Strategy to Enhance Grain Yield of Pearl Millet

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Abstract
A field study was carried out during three years from 2011-14 at Regional Research Station, Kalai, Aligarh, C.S. Azad University of Agriculture and Technology, Kanpur. The main objective was to find out the effect of organic manure/farm yard manure (FYM) on grain yield of pearl millet. The soil of experimental field was sandy loam, having pH 8.0, organic carbon 0.23%, total nitrogen 0.02%, available phosphorus 13.9 kg/ha and available potash 115 kg/ha, therefore, the status of organic matter in soil is low. The four treatment combinations i.e., FYM 0t/ha, FYM 5t/ha, recommended dose of fertilizer (RDF) and RDF+FYM 5t/ha were tried. The trend in the grain yield of pearl millet was found 1889 kg/ha, 1481 kg/ha and 1773 kg/ha due to application of FYM 5t/ha in first, second and third year, respectively. The three years average grain yield of pearl millet under RDF showed the higher grain yield (2411 kg/ha) over the FYM 5t/ha (1714 kg/ha) but the integration of RDF with FYM 5t/ha improved the grain yield (2609 kg/ha). The grain yield of pearl millet can be increased due to continuous use of FYM or it will give the similar grain yield to recommended dose of fertilizer in forthcoming years.

Keywords: *Farm yard manure,Integration, Moisture stress, Organic manure, Vegetative growth*.

I. INTRODUCTION

Pearl millet (*Pennisetum. glacum (L) R. Br*) is an important millet crop of India and is second to sorghum in area and production. It is grown practically all over the country and more particularly in semi-arid tropics (SAT) area of northern and peninsular India in soils of poorer fertility. Since, it is grown mostly under marginal condition of moisture and fertility of soil, which coupled with low yielding potentiality of varieties, often results into very poor per hectare yield. It is grown on 713kg million ha with an average productivity of 1132 kg/ha during 2015-16[1]. In Uttar Pradesh its area, production and productivity are 9.52 lakh hectare, 18.08 lakh mt. and 1900 kg/ha, respectively[2].

Pearl millet yield is very low in U.P., principally due to unbalance use of fertilizers and no integration of organic manure with inorganic fertilizers. Farmers apply very low quantity of nitrogen through urea but seldom apply phosphorus to pearl millet throughdiammonium phosphate (DAP). The non-application of organic manure is the major cause of yield reduction of pearl millet. On the one hand, where organic matter in soil is limited, nutrient deficiency may reduce yield and the addition of organic manure is warranted. On the other hand, chemical fertilizer induced increases in water use during the early vegetative growth period may reduce yield by increasing crop water deficit at critical later stages. The reduced availability and utilization of nutrients under moisture stress conditions vis-a-vis fertilizer induced drought tolerance make the problem even more complex[3].

Keeping the above points in view the present study was undertaken with the main objective to find out the suitable dose of organic manure through FYM or its integration with inorganic fertilizers for increasing pearl millet yield.

II. Materials and Methods

A field study was carried out during three years from 2011-12 to 2013-14 at Regional Research Station, Kalai, Aligarh, C.S. Azad University of Agriculture and Technology, Kanpur. The main objective was to find out the effect of organic manure/FYM on grain yield of pearl millet. The experimental soil was sandy loam, having pH 8.0, organic-carbon 0.23%, total nitrogen 0.02%, available phosphorus 13.9 kg/ha and available potash 115 kg/ha, therefore, the status of organic matter in soil is low. The pH was determined by Electrometric glass electrode method[4] while organic carbon was determined by Colorimetric method[5]**.** The nitrogen was analysed by Kjeldahl's method as discussed by Piper (1950). The available phosphorus and potassium were determined by Olsen's method[6] and Flame photometric method[7] respectively. The four treatment combinations i.e., FYM 0t/ha, FYM 5t/ha, RDF and RDF +FYM 5t/ha were tested. The experiment was laid out in Randomized Block Design with six replications. The pearl millet variety *HHB-223* was sown in the first fortnight of July 2012, 2013 and 2014 and harvested after complete maturity. The recommended dose of 80 kg N + 40 kg P_2O_5 + 40 kg potassium oxide (K_2O) was given to pearl millet. The

other recommended agronomical practices were followed in pearl millet. The irrigations were given in the absence of rains as protective irrigations.

The pooled data of the three years were statistically analysed with standard method [8] as described by the results of the study are discussed on mean value basis of three years.

III. Results and Discussion

The results obtained from the experiment are reported in **Table-I** and discussed below on the basis of pooled data.

Table I

Growth parameters; Yield traits and grain & Stover yield of pearl millet as influenced by different treatments (pooled data of three years).

Treatment combination	Plant stand (0,00/ha.)	Plant height (cm)	Total tillers/ plant	Effective tillers/ plant	Ear head length (cm)	Test weight (g)	Grain yield (kg/ha)	Stover yield (kg/ha)	Harvest index (%)
T1 FYM (0)	139	212	1.8	1.1	21.35	7.80	1331	6934	16.10
T2 RDF+ FYM (0)	139	227	2.1	1.2	22.75	8.00	2411	7926	23.32
T3 FYM (5t/ha)	141	221	2.0	1.2	21.25	7.90	1714	7201	19.22
T4 RDF+ FYM (5t/ha)	141	236	2.4	1.5	21.95	8.30	2609	9440	21.61
CD 5%	N.S.	N.S.	N.S.	N.S.	N.S.	0.10	233	582	-

A. Effect on growth parameters

The different treatments did not affect the significant to the plant stand but slight improvement was noted under FYM 5t/ha and RDF + FYM 5t/ha, both treatments displayed the statistically at par value of plant stand (**Table-1**). The plant height under different treatments was found insignificant, however, there was numerically increase in the plant height at RDF + FYM 5t/ha (236 cm). The number of total tillers/plant and effective tillers/plant was numerically maximized by application of RDF +FYM 5t/ha. The higher head length (22.75 cm) was measured at RDF+FYM kg/ha followed by RDF+FYM 5t/ha (21.95cm) but the difference among the treatments was not found significant.

The conjunction of FYM has the composition of iron and sulphur. Both iron and sulphur help in synthesis of chlorophyll. Iron also helped to the absorption of plant nutrients and increased the photosynthesis. Similarly, encouraged to vegetative growth of pearl millet and stimulated to the seed formation. Therefore, application of FYM in organic matter deficit soil increased the growth parameters considerably in comparison to other treatments.

B. Effect on yield traits

Among the yield traits test weight of grain is most important yield contributing character, therefore, data on this character has been recorded. Significant highest test weight was recorded under RDF+FYM 5t/ha in comparison to other tested treatments. Conjunction of FYM with RDF was stimulated to the healthy seed formation, which produced the highest test weight.

a). Effect on grain yield

The integrated dose of RDF+FYM 5t/ha yielded significantly higher grain yield (2609 kg/ha) except RDF+FYM kg/ha (2411 kg/ha), which was statistically at par to RDF+FYM 5t/ha. The lowest grain yield by 1331 kg/ha was recorded at FYM kg/ha. The considerable increase in effective tiller/plant, ear head length and test weight at RDF+FYM 5t/ha supported to higher grain yield (kg/ha) of pearl millet.

The better combination of FYM with RDF maintained better source-sink relationship. Under this situation the dry matter or photosynthates produced by source organs translocated toward sink organ (economic part) and produced higher seed of pearl millet. The sowing of pearl millet under RDF+FYM 5t/ha had higher growth parameters means it possessed higher sink

capacity to utilize the photoassimilatestranslocated from source, resulted in, higher test weight and more seed yield (kg/ha). These results confirm the findings of[9] - [14].

b). Effect on stover yield

The different treatment combinations were affected significantly to the stover yield. The treatment combination of RDF+FYM 5t/ha gave highest stover yield by 9449 kg/ha. The significantly lowest stover yield was weighed at FYM kg/ha in comparison to all other treatment combinations.

c). Effect on harvest index (%)

Not much variation was noted in harvest index under different treatments of nutrients combinations.

IV. CONCLUSION

The application of FYM 5t/ha reduced the grain yield of pearl millet by 408 kg/ha during second year over the first year but this reduction was minimised during third year (375 kg/ha). The reduction in grain field in second year (408 kg/ha) was minimised (375 kg/ha) during third year over the base year of experimentation due to improvement in organic matter in soil. Therefore, we conclude that pearl millet responded very well from the application of RDF + FYM 5t/ha, hence,this combination may be recommended to the farm families of pearl millet growing zone for obtaining better yield of pearl millet.

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