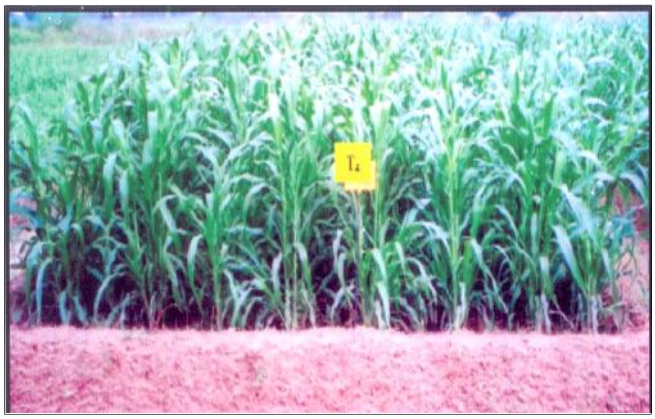

Fig. 3 : Studies on organic farming in pearl millet- gram crop sequence T_4= Residual effect of FYM@7.5t/ha

Fig. 2 : Studies on organic farming in pearl millet- gram crop sequence T_1= Control

Fig. 4 : Studies on organic farming in pearl millet- gram crop sequence T_1= Control

of grains means it possessed high sink capacity to utilized the photoassimilate translocated from source. These results are commensurable to the findings of Panwar *et al*. (1986); Shrivastava and Bharadwaj (1986) and Pachpor and Shete (2010).

Effect on chickpea yield:

The chickpea raised after pearl millet in successive on the same layout of pearl millet on eight treatments of residual organic source. The results revealed that the planting of chickpea after pearl millet on the residue of 7.5 t FYM/ha produced significantly higher grain weight by 1376 kg/ha closely followed by 3.0 t vermicompost/ha (1258 kg/ha). The lowest chickpea yield was recorded at control (703 k/ha).

The better residue of nutrients available under T_4, therefore, the dry matter or photosynthates produced by source organs translocated toward sink organ (economic part) and produced higher kernel yield of chickpea. These results confirm the findings of Panwar *et al*. (1986); Shrivastava and Bharadwaj (1986) and Pachpor and Shete (2010).

Effect of pearl millet equivalent yield and economics:

Application of 7.5 t FYM/ha increase pearl millet equipment yield (6161 kg/ha), net return (Rs., 31971/ha) and BCR (1:4.48) closely followed by the application of 3.0 t vermicompost/ha (T_7). The T_7 gave pearl millet equivalent 5687 kg/ha, net return Rs. 28003/ha and BCR 1:4.19. the lowest pearl millet equivalent yield (3508 kg/ha), net return (Rs. 9094/ha) and BCR (1:2.80) were found under control.

Conclusion :

The pooled results of three years displayed that highest grain yield of pearl millet and chickpea, PMEY, net return and BCR were recorded at 7.5 t FYM/ha

closely followed by 3.0 t vermicompost/ha, therefore, the farming majority may be suggested for adoption of pearl millet-chickpea cropping system with the application of 7.5 t FYM/ha or 3.0 t vermicompost/ha for supply of plant nutrients.

REFERENCES

Anonymous (2015). *Kharif phaslon kee saghan patatiyan*. Publication of Department of Agriculture, U.P. Lucknow, India pp. 185.

Anonymous (2016). *Rabi phaslon kee saghan patatiyan*. Publication of Department of Agriculture, U.P. Lucknow, India pp. 110.

Datta, N.P., Khera, M.S. and Saini, T.R. (1962). A rapid colorimetric procedure for the determination of organic carbon in soils. *J. Indian Soc. Soil Sci.*, **10** : 67-74.

Gomez, K.A. and Gomez, A.A. (1984). *Statistical procedures for agricultural research*. Johnwiley and Sons, NEW YORK, U.S.A.

Kanzaria, K.K., Sutaria, G.S., Akbari, K.N., Vora, V.D. and Padmani, D.R. (2010). Effect of integrated nutrient management on productivity of pearl millet and soil fertility of sandy loam soil under rainfed condition. *Asian J. Soil Sci.*, **5** (1) : 154-156.

Olsen, S.R., Cole, C.V., Watanable, F.S. and Dean, L.A. (1954). Estimation of available phosphorus in soils by extraction with sodium bicarbonate. U.S.D.A. Circ. 939 (Washington) : 19 pp.

Pachpor, N.S. and Shete, P.G.(2010). Source-sink relationship in soybean genotypes in summer season. *Internat. J. Agric. Sci.*, **6** (1) : 67-68.

Panwar, J.D.S., Shukla, D.S. and Sirohi, G.S.(1986). Growth and development aspect in relation to yield of mungbean. *Indian J. Plant Physiol.*, **4** : 312-315.

Parihar, C.M., Rana, K.S. and Parihar, M.D. (2009). Crop productivity, quality and nutrient uptake of pearl millet (*Pennisetum glaucum*)-Indian mustard (*Brassica juncea*) cropping system as influenced by land configuration and direct and residual effect of nutrient management. *Indian J. Agric. Sci.*, **79** : 927-930.

Piper, C.S. (1950). *Soil and plant analysis*. Univ. Adelaide Aust.

Shrivastava, J.P. and Bharadwaj, S.N. (1986). Contribution of different photosynthesizing organ to the pod in relation to source-sink interaction in field pea. *Indian J. Plant Physiol.*, **4** : 262-265.

Singh, R.P., Singh, H.P., Dubey, H.S. and Singh, K.C. (1981). Effect of periodical application of nitrogen inorganic and organic farms on the yield of rainfall pearl millet. *Indian J. Agric. Sci.*, **51** : 409-416.

Singh, R.P. (1985). Pearl millet. *Efficient management of dryland crops*. Publication of ICAR-CRIDA, Hyderabad, Andhra Pradesh, India, pp. 51-62.

Singh, T.A.(1971). A Laboratory manual of soil fertility and fertilizer, *U.P. Agril. Univ. Pantnagar* (*Nainital*) pp. 71-74.