Available online at www.ijpab.com

DOI: http://dx.doi.org/10.18782/2320-7051.2748

ISSN: 2320 – 7051

Int. J. Pure App. Biosci. **5 (5):** 720-724 (2017)

Research Article

International Journal of Pure & Applied Bioscience

OPEN ACCESS

Effect of Integrated Application of Inorganic and Organic Sources of Manures on Test Weight, Length of Earhead and Available Soil Micronutrient under Pearlmillet Crop

Swarnima Shrivastava* and Vinay Arya

Department of Soil Science and Agricultural Chemistry, Rajmata Vijayaraje Scindia Agricultural University, Gwalior – 474 002, Madhya Pradesh, India

*Corresponding Author E-mail: swarnima.ag@gmail.com

Received: 24.03.2017 | Revised: 29.04.2017 | Accepted: 8.05.2017

ABSTRACT

An experiment to find out the relative performance of two sources of organics and NPK is in progress in alluvial soils (Inceptisol) of College of Agriculture Gwalior, with nine treatments & 3 replications in randomized block design. Data presented has been obtained from the crop grown during Kharif 2014. Higher yield (4192.46 kg ha^{-1}) in comparison to 100% FYM and 100% vermicompost was recorded with 50% vermicompost + 50% NPK and this was followed by 100% NPK (3891.6 kg/ha^{-1}) The highest build-up of organic carbon in the soil was recorded in 100% NPK (4.61gkg^{-1}), which was at par with 25% vermicompost + 75% NPK and 75% vermicompost + 25% NPK. A significant increase was noted in test weight under different treatments compared to two organic manure (FYM ana vermicompost). Its ranged from of 9.00 to 10.65 g under different treatments. Maximum test weight (10.65 g) was under 100% NPK. Maximum length of ear head (35.9cm) was recorded with T9 (100% NPK) treatment but statistically at par with T4 25% FYM + 75% NPK and T8 treatments 25% Vermi + 75% NPK, having length of ear head 30.0 & 32.4 cm respectively. The results indicate that 100% NPK treatment contribute the highest content of available soil micronutrients Cu, Fe, Zn, and Mn 0.456, 8.06, 0.785, 9.430mgkg^{-1}resppectively over remaining treatments. Two sources of organics resulted in lower concentration. In general the status of Cu, Fe, Zn, Mn declined in the soil samples after harvest in comparison to initial samples.

Key words: *FYM, Pearl-millet, Cu, Fe, Zn, Mn, Micronutrient, Yield.*

INTRODUCTION

Pearlmillet is a common crop grown in *Kharif by* marginal and small farmers in alluvial soil region of northern Madhya Pradesh under Pearl millet – mustard and Pearl millet-wheat cropping systems. Under intensive cultivation, there are reports of reduction in yield even due to constant use of NPK fertilizers. The reduction in the yield is generally traced due to deficiency of secondary and micronutrients.

Cite this article: Shrivastava, S. and Arya, V., Effect of Integrated Application of Inorganic and Organic Sources of Manures on Test Weight, Length of Earhead and Available Soil Micronutrient under Pearlmillet Crop, *Int. J. Pure App. Biosci.* **5(5):** 720-724 (2017). doi: http://dx.doi.org/10.18782/2320-7051.2748

Soil research results of the last decade show that at the present time, among micronutrients, Zn deficiency is the most detrimental to effective crop yield. Other important micronutrients that increase crop yield (most to least effect) are Fe, B, Mn, Cu, and Mo. In the case of calcareous soils, the conventional notion that micronutrients increase crop yield by 15%-30% is an underestimated range. Enhanced removal of micronutrients as a consequence of adoption of high yielding varieties and intensive cropping together with the use of high analysis NPK fertilizers coupled with limited/no use of organic manures and less recycling of crop residues are important factors contributing to the accelerated depletion of micronutrients from the soils has resulted in the depletion of micronutrient Cations from the soil reserves.

MATERIALS AND METHODS

Field study was conducted at the Crop Research Farm of Rajmata Vijayaraje Scindia Agriculture University, Gwalior (M.P.) in Kharif season 2014 with Pearmillet as a test crop. The experimental soil having p H (1:2) 7.5, electrical conductivity (E.C.) 0.43dSm^{-1}, organic carbon (O.C.) 4.53 g kg^{-1}, available Cu(0.456) mg kg^{-1}, available Fe (8.063) mg kg^{-1}, available Mn (9.430) mg kg^{-1} and available Zn(0.785) mg kg^{-1}. The 100% NPK recommended dose of fertilizer for Pearlmillet was 80 kg N, 40 kg P_2O_5 and 20 kg K_2O ha^{-1} respectively. The experiment consisted of nine treatments replicated three times in a randomized block design viz., FYM @ 160 q ha^{-1} (T_1), N_{40} P_{20} K_{10} + FYM @ 80 q ha^{-1}: T_2, N_{20} P_{10} K_5 + FYM@120q ha^{-1}: T_3, N_{60} $P_{30}K_{15}$ + FYM@ 40 q ha^{-1}: T_4.

Vermicompost 5334 kg ha^{-1}: T_5, $N_{40}P_{20}K_{10}$ +Vermocompost @ 2667 kg ha^{-1}: T_6, $N_{20}P_{10}K_5$ +

Vermicompost @ 4000 kg ha^{-1}: T_7, $N_{60}P_{30}K_{15}$ + Vermicompost @ 1334 kg ha^{-1}: T_8, $N_{80}P_{40}K_{20}$: T_9. The farmyard manure (FYM) was obtained from small dairy holders. The FYM @ 160 q ha^{-1} was incorporated one month before sowing as per treatments. Total N, P, and K contents of the FYM were 0.50, 0.25 and 0.50 % respectively. Half of the N and entire dose of P, K were applied at the basal dose and remaining quantity of N was top dressed after 35 days, in the form of urea, di-ammonium phosphate, murate of potash. Grain and straw yields were recorded after harvest of crop. After harvest of the crop, the composite surface (0-15 cm) soil samples from each plot of the experimental field were analyzed for p H , EC, OC, available Cu, Fe, Zn, Mn by following standard procedures.

RESULT AND DISCUSSION

Grain and Straw Yields

Higher yield in comparison to 100% FYM and 100% vermicompost were recorded with 50% vermicompost + 50% NPK (table 2). There was a significant response of different treatments as compared to organic sources. Grain yield varied from 3044.73 to 4192.46 kg ha^{-1} under different treatments which were in T_5 (100% vermicompost) and T_6 (50% vermicompost +50% NPK) respectively. Application of P along with N considerably increased yield of pearlmillet compared to the application of FYM alone. A better supply of phosphorus has been associated with prolific root growth resulting in enhanced water and nutrient absorption. The application of K along with NP significantly increased the grain and straw yield of pearlmillet over FYM and vermicompost alone, emphasizing on the essentiality of balanced fertilization to obtain higher pearlmillet productivity. As K play a number of indispensable roles in a wide range of function. Increasing fertility levels increased the yield of pearlmillet in different combination of NPK + vermicompost.The result obtained in present study are in conformity with those of Kavimani *et al*[1]. and Sharma *et al*[3].

Test weight

It is an important yield attributing character which determines the grain size. It is inferred from the data given in table-1. that the different nutrients applied alone or with FYM

and V.C. were able to alter 1000 seed weight to some extent. A significant increase was noted in test weight under different treatments compared to two organic manure. It ranged from of 9.00 to 10.65 g under different treatments. Maximum test weight (10.65 g) was under T_9 treatment and was statistically at par with T_7 and T_8 treatments. Whereas minimum test weight (9.00 g) was in T_1 (100% FYM). Supplementing organic sources with increasing levels of NPK increased the weight in that order.It is evident from results that application of FYM (5 t /ha) and vermicompost with recommended dose of fertilizers produced significantly higher growth and yield attributing characters of pearl millet. Among different treatments, application of 100% NPK was found beneficial in terms of increase in growth and other related characters.

Length of ear head

Length of ear head ranged from 25.2 to 35.9 cm under different treatments. Maximum (35.9 cm) was recorded with T_9 (100% NPK) treatment, which is significantly higher over T_1, T_2, T_3 and T_5 treatments but statistically at par with T_4 and T_8 treatments, having length of ear head 30.1 & 32.3 cm respectively. Minimum length (25.2 cm) was under treatment T_1 (100% FYM) and was at par with T5.

Soil Properties

A perusal of data in table-1 showed that continuous use of chemical fertilizers and their combination with organics resulted in no changes in p H and EC of the soil.

Organic Carbon

The organic carbon of soil increased significantly with the application of FYM and vermicompost along with graded dose of fertilizers (table-1). The highest buil-up of OC in the soil was recorded in 100% NPK, which was at par with 25% vermicompost + 75% NPK and 75% vermicompost + 25% NPK. Thus, integrated application of organics with chemical fertilizers (vermicompost + NPK) resulted in significantly higher organic carbon content in soil. The increase in OC content in the manorial treatment combinations is attributed to direct addition of organic manure in the soil which stimulated the growth and activity of microorganisms and also due to better root growth, resulting in the higher production of biomass, crop stubbles and residues[3] (Moharana *et al.* 2012).The subsequent decomposition of these materials might have resulted in the enhanced carbon content of soil. These results are in agreement with the findings of Majumdar *et al*[2].

Available Copper

Available-Cu status in soil at harvest (Table 2) showed a significant trend due to different treatments, It varied from 0.258 – 0.456 mg kg^{-1} under different treatments. The highest status (0.456 mg kg^{-1}) of available - Cu observed under T_9 (100% NPK) was significant over rest of the treatments except T_6 and T_8.

Available Manganese

The data presented in Table 2 indicated that available - Mn ranged from 4.992 -9.430 mg /kg^{-1} under different treatments. The highest status (9.430 mg kg^{-1}) of available - Mn was observed under T_9 (100% NPK) which was very close to T_7 (75% VC + 25% NPK) and difference in values than T_1, T_2, T_4 and T_6 were worth recording.

Available Zinc

DTPA-extractable Zn was found in the range of 0.584 – 0.785 mg kg^{-1} under different treatments. The highest status (0.785 mg kg^{-1}) of available - Zn was observed under T_9 (100% NPK) and lowest (0.584 mg/kg) in T_1 which organic sources (FYM) of nutrient was added. In remaining treatments the DTPA extractable Zn was more or less similar in quantity.

It is clear from results that the amounts of different micronutrients in soil declined in FYM/vermicompost treated plots. Whereas their depletion from initial status was seen in plots wherein only organic sources of nutrient were incorporated. It is thus evident that under higher level of production organic

sources of nutrients is not sufficiently meeting one the requirement of crop such as pearl millet.

Available Iron

DTPA-extractable Fe was in the range of 2.77 – 8.06 mg kg^{-1} under different treatments. The highest conc. (8.06 mg kg^{-1}) of available – Fe noted under T_9(100% NPK) was statistically at par with T_8 (25% V.C + 75% NPK). Extractable Fe below critical limit was recorded under T_1, T_2, T_3 and T_5 the data pointed out that organic sources are not contributing iron to the desirable level. It is interesting to note that T_9(100%NPK) contributed Fe in the soil which may be ascribed to the contribution from root biomass and residues of crop left after harvesting of the previous crop.

Table 1: Effect of integrated application of inorganic and organic sources on soil properties, test weight and length of ear head

Treatments	pH (1:2)	EC (d Sm^{-1})	OC (g kg^{-1})	Test weight (g)	Length of ear head (cm)
100% FYM	7.4	0.42	4.24	9	25.2
50% FYM + 50% NPK	7.7	0.42	4.36	9.42	27.8
75% FYM +25% NPK	7.7	0.43	4.49	9.36	27.3
25% FYM + 75% NPK	7.5	0.44	4.46	9.93	30
100% Vermicompost	7.7	0.42	4.34	9.56	26.7
50% Vermi +50% NPK	7.6	0.45	4.5	9.98	29.4
75% Vermi + 25% NPK	7.6	0.45	4.5	10.21	28.5
25% Vermi + 75% NPK	7.4	0.46	4.59	10.32	32.4
100% NPK	7.4	0.46	4.61	10.65	35.9
CD (P=0.05)	NS	NS	0.17	0.44	1.62

Table 2: Influence of application of inorganic and organic sources on yield and total nutrient uptake (grain + straw) of pearl millet crop

Treatments	Grain Yield (kg ha^{-1})	Straw Yield (kg ha^{-1})	Available micronutrient (mg kg^{-1})			
			Cu	Fe	Mn	Zn
100% FYM	3170.66	9723	0.258	2.777	4.992	0.584
50% FYM +50% NPK	3549.3	12038	0.256	3.654	6.970	0.635
75% FYM + 25% NPK	3468.23	12038	0.260	4.428	7.713	0.646
25%FYM + 75% NPK	3693.43	12346	0.297	5.086	6.660	0.696
100% Vermicompost	3044.73	11575	0.302	4.534	8.334	0.669
50% Vermicompost + 50% NPK	4192.46	11266	0.392	5.870	6.966	0.701
75% Vermicompost + 25% NPK	3450.16	10957	0.310	6.368	8.989	0.603
25% Vermicompost + 75% NPK	3774.46	12964	0.425	7.430	7.243	0.767
100% NPK	3891.6	14507	0.456	8.063	9.430	0.785
CD (P=0.05)	646.27	1814.04	0.083	1.36	NS	NS

REFERENCES

1. Kavimani, R., Annadurai, K., Vijayabaskaran, S. and Rangaraju, G., The effect of farmyard manure and nitrogen on growth and yield of pearlmillet under rainfed Alfisol. *Madras Agril. J.*, **87(10-12):** 713-714 (2000).
2. Majumdar, B., Mandal, B., Bandyopadhyay, P.K., Gangopadhyay, A. and Mani, P.K., Organic amendments influence soil organic carbon pools and rice-wheat productivity. *Soil Science Society of America journal*, **72**: 775-785 (2008).
3. Moharana, P.C., Sharma, B.M., Biswas, D.R., Dwivedi, B.S. and Singh, R.V., Long-term effect of nutrient management on soil fertility and soil organic carbon pools under a 6-year-old pearl millet-wheat cropping system in an Incetisol of subtropical India. *Field Crops Research*, **136:** 32-41 (2012).