The Pharma Innovation Journal 2021; 10(7): 1276-1279

www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277- 7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2021; 10(7): 1276-1279

www.thepharmajournal.com
Received: 11-06-2021
Accepted: 14-07-2021

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Effect of integrated nutrient management practices on yield attributes, yield and economics of timely sown wheat (*Triticum aestivum* L.)

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Abstract
An experiment on "Effect of integrated nutrient management practices on yield attributes, yield and economics of timely sown wheat (*Triticum aestivum* L.)'' was carried out during winter season of 2018-19 and 2019-20 at the Agronomy Research Farm, ANDUA & T Kumarganj, Ayodhya (U.P.) India. The experiment consists of fourteen treatments were laid out in Randomized Block Design (RBD) with three replications. As per experiment the results revealed that the yield parameters were significantly influenced by different integrated nutrient management practices except test weight. The maximum yield attributes parameters *viz.* number of spikes (304.24, 310.32 m^{-2}), spike length (10.30, 10.35 cm), number of grain $spike^{-1}$ (42.30, 42.73 $spike^{-1}$) were observed with the application of 75% RDN + 25% N through (poultry manure) + $ZnSO_4$ @ 25 kg ha^{-1} + Sulphur @ 40 kg ha^{-1}, which was at par with rest of the integrated nutrient management practices and significantly higher over control (T_{14}) treatments. However, the maximum grain and straw yield (45.30, 47.10 q ha^{-1} and 62.05, 64.00 q ha^{-1}, respectively) and biological yield (107.35, 111.10 q ha^{-1}) were achieved when applied 75% RDN + 25% N through (poultry manure) + $ZnSO_4$ @ 25 kg ha^{-1} + Sulphur @ 40 kg ha^{-1}, which was at par with T_9, T_{11}, T_1, T_7, T_{12} and T_8 treatments, respectively. While significantly superior over rest of the treatments, whereas the harvest index did not influenced by INM. In case of economic of different treatments, the maximum gross return (Rs. 95752.00 and 103467.00 ha^{-1}) and were computed under 75% RDN + 25% N through FYM + $ZnSO_4$ @ 25 kg + Sulphur @ 40 kg ha^{-1}. However, maximum net return (Rs. 56182.00 and 61440.00 ha^{-1} and B:C ratio (1.63 and 1.69) was recorded with the application of 100% RDN (Recommended dose of Nitrogen) and minimum B:C ratio was noted under control (T_{14}) treatments.

Keywords: INM, yield and yield attributes and economic, wheat

Introduction
Wheat (*Triticum aestivum* L.) being a major cereal crop cultivated in India and abroad. It belongs to Poaceae family. Wheat generally grown in Rabi season and it can be successful grow in the tropical and sub-tropical climates and also in the temperate zone. Wheat can tolerate to severe cold and snow and resume growth with the setting in warm weather in spring. It can be cultivated from sea level to an altitude of 3300 meters. The most favorable climatic condition for wheat cultivation is cool and moist weather during the vegetative growth period followed by dry, warm weather for the grain to mature and ripening. The optimum temperature range for ideal germination of wheat seed is 20-25 ^{0}C. Warm and dry climatic conditions are not suited for wheat during the heading and flowering stage. Wheat is the staple food eaten in the form of chapatti. It is also consumed as various other preparations such as dalia and halwa and in most of the urban areas in the country the use of baked leavened bread, flakes, cakes, biscuits etc. Wheat contains more protein in the form of gluten than other cereals crop. Wheat occupied an acre ages about 215.29 million ha with production of 730.84 million metric tonns with productivity of 3390 kg ha^{-1} (Anonymous, 2019) [1]. In India it is grown on 29.55 million ha^{-1} (13.43% global area) with the production of 101.20 million tonns (1.3% rises previous year) and productivity about 3424 kg ha^{-1} (Anonymous, 2019) [1]. In Uttar Pradesh wheat occupied about 9.78 million ha^{-1} achieved rank first in production (31.99 million tonns) with productivity (3269 kg ha^{-1}). But the productivity is comparatively lower than that the Punjab (50.3 q ha^{-1}) and Haryana (44.1 q ha^{-1}) thus there is much scope to breed wheat varieties for higher yield coupled with acceptable quality (Anonymous, 2019) [1].

Integrated nutrient management (INM) is a flexible approach to minimize the use of chemical sources of nutrients along with maximization of their efficiency and farmer's profit. Fertilizers, organic manures and bio fertilizers are the main component of INM. No single source of plant nutrient can meet the entire nutrient need of the crops in modern agriculture; rather it needs to be used in judicious manner that is economically viable, socially acceptable, and ecologically sound. Singh *et al*. (2018) [7] reported that the number of spikes (m^{-2}), spike length (cm), number of grain spike-^{1}, 1000-grains weight and grain and straw yield of wheat improved significantly by the application of FYM @10t ha^{-1} and phosphorus @ 80 kg P_2O_5 ha^{-1}. The maximum net returns of Rs. 55242 ha^{-1} and benefit: cost ratio 2.82 were computed with the application of 100% RDF along with biofertilizer. However, maximum gross returns Rs. 90133 ha^{-1} was noted with the application of 125% RDF along with vermicompost, Kumar *et al*. (2018) [4].

Material and Methods

Present investigation entitled "Effect of integrated nutrient management practices on yield attributes, yield and economics of timely sown wheat (*Triticum aestivum* L.)'' was carried out during winter season of 2018-19 and 2019-20 at the Agronomy Research Farm, ANDUA & T Kumarganj, Ayodhya (U.P.). The experiment consists of fourteen treatments i.e. T_1-100% RDN (Recommended Dose of Nitrogen), T_2. 75% RDN, T_3. 75% RDN + $ZnSO_4$ @ 25 kg ha^{-1}, T_4. 75% RDN + Sulphur @ 40 kg ha^{-1}, T_5. 75% RDN + $ZnSO_4$ @ 25 kg ha-1 + Sulphur @ 40 kg ha^{-1} T_6. 75% RDN + 25% N through FYM, T_7. 75% RDN + 25% N through FYM + $ZnSO_4$ @ 25 kg ha^{-1}, T_8. 75% RDN + 25% N through FYM + Sulphur @ 40 kg ha^{-1}, T_9. 75% RDN + 25% N through FYM + $ZnSO_4$ @ 25 kg + Sulphur @ 40 kg ha^{-1}, T_{10}. 75% RDN + 25% N through (poultry manure), T_{11}. 75% RDN + 25% N through (poultry manure) + $ZnSO_4$ @ 25 kg ha^{-1}, T_{12}. 75% RDN + 25% N through (poultry manure) + Sulphur @ 40 kg ha^{-1}, T_{13}. 75% RDN + 25% N through (poultry manure) + $ZnSO_4$ @ 25 kg ha^{-1} + Sulphur @ 40 kg ha^{-1} and Control (T_{14}) treatments were laid out in Randomized Block Design (RBD) with three replications. The experimental field was well drained and leveled in order to determine the fertility status and soil class, soil samples were collected randomly from different places of the experimental field with the help of soil auger to the depth of 0-15 cm for physico-chemical analysis before execution of the fertility treatments. The soil was silty loam with the pH of (8.20, 8.30) with EC (0.24, 0.25 dS/m). The organic carbon content of soil was (0.32, 0.33%) with available nitrogen (135.72, 137.60 kg ha^{-1}), available phosphorous (14.35, 15.40 kg ha^{-1}), available potassium (247.30, 248.33 kg ha^{-1}), available sulphur (7.15, 7.30 kg ha^{-1}) and available Zinc (0.56, 0.59 ppm ha^{-1}). The experimental site falls under the sub-tropical climate of Indo-Gangatic alluvial plains zone (IGP) having alluvial calcareous soil and located at 26º47' N latitude and 82º12' E longitude with an altitude of 113 m above the mean sea level.

The variety PBW-154 is a double gene dwarf variety of height (100-110 cm), awned and have smooth, white glumes, grains are medium bold amber and hard. It has early maturity taking about 130-135 days. It is suitable variety for timely sown condition. The variety PBW 154 was shown proper moisture stage on 18 Nov., 2018-19 and 19 Nov., 2019-20. The seed was treated with theram @ 2.5 g kg^{-1} seed to control the fungal diseases. The seeds were placed in manually opened furrows as the depth of 5 cm below with the row spacing of 22.5 cm apart. The seed was applied informally each and every plots @ 100 kg ha^{-1}. Fertilizer Nitrogen, phosphorus and potassium were applied in the forms of Urea, DAP and Muriatic of potash @ 120, 60 and 40 kg ha^{-1}, respectively. Full dose of phosphorus, potassium and half dose of nitrogen were applied as Basel dressing at the time of sowing and rest half dose of nitrogen was applied as two split doses at the time of first irrigation and second irrigation.

Harvest index is an economic yield expressed as percentage of biological yield and calculated as formula given by Donald and Hamblin (1976) [2].

$$\text{Harvest index (\%)} = \frac{\text{Economic yield}}{\text{Biological yield}} \times 100$$

Net return (Rs. ha^{-1}) was calculated by deducting the cost of cultivation from the gross return of the individual treatments.

$$\text{Net Return (₹ ha}^{-1}\text{)} = \text{Gross return} - \text{Cost of cultivation}$$

Benefit-cost ratio (Rs./re-invested) was calculated with net return dividing by cost of cultivation.

$$\text{B:C ratio} = \frac{\text{Net return (₹ ha}^{-1}\text{)}}{\text{Cost of cultivation (₹ ha}^{-1}\text{)}}$$

Results and Discussion

The experimental results have been shown in (table 1) found that the yield attributes were significantly affected by integrated nutrient management practices except 1000-grains weight. The maximum yield attributes i.e. No. of Spike m^{-2}, length of spike (cm), number of grain spike^{-1} and test weight (g) were recorded with the application of 75% RDN + 25% N through (poultry manure) + $ZnSO_4$ @ 25 kg ha^{-1} + Sulphur @ 40 kg ha^{-1}, which was at par with the application of 75% RDN + 25% N through FYM + $ZnSO_4$ @ 25 kg + Sulphur @ 40 kg ha^{-1} and 75% RDN + 25% N through (poultry manure) + $ZnSO_4$ @ 25 kg ha^{-1}. In addition, the increase in yield attributes was mainly due to increase in photosynthesis activity of leaves, translocation of photosynthates from source to sink and nutrients uptake under higher nutrients availability in integrated nutrient management. The minimum values of the entire yield attributes were observed in the treatment received lower amount of nutrients in control plots because plants could not absorb required amount of nutrients and resulted in poor yield attributes (Nishant *et al*. 2020) [6].

Table 1: Number of spike m^{-2}, spike length (cm), No. of grains $spike^{-1}$, 1000-grain weight (g) on wheat as influenced by integrated nutrient management sources

Treatments	No. of spike m^{-2}		Spike length (cm)		No. of grains $spike^{-1}$		1000-grain weight (g)	
	2018-19	2019-20	2018-19	2019-20	2018-19	2019-20	2018-19	2019-20
T_1: 100% RDN (Recommended Dose of Nitrogen)	290.48	296.29	9.90	10.00	42.00	42.40	35.00	35.10
T_2: 75% RDN	274.29	279.77	8.60	8.60	38.00	38.30	33.10	33.20
T_3: 75% RDN + ZnSO4 @ 25 kg ha^{-1}	285.35	291.05	8.70	8.90	38.80	39.20	33.60	33.70
T_4: 75% RDN + Sulphur @ 40 kg ha^{-1}	277.68	283.24	8.60	8.70	38.60	39.10	33.40	33.60
T_5: 75% RDN + ZnSO4 @ 25 kg ha^{-1} + Sulphur @ 40 kg ha^{-1}	303.78	309.86	9.60	9.60	39.00	39.35	34.10	34.30
T_6: 75% RDN + 25% N through FYM	296.74	302.67	9.00	9.00	38.90	39.40	33.70	33.80
T_7: 75% RDN + 25% N through FYM + ZnSO4 @ 25 kg ha^{-1}	299.28	305.26	9.60	9.70	40.00	40.40	34.50	34.70
T_8: 75% RDN + 25% N through FYM + Sulphur @ 40 kg ha^{-1}	297.07	303.02	9.40	9.30	39.80	40.10	34.00	34.10
T_9: 75% RDN + 25% N through FYM + ZnSO4 @ 25 kg + Sulphur @ 40 kg ha^{-1}	302.54	308.59	10.40	10.20	42.00	42.50	35.10	35.30
T_{10}: 75% RDN + 25% N through (poultry manure)	294.01	299.89	9.00	9.20	39.00	39.45	34.10	34.20
T_{11}: 75% RDN + 25% N through (poultry manure) + ZnSO4 @ 25 kg ha^{-1}	292.26	298.11	9.90	9.90	41.00	41.40	34.80	34.90
T_{12}: 75% RDN + 25% N through (poultry manure) + Sulphur @ 40 kg ha^{-1}	294.58	300.47	9.40	9.50	40.20	40.55	34.20	34.40
T_{13}: 75% RDN + 25% N through (poultry manure) + ZnSO4 @ 25 kg ha^{-1} + Sulphur @ 40 kg ha^{-1}	304.24	310.32	10.30	10.30	42.30	42.73	35.20	35.40
T_{14}: Control	221.09	255.51	7.90	8.00	36.50	36.85	31.60	31.70
S.Em±	12.24	12.78	0.39	0.31	1.34	1.31	1.42	1.43
CD at 5%	35.59	37.15	1.13	0.89	3.91	3.80	NS	NS

Grain, straw and biological yield significantly increased with increasing the dose of integrated nutrient management practices. However, harvest index did not influence by INM. (Table 2). Among the integrated nutrient management practices, 75% RDN + 25% N through (poultry manure) + $ZnSO_4$ @ 25 kg ha^{-1} + Sulphur @ 40 kg ha^{-1} was achieved more grain & straw and biological yield than the other treatments. The yield was increase due to increased integration of nutrients results improved the fertility status of the soil which caused more nutrient availability in soil due to increased nutrient uptake by the crop, thus enhanced the photosynthesis rate as source and photosynthates translocated to sink which increased the yield attributes parameters *i.e.* number of spikes, length of spike (cm), number of grains $sipke^{-1}$ and 1000-grains weight (g) which was ultimately enhanced the grain, straw and biological yield of crop. Similar finding has been given by Fazily *et al.* (2021) [3].

Based on input output analysis, the cost of cultivation (Rs ha^{-1}), gross return (Rs ha^{-1}), net return (Rs ha^{-1}) and B:C ratio were worked out to ensure the economic feasibility for adoption of recommendations. Economics of various integrated nutrient management practices are given in Table 3. As par observed data the maximum gross return (Rs. 95752.00 and 103467.00 ha^{-1}) was computed when applied 75% RDN + 25% N through (poultry manure) + $ZnSO_4$ @ 25 kg ha^{-1} + Sulphur @ 40 kg ha^{-1}. This might be due to obtained more grain & straw yield. However, net return and B:C ratio were noted maximum with the application of 100% RDF as compared to other integration of nutrients. This might be due to no excess manure/fertilizer was concluded with treatment. While maximum cost of the cultivation was calculated under 75% RDN + 25% N through FYM + $ZnSO_4$ @ 25 kg + Sulphur @ 40 kg ha^{-1}. Comparable finding was likewise announced by Kaur *et al.* (2018) [4].

Table 2: Effect of integrated nutrient management on grain yield (q ha^{-1}), straw yield (q ha^{-1}), biological yield (q ha^{-1}) and harvest index of wheat

Treatments	Grain yield (q ha^{-1})		Straw yield (q ha^{-1})		Biological yield (q ha^{-1})		Harvest index (%)	
	2018-19	2019-20	2018-19	2019-20	2018-19	2019-20	2018-19	2019-20
T_1: 100% RDN (Recommended Dose of Nitrogen)	41.70	43.40	58.40	60.40	100.10	103.80	41.66	41.81
T_2: 75% RDN	33.50	35.90	51.53	52.25	76.03	88.15	40.10	40.29
T_3: 75% RDN + $ZnSO_4$ @ 25 kg ha^{-1}	37.20	38.70	53.98	54.89	91.18	93.59	40.80	41.00
T_4: 75% RDN + Sulphur @ 40 kg ha^{-1}	35.80	37.20	53.00	54.72	88.80	91.92	40.32	40.50
T_5: 75% RDN + $ZnSO_4$ @ 25 kg ha^{-1} + Sulphur @ 40 kg ha^{-1}	40.40	42.00	56.70	56.85	97.10	98.85	41.25	41.45
T_6: 75% RDN + 25% N through FYM	38.90	40.40	55.39	56.66	94.29	97.06	41.00	41.20
T_7: 75% RDN + 25% N through FYM + $ZnSO_4$ @ 25 kg ha^{-1}	41.30	43.10	58.00	59.70	99.30	102.80	41.59	41.81
T_8: 75% RDN + 25% N through FYM + Sulphur @ 40 kg ha^{-1}	40.20	41.80	56.45	56.68	96.65	98.48	41.32	41.51
T_9: 75% RDN + 25% N through FYM + $ZnSO_4$ @ 25 kg + Sulphur @ 40 kg ha^{-1}	44.60	46.40	61.60	63.55	106.20	109.95	42.00	42.20
T_{10}: 75% RDN + 25% N through (poultry manure)	39.10	40.70	55.80	56.76	94.90	97.46	41.20	41.40
T_{11}: 75% RDN + 25% N through (poultry manure) + $ZnSO_4$ @ 25 kg ha^{-1}	42.70	44.40	59.45	61.30	102.15	105.70	41.80	42.01
T_{12}: 75% RDN + 25% N through (poultry manure) + Sulphur @ 40 kg ha^{-1}	40.50	43.01	57.55	59.10	98.05	102.11	41.67	41.85
T_{13}: 75% RDN + 25% N through (poultry manure) + $ZnSO_4$ @ 25 kg ha^{-1} + Sulphur @ 40 kg ha^{-1}	45.30	47.10	62.05	64.00	107.35	111.10	42.20	42.39

T_{14}: Control	25.50	26.50	40.55	41.85	66.05	68.35	38.61	38.77
S.Em±	1.67	1.41	1.62	2.41	3.95	4.40	1.41	1.30
CD at 5%	4.87	4.09	4.70	7.01	11.49	12.80	NS	NS

Table 3: Effect of integrated nutrient management practices on economics of wheat crop

Treatments	Cost of cultivation (Rs ha^{-1})		Gross returns (Rs ha^{-1})		Net returns (Rs ha^{-1})		B:C	
	2018-19	2019-20	2018-19	2019-20	2018-19	2019-20	2018-19	2019-20
T_1: 100% RDN (Recommended Dose of Nitrogen)	34290	36290	90474	97730.0	56182	61440.0	1.63	1.69
T_2: 75% RDN	33875	35875	71946	79557.5	38071	43683.5	1.12	1.21
T_3: 75% RDN + $ZnSO_4$ @ 25 kg ha^{-1}	33625	37625	79244	85475.5	43619	47850.5	1.22	1.27
T_4: 75% RDN + Sulphur @ 40 kg ha^{-1}	36275	38275	76472	82154.0	40197	43879.0	1.10	1.14
T_5: 75% RDN + $ZnSO_4$ @ 25 kg ha^{-1} + Sulphur @ 40 kg ha^{-1}	38025	40025	85776	92220.0	47651	52195.0	1.25	1.30
T_6: 75% RDN+25% N through FYM	46675	48675	82654	89102.0	35979	40427.0	0.77	0.83
T_7: 75% RDN+25% N through FYM + $ZnSO_4$ @ 25 kg ha^{-1}	48425	50425	87592	94907.5	39167	44482.5	0.80	0.88
T_8: 75% RDN+25% N through FYM + Sulphur @ 40 kg ha^{-1}	49075	51075	85258	91807.0	36183	40732.0	0.73	0.79
T_9: 75% RDN+25% N through FYM + $ZnSO_4$ @ 25 kg + Sulphur @ 40 kg ha^{-1}	50825	52825	94388	102030.0	43559	49205.0	0.85	0.93
T_{10}: 75% RDN+25% N through (poultry manure)	36878	38878	83104	89699.5	46226	50821.5	1.25	1.30
T_{11}: 75% RDN+25% N through (poultry manure) + $ZnSO_4$ @ 25 kg ha^{-1}	39893	41893	88408	95631.0	48515	53738.0	1.25	1.28
T_{12}: 75% RDN+25% N through (poultry manure) + Sulphur @ 40 kg ha^{-1}	40543	42543	86030	94614.0	45487	52071	1.12	1.22
T_{13}: 75% RDN+25% N through (poultry manure) + $ZnSO_4$ @ 25 kg ha^{-1} + Sulphur @ 40 kg ha^{-1}	42293	44293	95752	103467.0	53459	59174	1.26	1.33
T_{14}: Control	32610	34610	55662	59382.5	23052	24772.5	0.70	0.71

Summary and Conclusion

As par the data presented in table 1, table 2 and table 3 the results may be concluded that, among the integrated nutrient management practices, 75% RDN + 25% N through (poultry manure) + $ZnSO_4$ @ 25 kg ha^{-1} + Sulphur @ 40 kg ha^{-1} proved to found better for yield attributes and yield. However, maximum net return and B:C ratio were calculated under 100% RDN as compare to other treatments.

Reference

1. Anonymous. Foreign Agriculture Service/USDA office of global analysis 2019.
2. Donald CM, Hamblin, J. The biological yield and harvest index of cereals as agronomic and plant breeding criteria. Advances in Agronomy 1976;28:361-405.
3. Fazily T, Thakral, Dhaka AK. Effect of Integrated Nutrient Management on Growth, Yield Attributes and Yield of Wheat. International Journal of Advances in Agricultural Science and Technology 2021;8(1):106-118.
4. Kaur R, Kumar S, Kaur R, Kaur J. Effect of Integrated nutrient management on yield of wheat (*Triticum aestivum* L.) under irrigated conditions 2018;6(4):1800-1803
5. Kumar S, Satyavan, Bishnoi DK, Kumar N, Dhillion A. Effect of integrated nutrient management on yield and yield Attributes and Economics of Wheat (*Triticum aestivum* L.) under Saline and Non-Saline Irrigation Water. International Journal of Current Microbiology and Applied Sciences 2018;7(5):618-628.
6. Nishant, Vivek, Rana V, Bharti N. Integrated nutrient management for sustainable wheat (*Triticum aestivum* L.) production in western Uttar Pradesh. Journal of Pharmacognosy and Phytochemistry 2020;10(1):1856-1859.
7. Singh B, Singh AP. Response of wheat (*Triticum aestivum* L.) by FYM and phosphorus application in alluvial soil. International Journal of Current Microbiology Applied Science 2018;7(6):418-423.