



EFFECT OF SOIL CONDITIONERS AND DIFFERENT DOSES OF N.P.K. ON WHEAT UNDER MAIZE–WHEAT CROPPING SYSTEMS

Subash Chand*

Department of Agronomy, B.R.D.P.G.College, Deoria, D.D.U.Gorakhpur University, Gorakhpur-274001

*Corresponding author email: subashc7@gmail.com

ABSTRACT

Wheat is a universal crop at global level. Maize -wheat cropping system is an important system being followed in whole in Uttar Pradesh particularly in central and south western parts. Soil conditioners play a vital role in maintaining the soil fertility, in cereals productivity and long term sustainability. Keeping this thing in view an experiment was conducted during 2012-2013 and 2013-2014 at research farm of Baba Raghav Das Post Graduate College Deoria (U.P.). The main object of the experiment was to know the effect of soil conditioners with different doses of NPK on wheat under maize-wheat cropping system. The result of experiment showed yield attributes, yield, gross return, net return and C: B ratio of wheat was significantly higher in FYM with $N_{120}P_{60}K_{40}$ over gypsum and control treatments. Wheat produced maximum of 48.45 qha^{-1} grain yield with FYM, which were 7.40 and 11.48% higher than gypsum and control, respectively. In case of NPK doses, $N_{120}P_{60}K_{40}$ produced 48.23 qha^{-1} grain yield of wheat, which was 15.25 and 12.13% higher than $N_{90}P_{45}K_{30}$ and $N_{60}P_{30}K_{20}$, respectively. Soil conditioners FYM and gypsum improved the condition of post harvest soil. The combination of FYM + $N_{120}P_{60}K_{40}$ has given maximum combination wheat yield under maize-wheat system.

KEY WORDS: Cropping system, Maize, NPK, Soil conditioners and Wheat.

INTRODUCTION

Among food grains, Wheat and maize are of almost importance. The demand of maize and wheat in India is expected to touch 42 and 112 Million tons by 2025. In India wheat is grown on an area of 29.70 mha and produces 72.50 million tons annually with productivity of 31.18 qha^{-1} . In case of maize it is occupied 8.71 million hectares area and produces 22.23 million tons annually with productivity of 25.52 qha^{-1} (GOI -2013). Maize and wheat behaves as exhaustive nature, resulting reduces the soil fertility and productivity under maize-wheat cropping system. Soil conditioners will have significant effect on soil fertility and productivity under maize-wheat cropping system (Sushila and Giri, 2001). It plays vital role in improve the soil properties, nutrients uptake, resulting in creased the productivity of maize and wheat under maize-wheat cropping system.

MATERIALS & METHODS

The experiments were conducted at Agronomy research farm, Baba Raghav Das Post Graduate College, Deoria (U.P) during two consecutive years of 2012-13 and 2013-14. Treatment consisting three soil conditioners (Control, FYM@ 5 tha^{-1} and Gypsum @ 1 tha^{-1}) and three fertilizer doses ($N_{120}P_{60}K_{40}$, $N_{90}P_{45}K_{30}$ and $N_{60}P_{30}K_{20}$). Thus, 9 treatment combinations were laid out in Randomized Block Design with thrice replicated. The statistical comparisons among treatment were worked out as standard error (SEM \pm) and critical difference (C.D) at 0.05 level of response (R.S. Chandel, 1998).The soil of experimental field was sandy loam in texture with pH 7.2, medium organic carbon (0.45%), Phosphorus (19 kgha^{-1}), Potassium (165 kgha^{-1}) and low in available nitrogen

(215 kgha^{-1}). The selected cultivars “Azad Uttam” of maize and PBW-343 of wheat were used in experiment. All cultivation practices were followed as per standard recommendation for each crop in both years. Observations on yield attributes, grain yield and byproduct were recorded at harvest or after harvest of crops. Economics of treatments were computed prevailing market price of products, while discussion of results done on pooled data basis of both years.

RESULTS & DISCUSSION

Effect of soil conditioners on wheat under maize-wheat cropping system:

Effect of soil conditioners on yield attributes are presented in Table -1 on pooled data base of two years. All yield attributes were recorded significantly higher in FYM followed by gypsum and control. It might be due to improved soil properties by application of FYM and gypsum. Number of spike $^{-1} \text{ m}^2$ and number of spikelet plant $^{-1}$ were recorded 419.3 and 18.45 under FYM followed by gypsum (393.2 and 17.83) with lowest value 370.7 and 17.20 under control. Grain weight spike $^{-1}$ under FYM was maximum of 1.84g which was 4.54 and 10.17% higher than gypsum and control, respectively. FYM produced maximum of 48.45 qha^{-1} grain yield which was 7.40% and 11.48% higher over gypsum and control treatments. Higher yield may be supported by high yield attributes. Same result is reported by Kumar and Puri (2001) and Chand *et al.* (2016). The data presented in (Table-2) indicated that FYM get significantly maximum and control treatment get minimum grain yield, gross income, net profit and C: B ratio. Grain yield (48.45 qha^{-1}), maximum gross income (Rs.36492 ha^{-1}), Net return (Rs.

16621 ha⁻¹ and C: B ratio (1.84) were recorded under FYM followed by gypsum (45.11qha⁻¹, Rs. 33825 ha⁻¹, Rs.15732 ha⁻¹ and 1.87), respectively and lowest value 43.46 qha⁻¹, Rs.32707 ha⁻¹ Rs.15024 ha⁻¹ and 1.85 under

control .The maximum net profit Rs.16621 ha⁻¹ which were Rs 889 and Rs.1597 ha⁻¹ higher than gypsum and control treatment.

TABLE-1: Yield attributes of maize and wheat under soil conditioners with fertilizer doses (Pooled data of two years).

Treatments	Maize			Wheat		
	No. of Cob plant ⁻¹	Cob Length (cm)	Grain weight plant ⁻¹ (g)	No. of spike ⁻¹ m ²	No. of spikelet plant ⁻¹	Grain weight spike ⁻¹ (g)
Soil conditioners						
Control (S ₁)	1.26	15.81	52.11	370.7	17.20	1.67
Gypsum (S ₂)	1.44	16.88	65.82	393.2	17.83	1.76
FY.M (S ₃)	1.60	17.92	76.43	419.3	18.45	1.84
SE (m±)	0.04	0.36	0.77	3.10	0.11	0.02
CD at 0.05%	0.08	0.78	1.55	6.20	0.22	0.05
Fertilizer levels						
N ₁₂₀ P ₆₀ K ₄₀	1.63	17.29	76.42	404.70	18.18	1.86
N ₉₀ P ₄₅ K ₃₀	1.41	17.04	63.92	395.30	17.91	1.77
N ₆₀ P ₃₀ K ₂₀	1.25	16.29	54.28	383.10	17.39	1.63
SE (m±)	0.06	0.40	0.80	3.40	0.13	0.03
CD at 0.05%	0.12	0.80	1.60	6.80	0.26	0.06

TABLE 2: Yield and economics of maize and wheat under soil conditioners with fertilizer doses (Pooled data of two years).

Treatments	Maize				Wheat			
	Grain yield qha ⁻¹	Gross income Rs ha ⁻¹	Net benefit Rs ha ⁻¹	C:B ratio	Grain yield qha ⁻¹	Gross income Rs ha ⁻¹	Net benefit Rs ha ⁻¹	C:B ratio
Soil conditioners								
S ₁ (Control)	30.44	18873	4273	1.29	43.46	32707	15024	1.85
S ₂ (Gypsum)	32.98	20316	5496	1.37	45.11	33825	15732	1.87
S ₃ (FYM)	36.81	22429	6071	1.37	48.45	36492	16621	1.84
SE (m±)	0.40	196	197	0.01	0.32	213	212	0.01
CD at 0.05%	0.80	395	395	0.02	0.64	428	424	0.02
Fertilizer levels								
N ₁₂₀ P ₆₀ K ₄₀	36.13	22131	6269	1.39	48.23	36076	16716	1.86
N ₉₀ P ₄₅ K ₃₀	33.42	20524	5238	1.34	45.82	34433	15843	1.85
N ₆₀ P ₃₀ K ₂₀	30.74	18964	4328	1.30	43.01	32516	14817	1.84
SE (m±)	0.45	200	201	0.01	0.36	214	211	0.01
CD at 0.05%	0.90	400	402	0.02	0.72	428	422	0.02

Effect of NPK doses on wheat under maize- wheat cropping system:

Effect of NPK doses on yield attributes represented in Table-1 on pooled data base of two years. All attributes were recorded significantly higher in N₁₂₀ P₆₀ K₄₀ dose followed by N₉₀ P₄₅ K₃₀ and N₆₀ P₃₀ K₂₀ doses, respectively. N₁₂₀ P₆₀ K₄₀ dose produced maximum of 1.86g grain spike⁻¹ which was higher 5.08 and 14.11 % than N₉₀ P₄₅ K₃₀ and N₆₀ P₃₀ K₂₀ doses, respectively. It might be increase availability of N, P and K in soil for crop uptake. The result may be supported by finding of Akbari *et al.* (1999). The data presented in Table-2 indicate that N₁₂₀ P₆₀ K₄₀ get significantly maximum and N₆₀ P₃₀ K₂₀ get minimum grain yield, gross income, net profit and C: B ratio. Grain yield (48.23qha⁻¹), gross income (Rs.36076ha⁻¹), net profit (Rs.16716 ha⁻¹) and C:B ratio (1.86) were recorded under N₁₂₀ P₆₀ K₄₀ followed by N₉₀ P₄₅ K₃₀ (45.82 qha⁻¹, Rs. 34433 ha⁻¹, Rs. 15843 ha⁻¹ and 1.85) and lowest (43.01qha⁻¹, Rs.32516 ha⁻¹, Rs.14817 ha⁻¹ and 1.84), respectively .These higher yield seem to be directly associated with yield attributes which also behaved in a similar manner. These results are agreements to Mishra *et al.* (1998). Maximum net profit Rs.16716 ha⁻¹

which was Rs.873 and 1899 ha⁻¹more than N₉₀ P₄₅ K₃₀ and N₆₀ P₃₀ K₂₀ doses, respectively. It may be supported by finding of Akbari *et al.* (1999).

CONCLUSION

All yield attributes were higher in FYM and N₁₂₀ P₆₀ K₄₀ followed by others. Grain yield of wheat 48.45 qha⁻¹ was higher by FY.M than gypsum 45.11 qha⁻¹and Control 43.46 qha⁻¹. Soil conditioners FYM and gypsum improved the condition of post harvest soil. The combination of FY.M + N₁₂₀ P₆₀ K₄₀ has given maximum wheat yield, net profit and C:B ratio under maize-wheat cropping system.

REFERENCES

Akbari, K.N., Karan, F and Pandya, H.R. (1999) Effect of micro-nutrients, sulphur and gypsum on yield of wheat and post harvest soil fertility on red loam soils of Newar. *Indian journal of Agriculture Research* 32 (2): 80-86.

Chand, S., Gaur, S.C. and Kumar, S. (2016) Response of soil conditioners and different doses of N.P.K. on maize under maize-wheat cropping systems. *Progressive Research* 11(8):5167-5169.

Chandel, R.S. (1998) Experimental Designs. *Hand Book of Agricultural Statistics*. Pp401-412.

Govt. of India (2013) Directorate of economics and statistics, ministry of Agriculture, Govt. of India Pp102.

Kumar, P And Puri, U.K (2001) Effect of nitrogen and farm yard manure application on maize varieties. *Indian journal of Agronomy* 46(2): 255-259.

Mishra, M., Patjoshi, A.K. and T. jena, D. (1998) Effect of bio-fertilization on production of maize. *Indian journal of Agronomy* 43(2): 307-310.

Sushila, R. and Giri, G. (2001) Influence of farm yard manure, nitrogen and bio-fertilizers on growth, yield attributes and yield of wheat under limited water supply. *Indian journal of Agronomy* 45(3) : 590-595.