

Long term effect of organic matters and fertilizers on seed yield in pearl millet - pearl millet cropping systems

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Abstract

An investigation was undertaken to study the effect of long-term application of inorganic fertilizers and organic materials (FYM and farm residue) on seed yield and economics after 26 cycles of pearl millet- pearl millet cropping system at research farm of Dryland Project, R.B.S.College, Bichpuri, Agra. The experiment consisted of nine treatments including control, RDF, 50% dose of RDF through fertilizers, 50% dose of RDF through farm residue, 50% dose of RDF through FYM, 50% N through fertilizers + 50% N through farm residue (P was given through DAP), 50% N through fertilizers + 50%N through FYM (P was given through DAP), Recommended dose of fertilizer + Zinc as soil application (25 kg ZnSo₄/ha) and farmers practice. Continuous use of FYM and farm residue in conjunction with fertilizers increased the seed yield and economics. Highest pooled seed yield (3142 kg/ha), B:C ratio (2.50) and RWUE (7.66) were registered with treatment 50% N through fertilizers+ 50% N through FYM followed by Recommended dose of fertilizer + Zinc as soil application (25 kg ZnSo₄/ha) and 50% N through fertilizers + 50% N through farm residue. The results suggest that integrated use of inorganic fertilizer in combination with organic materials increased the seed yield and economics of pearl millet under pearl millet- pearl millet cropping system.

Key words: Organic, Fertilizers, Pearl millet, Seed yield, B:C Ratio, Manures, Inorganic fertilizer

Introduction

Pearl millet (*Penisetum glaucum* L.) is one of the important millet crop of hot and dry areas of arid and semi-arid climatic condition particularly of Uttar Pradesh. It has been estimated that pearl millet embodies a tremendous productivity potential particularly in areas having extreme environmental stress condition on account of drought. In addition to tolerating hot and dry climates, pearl millet is able to produce reasonable yields on marginal soils of arid and semi-arid areas, where other crops would fail. It is nutritionally better than many cereals as it is a good source of protein having higher digestibility (12.1%), fats (5.0%), carbohydrates (69.4%) and minerals (2.3%).

Intensive cropping, cultivation of high yielding varieties, crop residue burning and indiscriminate use of chemical fertilizers have resulted into depletion of nutrients, soil organic carbon and deterioration of soil physical conditions. Long term studies indicated that supplying of plant nutrients only through chemical

fertilizers depleted soil organic matter and declined the soil productivity (Srivastava, 1998; Singh *et al.*, 1999). Therefore, there is a need to manage the long - term soil productivity through integrated use of both inorganic and organic sources of nutrients. The organic sources of nutrients including farm yard manure, green manure crop residue, etc. have potential for increasing soil organic matter.

The soil organic matter plays an important role in improvement of soil physical, chemical and biological properties and ultimately increasing soil productivity and crop yields (Antil *et al.*, 2011; Bhagat, *et al.* 2003; Marinari *et al.*, 2000). Long term experiments have shown that crop residues incorporation, farm yard manures and green manures increased soil organic carbon and nutrient availability as compared to chemical fertilizers (Babhulkar *et al.*, 2000; Lado *et al.*, 2004). Therefore, the present study was carried out to investigate the long term effect of organic materials along with inorganic fertilizers on

seed yield under pearl millet - pearl millet cropping system in a sandy loam soil.

Materials and Methods

An ongoing long - term experiment, on application of different organic materials (FYM and farm residue) and inorganic fertilizers on seed yield in pearl millet- pearl millet cropping system which is in progress for last 35 years at research farm of Dryland Project, R.B.S. College, Bichpuri, Agra was selected for the study from 2010-2016. Year 2015 was considered as drought year. The climate of the region is semi-arid with mean annual rainfall of 665mm., 80% of which is concentrated from July to September. The experimental soil is sandy loam. The experiment consisted of nine treatments (Table 1) having observation plot size 10mx8m. The N and P were applied through urea and diammonium phosphate. The crops were raised as per the recommended practices. Total area of each plot was harvested manually to record the seed yield.

The experiment was laid out in a randomized block design (RBD) with three replications. The experiment data were statistically analyzed using analysis of variance of randomized block design and F- test.

The seed yield of pearl millet increased with the long term application of organic materials along with inorganic fertilizers (Table 1). Six years pooled data indicated that combination of 50% N through fertilizers + 50 % N through FYM gave highest seed yield of 3142kg/ha of pearl millet. This indicate the potential use of FYM + fertilizers for sustaining the soil productivity. Similar effect of long-term application of FYM was reported by Antil *et al.*, (2011). The beneficial effect on yield might be due to the increased supply of all the essential nutrients by FYM that might have resulted in higher manufacture of food and its subsequent partitioning towards

Table 1: Permanent manorial trial on pearl millet - pearl millet crop sequence

Treatments	Seed yield (kg/ha)						Mean of 6 years	BC ratio Mean	RWUE (kg/mm/ha) Mean
	2010	2011	2012	2013	2014	2015			
T-1 Control	1652	1516	1250	980	890	DROUGHT	1449	1.26	2.99
T-2 Recommend dosed of fertilizer (60 kg N+40 kg P ₂ O ₅ /ha)	2975	3220	2468	2300	2825	SEASON	3040	2.31	6.84
T-3 50% of the recommended dose through fertilizer	2425	2615	1780	1495	1884		2289	1.81	5.01
T-4 50% of the recommended dose through farm residue	2381	2565	1840	1528	1932		2320	1.78	5.06
T-5 50% of the recommended dose through FYM	2440	2642	1910	1605	2005		2409	1.85	5.24
T-6 50% N through fertilizers+50% N through farm residue (P was given through DAP)	3026	3233	2485	2398	3015		3150	2.29	6.91
T-7 50% N through fertilizers+50%N through FYM (P was given through DAP)	3253	3675	2678	2575	3103		3568	2.50	7.66
T-8 Recommended dose of fertilizer+ Zinc as soil application (25 kg ZnSO ₄ /ha)	3105	3494	3535	2490	3065		3450	2.34	7.40
T-9 Farmers method (10-15 kg N/ha)	1825	1815	1515	1326	1408		2016	1.56	3.94
Mean	2565	2870	2051	1877	2236		2632	-	-
SEm ±	146	148	143	108	134		181	-	-
CD at 5%	425	432	418	314	390		527	-	-
CV (%)	11.37	10.78	13.98	11.65	11.98		13.73	-	-
Rainfall during the season (mm)	642.7	635.9	679.7	987.4	368.3	233.2	991.2	-	-
Rainfall during crop growth period (mm)	522.1	457.8	584.5	610.8	231.4	93.2	375.3	-	-

sink. The findings of present investigation are supported by Khan *et al.*, (2000) in pearl millet and Kumawat and Jat (2005) in barley. These findings are in agreement with another research finding shows that the yield could increase with combined application of organic manure and inorganic fertilizer since it could enhance soil moisture holding capacity in the short rainy season, in addition to soil fertility improvement (Abebe *et al.*, 2016). Although, the yield was recorded slightly lesser in the treatment 50% N through fertilizers + 50% N through farm residue, but it might be used promising alternatives for sustainable soil productivity. B:C ratio (2.50) and RWUE (7.66) were also registered higher in 50% N through fertilizers + 50% N through FYM followed by 2.34 & 7.40 in RDF + Zinc application (Table 1).

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