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Influenced of Micronutrients Integration with FYM on Profitability of Late Sown Wheat

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Abstract
A field experiment entitled impact of micronutrients (Zn, Fe and Mn) integration with FYM on profitability of late sown wheat was conducted during two consecutive *rabi* season 2018-2019 and 2019-2020 at Crop Research Centre, Sardar Vallabhbhai Patel University of Agriculture & Technology, Meerut (U.P). Application of RDF + Zn @ 5 kg/ ha^{-1} + 5 ton FYM/ ha^{-1} (T_7) recorded higher net returns (Rs. 65238 and 77224 /ha^{-1}) and B: C ratio (2.53 and 2.77) during both years of experiment. Application of micronutrients along with organic manure (FYM) can be recommended to get higher net returns from late sown wheat in place of use of organic manure and chemical fertilizer alone.

Keywords: Micronutrients, FYM, wheat, economics, yield

Introduction
Wheat (*Triticum aestivum*) is one of the most widely grown crops in the world, and is the second most important source of staple food in India after rice. In order to increase the wheat yield the farmers are extensively using the chemical fertilizer for higher yield. During the era of green revolution, the farmers stressed more in use hybrid and high yielding varieties. However, it increased the crop production and productivity but supplying the nutrient source from inorganic fertilizer for long term without any addition of organic manures affected the soil health and resulted in the large-scale deficiency of micro nutrients in soil which play an important role in enhancing the quality and quantity of the agriculture production. Further, heavy application of inorganic fertilizer left residues in grain fruits and vegetables and caused human and animal health. The use of inorganic fertilizer alone also reduces the fertilizer use efficiency by crop through creation of problems such as volatilization, leaching and denitrification of nitrogen. To overcome the problem of nutrient deficiency and helping the nature rather than destroying it. Organic sources of nutrients are the best option maintain the health of soil, plant and animal and provide the equal opportunity for all living existence to live and use from their beneficial activities, like nitrogen fixation, phosphorus solubilization, recycling of animal waste etc. Hence, the present study was undertaken.

Material and Methods
The field experiment was conducted during *rabi* season of 2018-19 and 2019-20 at Crop Research Centre, S.V.B.P. University of Agriculture & Technology, Meerut (U.P.). The experimental farm is situated at 28^{O} 59' N latitude and 77^{0} 42' E longitude at an altitude of 237 meter mean sea level. The experimental site is characterized by a sub-tropical, semi-arid climate with hot dry summers (45^{O}C) and very low temperature during winter (3^{O}C). The experimental soil was sandy loan in texture having pH 7.81, organic carbon 4.55 g/kg. Available N, P, K were 215.30, 12.50, 230.15 kg/ha^{-1}, respectively and DTPA-Zn, Fe, Mn was 0.60, 9.61, 1.50 mg/kg, respectively. The experiment was laid-out in a randomized block design with 3 replications. The experiment included 9 treatments, viz. T_1: control, T_2: RDF 120:60:40 NPK kg ha^{-1}, T_3: RDF + Zn @ 5.0 kg ha^{-1}, T_4: RDF + Fe @ 5.0 kg ha^{-1}, T_5: RDF + Mn @ 5.0 kg ha^{-1}, T_6: RDF + 5 ton FYM ha^{-1}, T_7: RDF + Zn @ 5.0 kg ha^{-1} + 5 ton FYM ha^{-1}, T_8: RDF + Fe @ 5.0 kg ha^{-1} + 5 ton FYM ha^{-1} and T_9: RDF + Mn @ 5.0 kg ha^{-1} + 5 ton FYM ha^{-1}. Nitrogen was given in the form of urea as per treatments. Di-ammonium phosphate and muriate of potash were used as sources for P_2O_5 and K_2O, respectively. Recommended dose of N, P and K for late sown wheat was 120:60:40 kg/ha^{-1}, respectively. Full quantities of P and K fertilizers were given at the time of sowing. Nitrogen was applied as basal and in 2 splits at first and second irrigation.

The micronutrients fertilizer was applied as basal at the time of sowing. Well-decomposed FYM (0.52% N, 0.31% P, and 0.49% K) was added to plots as per treatments one week before sowing. The wheat (variety DBW- 71) was sown at the rate of 120 kg/ha^{-1} on December 2nd and 10th during 2018-19 and 2019-20, respectively. Crop was given 5 irrigations using water from tube well. The crop was harvested at physiological maturity and grain and straw yield were recorded at harvest. The growth parameters were recorded at 30, 60, 90 DAS and at harvest and yield attributes were also recorded at harvest following standard procedures as suggested by (Rana *et al*. 2014) [2]. The trend of results was similar during both study years, hence, two-year data were averaged and then subjected to statistical analyses. The statistical analysis was done using procedures described by Gomez and Gomez (1984) [1].

Results and Discussion

Economics

The statistical analysis showed that the application of T_7 recorded significantly higher gross (Rs. 107748 and 120785) and net returns (Rs. 65238 and 77224) of wheat followed by T_9 (Rs 104347 and 116107) and (Rs 61787 and 72496) and they were higher over rest of the treatments (Table 1). This might be due to the variation in rate of micronutrients and organic manures, as well as significant contribution of these organic manures, which increased the grain and straw yield, respectively over all other treatments and recorded higher gross and net returns.

Significantly higher B:C was recorded with T_7 (2.53 and 2.77), which was on par to T_3 (2.54 and 2.73) and T_5 (2.50 and 2.66). This might be due to higher gross returns and lower cost of cultivation. The minimum B:C (1.92 and 2.07) was recorded under control.

Table 1: Effect of micronutrients in conjunction with FYM on economics of late sown wheat

Treatments	Cost of cultivation (Rs / ha)			Gross return (Rs / ha)			Net return (Rs / ha)			B: C ratio		
	2018-19	2019-20	Pooled	2018-19	2019-20	Pooled	2018-19	2019-20	Pooled	2018-19	2019-20	Pooled
T_1	32658	33709	33183	62800	69983	66391	30142	36274	33208	1.92	2.07	1.99
T_2	36480	37531	37005	86317	97137	91727	49837	59606	54722	2.36	2.58	2.47
T_3	37110	38161	37635	94566	104253	99409	57456	66092	61774	2.54	2.73	2.64
T_4	36600	37651	37125	90892	100133	95512	54292	62482	58387	2.48	2.65	2.57
T_5	37160	38211	37685	92927	101685	97306	55767	63474	59620	2.50	2.66	2.58
T_6	41880	42931	42405	96578	106666	101622	54698	63735	59216	2.30	2.48	2.39
T_7	42510	43561	43035	107748	120785	114266	65238	77224	71231	2.53	2.77	2.65
T_8	42000	43051	42525	101279	112294	106787	59279	69243	64261	2.41	2.60	2.50
T_9	42560	43611	43085	104347	116107	110227	61787	72496	67142	2.45	2.66	2.55

Conclusions

Under organic production system, integrated organic nutrient management practices involving application of RDF + Zn @ 5 kg/ ha^{-1} + 5 ton FYM/ ha^{-1} resulted in higher net returns and maximum B:C ratio over other micronutrient and organic manure combinations as well as chemical fertilizers alone.

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