

Impact of Fertilizer Doses with Soil Conditioners under Maize–Wheat Sequential Cropping

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Abstract

An experiments was carried out in tow consecutive year of Kharif and Rabi season of 2003-04 and 2004-05 at Agriculture Research Farm of Shri Durga Ji Post Graduate College Chandeshwar Azamgarh under afflicted Veer Bahadur Singh Purvanchal University, Jaunpur (UP) with a view to find out the production potential of maize-wheat cropping system under different fertilizer doses with soil conditions. The results showed that the wheat equivalent yield was received maximum of 80.01 and 79.71q/ha with FYM application while in gypsum reduced 74.32 and 76.26q/ha and minimum equivalent yield of 71.79 and 73.23q/ha was recorded in control plot during first and second years, respectively. On the mean basis gross income of Rs. 63159 and Rs. 63878 /ha and net profit of Rs. 28246 and Rs. 29017/ha were significantly more obtained with FYM from maize-wheat system during both year, respectively while, gypsum gave gross income of Rs. 59199 and 60653/ha and net profit Rs. 26479 and Rs. 27933/ha during respective years. The percentage increment of FYM in soil conditioner over control was 10.77% and 9.18% net profit in first and second years respectively. In case of fertilizer, significantly maximum equivalent yield of 80.85 and 82.07 q/ha was obtained at 125% fertilizer during first and second year, respectively. The highest gross income of Rs. 63798 and Rs. 64854/ha was achieved with 125% fertilizer while maximum net profit of Rs. 28901 and Rs. 29682/ha was obtained with 100% RDF during first and second year. The increment percentage in net profit of 22.05% and 19.91% compared to 50% RDF during both the years, respectively. Therefore, application of FYM @ 5ton/ha along with 100% RDF proved to be most economic combination of the system.

Keyword: Soil Conditioners, Fertilizer Doses, Maize, Wheat, Crop rotation

INTRODUCTION

Cropping system growing two crops in the same field one after one in the same year (Anonymous, 2022). These cropping system become popular because of higher productivity per unit area, per unit time with less risky. The maize-wheat sequence is one of the predominant system being followed in India particularly with irrigation facilities, maize-wheat cropping system coverage about 1.00 million ha area (Nagrajan, 2000). This system is also followed in Uttar Pradesh or large area. The practice of maize-wheat system exploited production resources. It is an alarming situation for sustainable agriculture which needs proper attention. It would therefore, be desirable to reduce the total dependence on chemical fertilizers by partly substituting them with locally available and renewable organic sources of nutrients and other soil conditions. Organic sources are known to enhance the use efficiency of applied fertilizers, besides improving soil physical chemical properties and preventing emergence of micro nutrients deficiencies. FYM is the most common and popular since long back in India agriculture. The use of gypsum even in normal soil was also found to improve physico-chemical properties of soil. Thus it may prove a better and cheaper soil conditioner. In maize-wheat sequence being both crops are cereals and heavy feeder of plant nutrient affects soil properties adversely.

MATERIALS AND METHODS

The field experiment was conducted at Research Farm of Shri Durga Ji post graduate college Chandeshwar, Azamgarh, UP during 2003 - 05. The Research Farm geographically located latitude 26.4⁰N and longitude of 83.11⁰E. The soil of experimental plots was loamy (sand-52.30%, silt-24.15% and clay 18.20%) in texture. Availability of nutrients is organic carbon 0.41%, N-226.10%, P₂O₅-13.21% and K₂O-131.10% and soil pH was 8.5. Twelve treatment combinations viz. soil conditioners- control, Gypsum@100 kg/ha and FYM @ 5 t/ha and fertilizer levels 125% (N₁₅₀ P₇₅ K₅₀), 100% (N₁₂₀ P₆₀ K₄₀) 75% (N₉₀ P₄₅ K₃₀) and 50% (N₆₀ P₃₀ K₂₀) replicated 4 times in factorial experiment in RBD. Plot size 5m × 3m. Field preparation was done after harvesting of previous crop ploughing with tractor drawn disc harrow and left for sun drying in summer, after pre irrigation to ploughing were done and followed by planking. As per treatment gypsum 100 kg/ha and FYM 5t/ha applied before last ploughing and in corporate in soil. Half amount of nitrogen and full amount of P₂O₅ and K₂O as basal application and remaining half dose of nitrogen was applied in two equal splits at knee high and tussling stage of crop. Sowing of maize (Azad Uttam) was done 15 June 2003 and 20 June 2004 and using 20 Kg seed/ha at row spacing 50 cm and sowing was done with help of Kudali. Other cultural activities were adopted as per recommendation of the sequential cropping.

RESULTS AND DISCUSSION

Effect of Soil Conditioners

The application of FYM had significantly maximum wheat grain equivalent yield than control only to second year. Gypsum application had statistically equal wheat grain equivalent yield to control during both years of study. FYM gave higher wheat grain equivalent yield to the tune of 11.45% and 7.66 during first year and 8.89% and 4.52% during

second year over control and gypsum application, respectively. On average basis of two year study, the highest wheat grain equivalent yield was 79.86 q/ha which was more by a margin of 7.36 q and 4.57 q/ha than control and gypsum application. Gypsum had higher wheat grain equivalent yield by 2.79q/ha over control. System production was worked out in terms of wheat grain equivalent yield which was found significantly maximum with FYM and minimum in control. This may be supported by yields of individual crops of maize and wheat which also maximized with FYM application. Thus, combined effect of maize and wheat yields reflected in wheat grain equivalent yield. These results are similar to those of Verma *et al.* (2005) and Verma *et. al.* (2018).

Earned significantly maximum gross and net income by applied FYM while minimum income was received in control treatment. Gypsum achieved equal gross and net return during both years over control treatment. On the basis of average, use of FYM gave higher gross income by Rs. 5786/- and Rs. 3593/- per hectare and net return by Rs. 2594.00 and Rs. 1426.00/ha than control and gypsum treated plot, respectively. Gypsum application gained higher gross return and net profit by a margin of Rs. 2193.00/ha (3.40%) and Rs. 11.68 w/ha (4.49%) than control, respectively. Gross return and net profit were significantly maximum with FYM followed by gypsum and minimum in control treatment. The higher economics with FYM was also confirmed by Verma *et al.* (2005).

Effect of Fertilizers

The significantly higher wheat equivalent yield was obtained at 125% dose of fertilizer which reduced significantly with 75 and 50% fertilizer during both years of experimentation. Application of 100% fertilizer produced at par wheat grain equivalent yield of 125% fertilizer. During first year the reduction in wheat grain equivalent yield was by 1.57%, 8.23% and 17.29% at 100, 75 and 50% fertilizer doses, respectively. While, in second year the reduction was by 1.83%, 7.63% and 16.41%, respectively. On mean basis, the maximum wheat grain equivalent yield of 81.46q/ha was recorded with 125% fertilizer doses. The reduction in equivalent yield was calculated to be 1.39q, 6.4 5 and 14.12 q/ha at 100, 75 and 50% fertilizer doses, respectively. Application of 125 and 100% recommended dose of fertilizer produced at par and significantly maximum grain equivalent yield which reduced at 75 and 50% dose of fertilizers. It may be also supported by higher yield of maize and wheat grown in sequence with 125 and 100% recommended dose of fertilizer. Al most similar results have been reported by balyan and Idnani (2000) and Verma *et al.* (2005).

The application of 125% fertilizer dose had significantly higher gross income during both years of study. Whereas, significantly maximum net profit was recorded with 100% recommended dose of fertilizer and it reduced significantly at each lower dose of fertilizer during both years o investigation. Application of 125% fertilizer dose failed to show the higher net profit than recommended dose of fertilizer. On the basis of mean data maximum gross income was achieved with 125% fertilizer which reduced by Rs. 1165/ha (1.81%), Rs. 4695/ha (7.30%) and Rs. 9913/ha (15.41%) and 100, 75 and 50% fertilizer dose, respectively while, 75 and 50% fertilizer doses reduced the net profit by a margin of Rs. 2007/ha (6.85%) and Rs. 5490/ha (18.74%), respectively. The results may be supported by the findings of Verma *et. al.* (2005) and Maurya *et. al.* (2020) who, reported higher income from maize-wheat system at increased rate of chemical fertilizers.

REFERENCES

- Anonymous, (2022). Crop-rotation sustainable development, internet, website, <https://www.researchgate.net>.
- Balyan, J.S. and Idnani, L.K. (2000). Fertilizer management in maize-wheat sequence. *Indian Journal of Agronomy*, 45(4):645-652.
- Nagarajan, S. 2000, wheat cropping intensity hold Key. *The Hindu Survey of Indian Agriculture*, 49-52.
- Verma, C.P. Prasad, K. and Verma, R.N. (2005). Production potential and economics of maize-wheat cropping system under different soil conditioners and fertility levels. *Crop Research*, 29(1): 23-27.
- Verma, Karan, Bindra, A.D., Singh, Janardan, Negi, S.C., Datt, Naveen, and Rana, Usha (2018). Effect of integrated nutrient management on growth, yield attributes and yield of maize and wheat in maize wheat cropping system in Mid- Hls of Himanchal Pradesh., *Int. J. Pure App. Bio Sci.* 6 (3): 282 – 301.
- Maurya, R. N., Verma, V.K., Pyare, R. and Singh, U.P. (2020). Effect of resource conservation practices on yield attributes and yield in maize based cropping system. *International J. of Chemical Studies*, 8(6): 2795 – 98.

Table: Effect of Soil conditioners and Fertilizers doses on wheat equivalent yield, gross income and net income under maize-wheat cropping system

Treatments	Wheat equivalent yield (q/ha)		Gross income (000 Rs./ha)		Net profit (000 Rs./ha)	
	2003-04	2004-05	2003-04	2004-05	2003-04	2004-05
Soil conditioners						
Control	71.79	73.20	57.13	58.27	25.49	26.57
Gypsum	74.32	76.26	59.19	60.65	26.47	27.93
FYM	80.01	79.71	63.15	63.87	28.24	29.01
SE (d)	1.41	1.82	1.316	0.244	0.256	0.250
CD 5%	2.86	3.70	2.678	0.496	0.520	0.508
Fertilizer doses						
125% of rec.	80.85	82.07	63.79	64.85	28.26	29.31
100% of rec.	79.58	80.56	62.77	63.55	28.90	29.68
75% of rec.	74.20	75.81	59.00	60.27	26.64	27.92
50% of rec.	66.87	68.60	53.76	55.06	23.15	24.44
SE (d)	1.62	2.10	1.620	0.282	0.295	0.288
CD 5%	3.30	4.27	3.092	0.573	0.520	0.586