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Response of Organic Manure, Zinc and Iron on Soil Properties, Yield and Nutrient Uptake by Pearlmillet Crop Grown in Inceptisol

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ABSTRACT

An investigation on "Response of organic manure, zinc and iron on nutrient uptake by pearlmillet crop grown in Inceptisol" under adoptic and climatic conditions of Northern part of Madhya Pradesh was carried out during Kharif season 2014 at the Research Farm, College of Agriculture, R.V.S.K.V.V., Gwalior (M.P.). The experiment was laid out in randomzied block design (R.B.D.) replicated three times with 12 treatments. Pearlmillet variety "Kaveri super boss" was grown by adopting recommended package of practices. Plant nutrients applied through inorganic fertilizer or in combinations with organic manures did not show any significant effect on pH and EC in different treatments. Organic carbon content was influence significantly due to application of NPK+5 tonnes Vermi-compost (T_3) compared to rest of the treatments. Maximum grain yield (3500.00kg/ha) was observed in T_3 (NPK+5 tonnes Vermi-compost) followed by treatment T_2 (3375.00kg/ha) as well as treatment T_{11}. Similar trend was observed in the stover yield of pearlmillet crop. Application of T_3 (NPK+5 tonnes Vermi-compost) recorded highest total nitrogen, phosphorus and potassium uptake 119.34, 28.26, 146.35 kg/ha respectively followed by T_2 (NPK+5 tonnes FYM). Maximum zinc uptake was recorded with application of treatment T_{11} (NPK +0.5 % $ZnSO_4$ + 0.5% $FeSO_4$ spray at 35 and 55 DAS), followed by T_6 and both were superior over rest of the treatments. Maximum total iron uptake (430.67 g/ha) was recorded with application of treatment T_3 (NPK+5 tonnes Vermi-compost), followed by T_{11} (429.52 g/ha) and both were superior over rest of the treatments.

Key words: *Vermi-compost, NPK, Kharif, Plant nutrients*

INTRODUCTION

Pearl millet (*Pennisetum glaucum* (L.) R. Br.), the world's hardiest warm season cereal crop[17].Globally it ranks sixth after rice, wheat, maize, barley and sorghum in terms of area[8] and share 42% of total world production[16]. Pearl millet (*Pennisetum glaucum* [L.] R. Br.) is an indispensable arid and semi arid crop of India[16] cultivated as dual purpose (food and feed) crop in over 8.3 m ha ranking fourth among total cereals[35].

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Pearl millet is the richest sources of nutrition, especially iron, calcium and zinc among cereals and hence can provide all the nutrients at the least cost compared to wheat and rice[15]. Pearlmillet is a common crop grown in *Kharif* by marginal and small farmers in alluvial soil region of northern Madhya Pradesh under Pearlmillet - mustard and Pearlmillet - 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 micronutrients. The micronutrient deficiencies which were sparse and sporadic initially are now widespread because the ability of the plants to enhance yield is dependent on the availability of adequate and balanced quantity of plant nutrients because cultivation of high yielding varieties of crop coupled with intensive cropping system has depleted the soil fertility, resulting in multi-nutrient deficiencies in soil-plant system. Fundamental importance of soil organic matter in maintaining soil fertility. It is a store house of essential plant nutrients, affects soil physical, chemical and biological properties; provides energy material for the soil organisms; and plays a vital role for sustainable crop productivity. It also acts as a sink for green house gases between land surface and the atmosphere[27]. Organic manures, particularly FYM and Vermi-compost not only supply macronutrients but also meet the requirement of micronutrients besides improving soil health. Organic manure influence both yield and plant micronutrients need and thus help to sustain crop productivity[11]. Organic manure and fertilizers changes the chemical, physical and biological properties of the soil which in terms affect the availability of plant nutrients especially the secondary and micronutrient required by growing plants in minute quantities. Indiscriminate use of high analysis chemical fertilizers results in the deficiency of secondary and micronutrient in soil[22]. The word "micronutrients" represents some essential nutrients that are required in very small quantities for the growth of plants and microorganisms, micronutrients also called as trace elements: are zinc (Zn), copper (Cu), iron(Fe), manganese (Mn), boron (B), molybdenum (Mo), chlorine (Cl) and nickel (Ni), the importance of micronutrients has been realized during the past four decades when wide spread micronutrient deficiencies particularly that of Zn were observed in most of the soils in our country, where intensive agriculture is practiced. Micronutrients are not only important for better crop productivity, but also essential for sustaining human and animal health. The world health organization estimates that globally approximately two billion people are affected by iron deficiency[33]. Also zinc deficiency is increasingly recognized as an important public health problem. Increased use of high analysis fertilizers for enhancing food grain production has resulted in the deficiencies of micronutrients due to their continued removal from soil. A sharp decline in availability of these nutrients with continuous cropping at recommended dose of NPK application has been wildly reported in Indian soils[24,25]. Keeping these views in mind, an experiment was conducted to find out the effect of organic manure, zinc and iron on soil properties, yield and nutrient uptake by pearlmillet crop grown in inceptisol.

MATERIALS AND METHODS

The experiment was carried out in research farm of the Department of Soil Science and Agricultural Chemistry, College of Agriculture, R.V.S.K.V.V., Gwalior, situated in Gird zone at the latitude of 26^0 13'N and longitude 76^0 10'E with an altitude of 197 meters from mean sea level (MSL). The climate of experimental site is semi-arid and sub-tropical dominated with extreme weather conditions having hot and dry summer and cold winter, where maximum temperature goes up to 45 ^{0}C during summer and steeps down to a chilling temperature of as low as 1-2^{0}C during winter. The monsoon sets in during last week of June. Most of which falls during last June to middle of September with mean annual rainfall of area is about 751 mm. Winter rains

are occasional and uncertain. The soil samples were collected from the experimental plot and prepared a mixed soil samples then air-dried and sieved through a 2 mm sieve. The soil of the experimental site was sandy clay loam 55.6, 23.8, 20.6% sand, silt, clay respectively, organic carbon 0.41%, soil pH and EC 7.7 and 0.37dS/m, respectively. The pearl millet cultivar 'Kaveri Super Boss' was sown with 40 cm of row spacing. The experiment was designed as randomized block design with three replications. The 100 kg N, 60 kg P_2O_5 and 40 kg K_2O /hectare was optimum dose (100%) for pearl millet. Half dose of the N in the form of urea was applied as basal and remaining quantity of nitrogen was top dressed before first irrigation. The complete doses of P and K were applied as super phosphate and muriate of potash at the time of sowing. As per treatment FYM and Vermi-compost were added @ 5 tonnes /ha before sowing of pearl millet. Micronutrients (i.e., Zn and Fe) were applied in the form of zinc sulphate @ 25 kg/ha (soil application) and 0.5 % (folier spray), $FeSO_4$ @ 40 kg/ha (soil application) and 1% (folier spray), respectively. Grain and straw yields were recorded after harvest of crop.The grain and straw samples were digested in H2SO4 for determination of N and di-acid mixture of HNO3 and HClO4 (2:5) for P and K estimation. Plant uptake of N, P, K, Zn and Fe were computed by multiplying the yield with the respective nutrient content. After harvest of the crop, the composite surface (0-15 cm) soil samples from each plot of the experimental field were analyzed for pH, EC, OC by following standard procedures[3].

RESULTS AND DISCUSSION

Soil Properties

pH

A perusal of data in Table-1 showed that the plant nutrient applied through inorganic fertilizer or in combinations with organic manures did not show any significant effect on pH in different treatments

EC

The data on electrical conductivity (Table-1) in various treatments was more or less the same in different treatments and it was observed in the range of 0.34 – 0.40 dS/m. All treatments did not show any significant effect on soil EC. The result also confirms the findings of Pareta *et al*.[13].

Organic carbon

Organic carbon content ranged between 0.37 to 0.48 % (Table-1). Organic carbon content showed not significant increase with most of the treatments over NPK (100:60:40) (T_1) except treatments T_3 and T_2.Maximum organic carbon content (0.48%) obtained with application of NPK+5 tonnes Vermi-compost (T_3) followed by 0.44% with T_2 (NPK+5 tonnes FYM) and minimum with NPK (120:80:40) (T_1). Organic carbon content was influenced significantly due to application of NPK+5 tonnes Vermi-compost (T_3) compared to rest of the treatments. The relative influence in organic carbon content of the soil due to VC and FYM application, which may be attributed largely by addition of organic matter. Similar results were also reported by Tolanur and Badanur[29].

Grain and Straw Yields

Grain and stover yield as influenced by different treatments is presented in Table-1. Pearlmillet grain yield significantly increased with application of chemical fertilizers in combination with organic manures (FYM and VC) as well as micronutrients (Zn and Fe) compared to chemical fertilizers (NPK (100:60:40)) (T_1). Maximum grain and stover yield (3500.00 kg/ha and 7700.00 kg/ha) was observed in T_3 (NPK+5 tonnes Vermi-compost) followed by treatment T_2 (3375.00 kg/ha and 7425.00 kg/ha) as well as treatment T_{11} (3312.50 kg/hand 7287.50 kg/ha) and minimum (2833.33 kg/ha and 6233.33 kg/ha) with treatment T_1 (NPK (100:60:40)). The results are in agreement with the findings of Sharma and Abraham[26] and Faujdar and Sharma[5]. The efficacy of organic fertilizer is much pronounced when it is combined with organic manures (FYM and vermicompost). The increased vegetative growth and the balanced C:N ratio might have increased the synthesis of carbohydrates, which ultimately promoted yield. The present trend of increase

in yield is in close conformity with the findings of Satyajeet and Nanwal[21] and Parihar *et al.*[12]. During initial growth stages of crop, requirement of N is fulfilled by inorganic form of N applied through urea and in the later stages of crop growth, all the plant nutrients are released from FYM which have significantly influenced positively on yield and supplied plant nutrients throughout the period of crop growth. A positive effect of FYM on pearl millet yield had also been reported by Singh *et al.*[20] and Agarwal and Kumar[1]. Increase in seed and stover yield might be due to addition of FYM resulted in stimulation of the enzyme activity which promotes the recycling of nutrients in the soil ecosystem[19].

Nutrient content in grain

Data on nitrogen content in grain of pearlmillet crop presented in Table-2 showed that nitrogen content was found in range of 1.60 to 1.80 per cent in different treatments. Maximum nitrogen (1.80%) content was recorded with treatment T_3 (NPK+5 tonnes Vermi-compost) and minimum (1.60%) with treatment T_{10} (NPK+0.5 % $ZnSO_4$ + 0.5% $FeSO_4$ spray at 35 DAS). It is clearly evident that application of T_3 (NPK+5 tonnes Vermi-compost) significantly increased nitrogen content in grain over all treatments.

Phosphorus content in grains ranged from 0.35 to 0.43 percent in different treatments. Maximum phosphorus content in grain (0.43%) was recorded with T_3 (NPK+5 tonnes Vermi-compost) followed by T_2 (NPK+5 tonnes FYM). Phosphorus content in grain was highly significant with T_3 (NPK+5 tonnes Vermi-compost) over all treatments.

Potassium content increased due to application of chemical fertilizers in combination with organic manures (FYM and VC) as well as micronutrients (Zn and Fe) as compare to chemical fertilizers alone T_1 (NPK (100:60:40)). Maximum potassium content in grain (0.79 per cent) was significantly superior in T_3 (NPK+5 tonnes Vermi-compost) compared to other treatments, followed by treatment T_2. It is clearly evident that application of T_3 (NPK+5 tonnes Vermi-compost) significantly increased nitrogen content in grain as well as stover over all treatments. The results of present experiment confirmed the finding of Singh *et al.*[23].

Zinc content in grain of pearlmillet varied from 14.33 to 19.33 mg/kg (Table-2). Highest zinc content (19.33 mg/kg) was found with treatment T_{11} (NPK +0.5 % $ZnSO_4$ + 0.5% $FeSO_4$ spray at 35 and 55 DAS) while as treatment T_1 (NPK (100:60:40)) recorded minimum zinc content (14.33 mg/kg). Zinc content significantly increased with application of NPK +0.5 % $ZnSO_4$ + 0.5% $FeSO_4$ spray at 35 and 55 DAS (T_{11}) followed by NPK+0.5 % $ZnSO_4$ spray at 35 and 55 DAS (T_6) over to all other treatments. Similar finding are reported by Majumdar *et al.*[9] and Singh *et al.*[23].

Iron content in grain presented in Table-2 showed that iron content ranged from 50.83 to 55.67 ppm in different treatments. Maximum iron content (55.67 ppm) was recorded in T_9 (NPK+1 % $FeSO_4$ spray at 35 and 55 DAS) followed by treatment T_{11} (54.50 mg/kg). Minimum iron content (50.83 mg/kg) was recorded in treatment T_1 (NPK (100:60:40)). It is clearly evident that application of T_9 (NPK+1 % $FeSO_4$ spray at 35 and 55 DAS) significantly increased iron content in grain over all treatments.

Nutrient content in stover

Data on NPK content in pearlmillet stover (Table-3) revealed that Treatment T_3 (NPK+5 tonnes Vermi-compost) significantly increased NPK content in stover 0.73%,0.17% and 1.54% respectively and followed by treatment T_2 (0.69%, 0.14%,1.50% respectively and both were significantly superior over rest of the treatments. The results of present experiment confirmed the finding of Singh *et al.*[23].

Data on table-3 revealed that Zinc content increased in stover with application of chemical fertilizers in combination with organic manures (FYM and VC) as well as micronutrients (Zn and Fe) as compare to alone application of chemical fertilizers (NPK (100:60:40)) (T_1). Zinc content in stover varied from 7.33 (T_1) to 12.00 mg/kg (T_{11}). Zinc content significantly increased with application of NPK +0.5 % $ZnSO_4$ + 0.5%

$FeSO_4$ spray at 35 and 55 DAS (T_{11}) followed by T_6 (NPK+0.5 % $ZnSO_4$ spray at 35 and 55 DAS) over rest of the treatments. Table-3 revealed that iron content in stover ranged from 30.17 mg/kg (T_1) to 35.50 mg/kg (T_9) in different treatments. It is clearly evident that iron content in (T_9) followed by treatment NPK +0.5 % $ZnSO_4$ + 0.5% $FeSO_4$ spray at 35 and 55 DAS (T_{11}) over rest of the treatments. These result corroborate the finding of Dhaliwal *et al.*[2] and Yadav *et al.*[34] .The findings confirm the results of Zeidan *et al.*[36].

Nutrient uptake by pearlmillet crop

Data on total nitrogen uptake by pearlmillet crop (grain + stover) are presented in Table -4. Nitrogen uptake by pearlmillet crop was increased in all treatments as compared to treatment NPK (100:60:40) (T_1). In all treatments the total nitrogen uptake was found in range of 87.36 (T_1) to 119.34 kg/ha (T_3). Application of T_3 (NPK+5 tonnes Vermi-compost) recorded highest total nitrogen uptake (119.34 kg/ha), followed by T_2 (NPK+5 tonnes FYM) (109.75 kg/ha). The higher nutrient uptake with organic manures might be attributed to solubilization of native nutrients, chelation of complex intermediate organic molecules produced during decomposition of added organic manures, their mobilization and accumulation of different nutrients in different plant parts. The results are in agreement with the findings of Verma *et al.*[31] and Singh *et al.*[23].It can be explained on the basis of that application of fertilizer along with micronutrients improved initial process of plant growth of such as consequent to increase in the number and size of growing cell of root etc, enabling the plant to have healthy root system that helped in better absorption of nutrients and moisture from soil. Similar positive influence of nutrients on uptake has also been reported by Gupta *et al.*[6] and Prasad *et al.*[14].

Phosphorus uptake by pearlmillet crop was found in the range of 16.12 (T_1) to 28.26 kg/ha (T_3) in different treatments. Application of T_3 (NPK+5 tonnes Vermi-compost) recorded significantly highest total phosphorus uptake by pearlmillet crop, followed by treatment T_2 (NPK+5 tonnes FYM) and both were superior over rest of the treatments. The solubilizing action of organic acids produced during decomposition of organic manures might have increased the release of native P, stimulated microbial growth in the soil, and favored root growth which had finally led to increased P uptake by pearlmillet. The increase in available P is due to the addition of P through manure/fertilizer in excess of removal by the crop. Similar finding are reported by Majumdar *et al*[9] and Singh *et al.*[23].

Total potassium uptake by pearlmillet crop increased in all treatments as compared to treatment T_1 (NPK (100:60:40)). It varied from 111.24 to 146.35 kg/ha in different treatments. Maximum total potassium uptake (146.36 kg/ha) recorded with the application of T_3 (NPK+5 tonnes Vermi-compost), followed by T_2 (25.31 kg/ha) and both were superior over rest of the treatments. The minimum total potassium uptake by pearlmillet crop (111.24 kg/ha) was recorded with application of T_1 (NPK (100:60:40). The results are in agreement with the findings of Majumdar *et al.*[9] and Singh *et al.*[23].

The increase in NPK uptake by pearl millet with integrated application of nutrients may be due to improvement of the soil environment which encouraged proliferation of roots resulting in more absorption of water and nutrient from larger area and depth. This might be due to improved nutritional environment in the rhizosphere as well as its utilization in the plant system leading to enhanced translocation of nutrients towards reproductive structures *viz.,* ear heads, seeds and other plant parts. These results gain support from Meena and Gautam[10].

Moreover organic manures after decomposition released nutrient which became available to the plants and thus increased NPK concentration. The higher nutrient uptake with organic manure might be attributed to solubilization of native nutrients, chelation of complex intermediate organic molecules produced during decomposition of added organic manure their mobilization and accumulation of different nutrients in different plant part[30,32] swarnima.

Total zinc uptake by pearlmillet crop (grain + stover) as influenced by different treatments given in Table-4 revealed that all

treatments increased total zinc uptake by pearlmillet crop as compared to only chemical fertilizers treatment T_1 (NPK (100:60:40)). Maximum zinc uptake (151.49 g/ha) was recorded with application of treatment T_{11} (NPK +0.5 % $ZnSO_4$ + 0.5% $FeSO_4$ spray at 35 and 55 DAS), followed by T_6 N P K + 0.5 % $ZnSO_4$ spray at 35 & 55 DAS (132.85 g/ha) and both were superior over rest of the treatments. Dwivedi and Tiwari[4] reported that Zinc concentrations and uptake in grain and straw increased with the zinc rate particularly in soil with below 0.60 ppm DTPA- Zn. Similar findings were also reported by Shaheens *et al*.[28]. Similar findings were also reported by Kumar *et al.*[7] and Yadav *et al*.[34].Total iron uptake by pearlmillet crop (grain + stover) as influenced by different treatments given in Table-4, revealed that all treatments increased total iron uptake by pearlmillet crop as compared to only chemical fertilizers treatment T_1 (NPK (100:60:40)). Maximum total iron uptake (430.67 g/ha) was recorded with application of treatment T_3 (NPK+5 tonnes Vermi-compost), followed by T_{11} (429.52 g/ha) and both were superior over rest of the treatments. These findings are in close agreement with Kumar *et al*[7].

It may be concluded from the present study that the application of NPK+5 tonnes Vermi-compos t(T_3), followed by treatment NPK+5 tonnes FYM (T_2) sustained higher productivity and uptake of nutrients by the crop and not only restored the original fertility status of soil under zinc and iron deficient soils of Madhya Pradesh, but also increased their status at harvest which may be beneficial to the next crop.

Table 1: Effect of different treatments on soil pH, electrical conductivity (EC) and organic carbon (%)

Symbols	Treatments	pH	EC (dS/m)	Organic carbon (%)
T_1	NPK (100:60:40)	7.7	0.34	0.40
T_2	NPK+5 tonnes FYM	7.8	0.39	0.44
T_3	NPK+5 tonnes Vermi-compost	7.9	0.40	0.48
T_4	NPK+25 kg $ZnSO_4$/ha	7.6	0.37	0.39
T_5	NPK+0.5 % $ZnSO_4$ spray at 35 DAS	7.8	0.34	0.38
T_6	NPK+0.5 % $ZnSO_4$ spray at 35 and 55 DAS	7.7	0.35	0.37
T_7	NPK+40 kg $FeSO_4$/ha	7.6	0.37	0.39
T_8	NPK+1 % $FeSO_4$ spray at 35 DAS	7.8	0.35	0.37
T_9	NPK+1 % $FeSO_4$ spray at 35 and 55 DAS	7.7	0.36	0.38
T_{10}	NPK+0.5 % $ZnSO_4$ + 0.5% $FeSO_4$ spray at 35 DAS	7.6	0.36	0.39
T_{11}	NPK +0.5 % $ZnSO_4$ + 0.5% $FeSO_4$ spray at 35 and 55 DAS	7.7	0.37	0.37
T_{12}	NPK+25 kg $ZnSO_4$/ha + 40 kg $FeSO_4$/ha	7.6	0.38	0.39
	SEm ±	**0.11**	**0.03**	**0.01**
	CD at 5%	**NS**	**NS**	**0.03**

Table 2: Effect of different treatments on grain yield, stover yield and nutrient uptake of pearlmillet crop

Treatments	Grain yield (kg/ha)	Stover yield (kg/ha)	Nitrogen uptake (kg/ha)	Phosphorus uptake (kg/ha)	Potassium uptake (kg/ha)	Zinc uptake (g/ha)	Iron uptake (g/ha)
NPK (100:60:40)	2833.33	6233.33	87.36	16.12	111.24	86.27	332.12
NPK+5 tonnes FYM	3375.00	7425.00	109.75	23.79	136.68	123.28	413.56
NPK+5 tonnes Vermi-compost	3500.00	7700.00	119.34	28.26	146.35	128.47	430.67
NPK+25 kg $ZnSO_4$/ha	3000.00	6600.00	90.79	17.54	116.82	112.84	356.41
NPK+0.5 % $ZnSO_4$ spray at 35 and 55 DAS	2958.33	6508.33	90.27	17.05	115.17	116.57	349.88
NPK+0.5 % $ZnSO_4$ spray at 35 and 55 DAS	3041.67	6691.67	90.87	17.41	117.46	132.85	358.11
NPK+40 kg $FeSO_4$/ha	3020.83	6645.83	91.23	17.18	117.23	97.98	384.66
NPK+1 % $FeSO_4$ spray at 35 DAS	2979.17	6554.17	90.00	16.64	114.88	96.13	382.06
NPK+1 % $FeSO_4$ spray at 35 and 55 DAS	3062.50	6737.50	91.88	17.45	118.11	96.03	409.61
NPK+0.5 % $ZnSO_4$ + 0.5% $FeSO_4$ spray at 35 DAS	3208.33	7058.33	95.43	18.50	124.49	126.98	396.58
NPK +0.5 % $ZnSO_4$ + 0.5% $FeSO_4$ spray at 35 and 55 DAS	3312.50	7287.50	101.05	19.92	128.13	151.49	429.52
NPK+25 kg $ZnSO_4$/ha + 40 kg $FeSO_4$/ha	3187.50	7012.50	96.22	18.17	125.23	122.80	410.38
SEm ±	**37.38**	**82.24**	**1.43**	**0.51**	**1.64**	**3.05**	**4.99**
CD at 5%	**110.28**	**242.62**	**4.22**	**1.50**	**4.84**	**9.00**	**14.72**

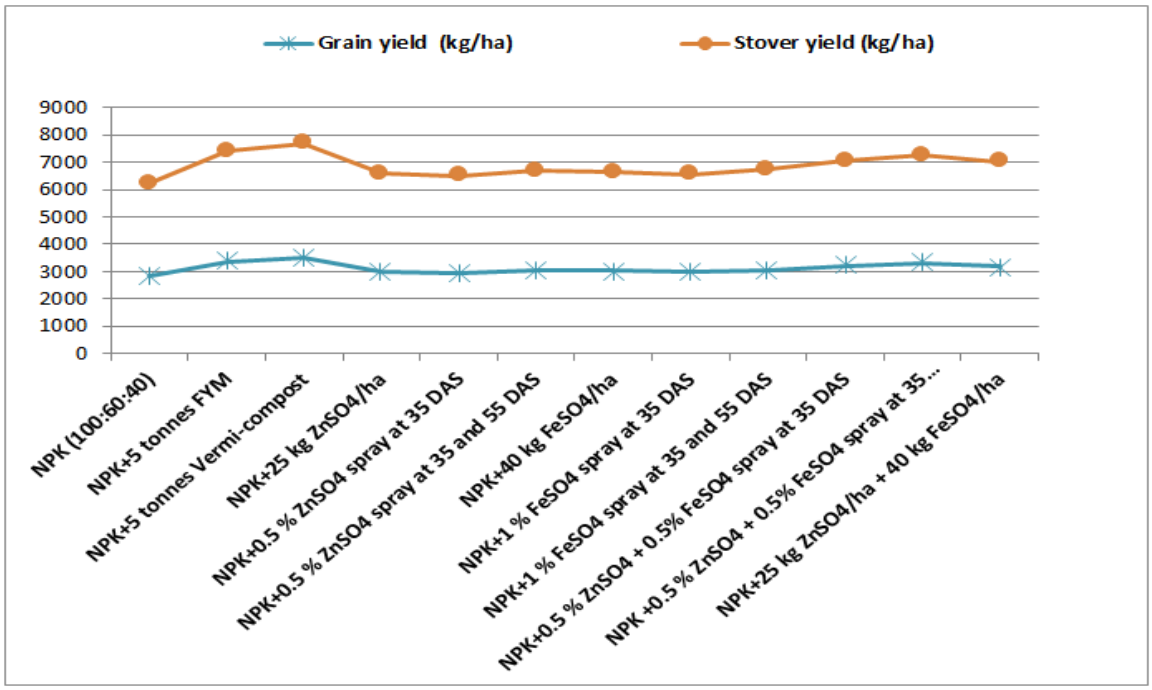
Table 3: Effect of different treatments on N, P, K, Zn and Fe content in grain of pearlmillet crop

Treatments	Nutrient content in grains				
	N (%)	P (%)	K (%)	Zn (mg/kg)	Fe (mg/kg)
NPK (100:60:40)	1.65	0.36	0.71	14.33	50.83
NPK+5 tonnes FYM	1.73	0.4	0.75	16	52.5
NPK+5 tonnes Vermi-compost	1.8	0.43	0.79	16.17	52.67
NPK+25 kg $ZnSO_4$/ha	1.63	0.35	0.69	16.33	51.33
NPK+0.5 % $ZnSO_4$ spray at 35 DAS	1.64	0.36	0.7	16.67	51.17
NPK+0.5 % $ZnSO_4$ spray at 35 and 55 DAS	1.62	0.36	0.69	18	51
NPK+40 kg $FeSO_4$/ha	1.63	0.36	0.68	14.83	54
NPK+1 % $FeSO_4$ spray at 35 DAS	1.62	0.35	0.71	14.67	54.17
NPK+1 % $FeSO_4$ spray at 35 and 55 DAS	1.61	0.35	0.7	14.5	55.67
NPK+0.5 % $ZnSO_4$ + 0.5% $FeSO_4$ spray at 35 DAS	1.6	0.36	0.69	16.83	52.83
NPK +0.5 % $ZnSO_4$ + 0.5% $FeSO_4$ spray at 35 and 55 DAS	1.65	0.37	0.7	19.33	54.5
NPK+25 kg $ZnSO_4$/ha + 40 kg $FeSO_4$/ha	1.64	0.35	0.71	16.5	54.33
SEm ±	**0.02**	**0.01**	**0.01**	**0.35**	**0.36**
CD at 5%	**0.05**	**0.02**	**0.03**	**1.02**	**1.07**

Table 4: Effect of different treatments on N, P, K, Zn and Fe content in stover of pearlmillet crop

Treatments	Nutrient content in stover				
	N (%)	P (%)	K (%)	Zn (mg/kg)	Fe (mg/kg)
NPK (100:60:40)	0.65	0.09	1.46	7.33	30.17
NPK+5 tonnes FYM	0.69	0.14	1.5	9.33	31.83
NPK+5 tonnes Vermi-compost	0.73	0.17	1.54	9.33	32
NPK+25 kg $ZnSO_4$/ha	0.63	0.11	1.46	9.67	30.67
NPK+0.5 % $ZnSO_4$ spray at 35 DAS	0.64	0.1	1.45	10.33	30.5
NPK+0.5 % $ZnSO_4$ spray at 35 and 55 DAS	0.62	0.1	1.44	11.67	30.33
NPK+40 kg $FeSO_4$/ha	0.63	0.09	1.45	8	33.33
NPK+1 % $FeSO_4$ spray at 35 DAS	0.64	0.09	1.43	8	33.67
NPK+1 % $FeSO_4$ spray at 35 and 55 DAS	0.63	0.1	1.43	7.67	35.5
NPK+0.5 % $ZnSO_4$ + 0.5% $FeSO_4$ spray at 35 DAS	0.62	0.1	1.45	10.33	32.17
NPK +0.5 % $ZnSO_4$ + 0.5% $FeSO_4$ spray at 35 and 55 DAS	0.64	0.11	1.44	12	34.17
NPK+25 kg $ZnSO_4$/ha + 40 kg $FeSO_4$/ha	0.63	0.1	1.46	10	33.83
SEm ±	**0.01**	**0.01**	**0.01**	**0.36**	**0.35**
CD at 5%	**0.03**	**0.02**	**0.03**	**1.05**	**1.04**

Fig. 1: Effect of different treatments on grain yield and stover yield of pearlmillet crop



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