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Evaluation of Inorganic Nutrient Sources and Organic Manures on Growth, Yield and Quality of Wheat (*Triticum aestivum* L.)

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Abstract— *A field study was conducted during the Rabi Season of 2022–23 and 2023–24 at the Department of Agriculture, Sri Guru Granth Sahib World University, Fatehgarh Sahib on the effect inorganic nutrient sources and organic manures on the growth, yield, and quality of wheat (Triticum aestivum L.). The experiment followed a Randomized Block Design with 14 treatments replicated thrice. Results indicated that treatment T_9 (100% RDN through chemical fertilizer + 25% RDN through poultry manure) recorded the highest values for growth parameters -plant height (101.62 cm), leaf area (6.14 m²), dry matter (302.48 q ha^{-1} row), and number of tillers (124.33 m^{-1} row) and yield parameters, including grain yield (58.82 q ha^{-1}), straw yield (74.25 q ha^{-1}), biological yield (131.30 q ha^{-1}), harvest index (45%), and protein content (12.18%). These were statistically at par with T_2 (100% RDF), T5 (100% RDN + 25% FYM), and T_7 (75% RDN + 25% poultry manure). The lowest values across all parameters were recorded in the control (T_1). The study concluded that integrating organic manures with inorganic fertilizers significantly enhances wheat growth, yield, and quality over sole application of chemical or organic sources.*

Keywords— ***Wheat, FYM, Poultry manure, Biogas Slurry, Nitrogen.***

I. INTRODUCTION

Wheat (*Triticum aestivum* L.) a member of family *Poaceae,* is chief staple food which supplies approximately 35 percent of total food consumed by the global population (Mohammadi-Joo *et al* 2015). It is one of the most important cereal crops of the world, which globally stand in second position both in terms of area and production next to rice. In Punjab, it is cultivated over an area of 35.17 lakh hectares with annul production of 165.67 lakh tonnes and average productivity of 47.10 quintals ha^{-1} (Anonymous, 2024). The demand for wheat is expected to increase due to increase in population and affordability due to improved income status of the people (Gangwar *et al* 2018).

Integrated nutrient management refers to the combination of all possible sources of nutrients like organic, inorganic and biological sources in a judicious way for obtaining an ecologically sound environment and economically optimal farming system (Jat *et al* 2015). Integrated use of organic and inorganic nutrient sources helps in gaining sustainable yield and improved soil quality for enhanced production (Brar *et al* 2015). Continuous application of organic manures year after year improves physical and chemical conditions by providing a favourable soil structure, enhanced soil cation exchange capacity, increased quantity and availability of plant nutrients, increase humus content and substrate for microbial activities (Bohme and Bohme, 2006).

The use of organics in an integrated way renders the benefits through, the maintenance or adjustment of soil fertility and plant nutrient supply at an optimum level for sustaining the desired productivity. (Abdulrahimzai, 2019). As poultry waste contains a high concentration of nutrients

so addition of small quantity of poultry manure in an integrated nutrient management system could meet the shortage of FYM to some extent (Ghosh *et al* 2004). Poultry manure carried out rapid mineralization.

II. MATERIAL AND METHODS

The present studies were carried out at Agriculture Farm, Sri Guru Granth Sahib World University, Fatehgarh Sahib during *rabi* season in the year 2022-2023 and 2023-2024. The experimental site for the current study is located in Fatehgarh Sahib district, Punjab, India. Geographically situated at approximately 30.65° N latitude and 76.40° E longitude, the region falls under the agro-climatic zone of the central plain region of Punjab. The area experiences a subtropical climate characterized by hot summers, cold winters, and a monsoon season from July to September. The average annual rainfall is around 700-800 mm, with most of it occurring during the monsoon. It was 14 treatments and three replications with RBD design. The crop was sown in the first week of November in both years. Seeds should be sown at 5 cm depth in furrows 20 cm apart with uniform seed rate of 100 kg ha^{-1}. The variety was sown in PBW-826. Observations were collected for Growth attributes viz., Plant height (cm), Leaf area index (m^2), Dry matter accumulation (q ha^{-1}) and Number of tillers per meter row length, grain yield (q ha^{-1}), straw yield (q ha^{-1}), biological yield (q ha^{-1}), harvest index (%) and protein content (%).

III. RESULT AND DISCUSSION

Growth Attributes

The study evaluated the effect of different nutrient sources on plant growth attributes, including plant height, leaf area index, dry matter accumulation and the number of tillers per meter row length, for two consecutive years (2023 and 2024) data were show in table 1 and figure 1. The highest plant height, leaf area, dry matter and number of tillers per meter row length were recorded in T_9 (100% RDN through poultry manure) with 101.00 cm, 6.16 m^2, 133.45 q ha^{-1} and 124.33 and in 2024 and 102.23 cm, 6.16 m^2, 133.22 q ha^{-1} and 124.67 in 2023. This was statistically at par with T_2 – (100 % RDF (125 kg ha^{-1}) from chemical fertilizers), T_5 – (100 % RDN through chemical fertilizer + 25 % RDN through FYM), T_7 - (75% RDN through chemical fertilizer + 25% RDN through poultry manure) and T_{13} - (100% RDN through chemical fertilizer + 25% RDN through biogas slurry) in both the years. The control treatment (T_1) showed the lowest result in all the growth parameters. Due to this, the study concludes that nutrient management significantly influences plant growth parameters. Among the treatments, T_9 exhibited the best results across all growth attributes, including plant height, leaf area index, dry matter production, and tiller count, making it a promising organic nutrient source for sustainable crop production. However, the control treatment (T_1) resulted in significantly lower growth attributes, emphasizing the necessity of nutrient application for optimal plant development.

Table 1: Effect of inorganic nutrient sources and organic manures on growth of wheat

	Growth attributes	Plant Height (cm)			Leaf area index (m^2)			Dry matter accumulation (q ha^{-1})			Number of tillers per meter row length		
		2023 year	2024 year	Pooled	2023 year	2024 year	Pooled	2023 year	2024 year	Pooled	2023 year	2024 year	Pooled
T_1	Control (No nutrient sources)	85.70	86.80	86.25	4.38	4.61	4.50	119.51	120.24	119.87	102.00	104.33	103.17
T_2	100 % RDF (125 kg a^{-1}) from chemical fertilizers	100.43	101.13	100.78	6.13	6.14	6.14	132.05	132.93	132.49	123.67	124.33	124.00
T_3	75 % RDN (93.75 kg ha^{-1}) through chemical fertilizer + 25% RDN through farm yard manure (FYM)	98.40	99.07	98.73	5.68	5.81	5.75	129.94	130.83	130.39	120.33	122.33	121.67
T_4	50 % RDN (62.5 kg ha^{-1}) through chemical fertilizer + 50 % RDN through FYM	96.37	97.17	96.77	5.56	5.62	5.59	127.82	128.38	128.10	120.00	121.00	120.50
T_5	100 % RDN through chemical fertilizer + 25 % RDN through FYM	100.29	100.95	100.62	6.10	6.13	6.12	131.61	132.23	131.92	122.67	123.67	123.17
T_6	100 % RDN through FYM	96.03	96.87	96.45	4.53	4.74	4.64	122.24	122.95	122.59	117.33	119.33	118.33
T_7	75 % RDN through chemical fertilizer + 25% RDN through poultry manure (PM)	99.59	100.40	99.99	6.12	6.14	6.13	131.81	132.60	132.21	123.00	124.33	123.67

T_8	50 % RDN through chemical fertilizer + 50 % RDN through PM	95.87	96.27	96.07	5.53	5.66	5.60	127.13	127.80	127.46	119.33	120.00	119.67
T_9	100 % RDN through chemical fertilizer through PM + 25% RDN through poultry manure (PM)	101.00	102.23	101.62	6.16	6.16	6.16	133.22	133.45	133.33	124.33	124.67	124.33
T_{10}	100 % RDN through PM	95.80	96.43	96.12	5.45	5.54	5.49	124.76	125.48	125.12	118.00	119.00	118.50
T_{11}	75 % RDN through chemical fertilizer + 25% RDN through Biogas Slurry	95.63	96.80	96.22	5.63	5.70	5.66	129.86	129.80	129.83	120.33	122.00	121.50
T_{12}	50 % RDN through chemical fertilizer + 50 % RDN through Biogas Slurry	93.53	96.37	94.95	5.45	5.52	5.48	123.46	124.36	123.91	117.00	120.00	118.50
T_{13}	100 % RDN through chemical fertilizer + 25 % RDN through Biogas Slurry	99.29	100.15	99.72	6.09	6.13	6.11	131.36	132.04	131.70	122.00	123.00	122.50
T_{14}	100 % RDN through Biogas Slurry	93.37	94.87	94.12	4.92	5.08	5.00	121.01	122.25	121.63	114.67	116.00	115.33
	SEM	0.62	0.63	0.54	0.16	0.11	0.13	0.68	0.52	0.52	1.19	0.59	0.72
	C.D. (0.05)	1.80	1.84	1.56	0.47	0.33	0.37	1.98	1.51	1.50	3.45	1.73	2.08
	C.V. (%)	0.09	0.10	0.09	0.36	0.25	0.28	0.92	0.70	0.05	1.73	0.86	0.07

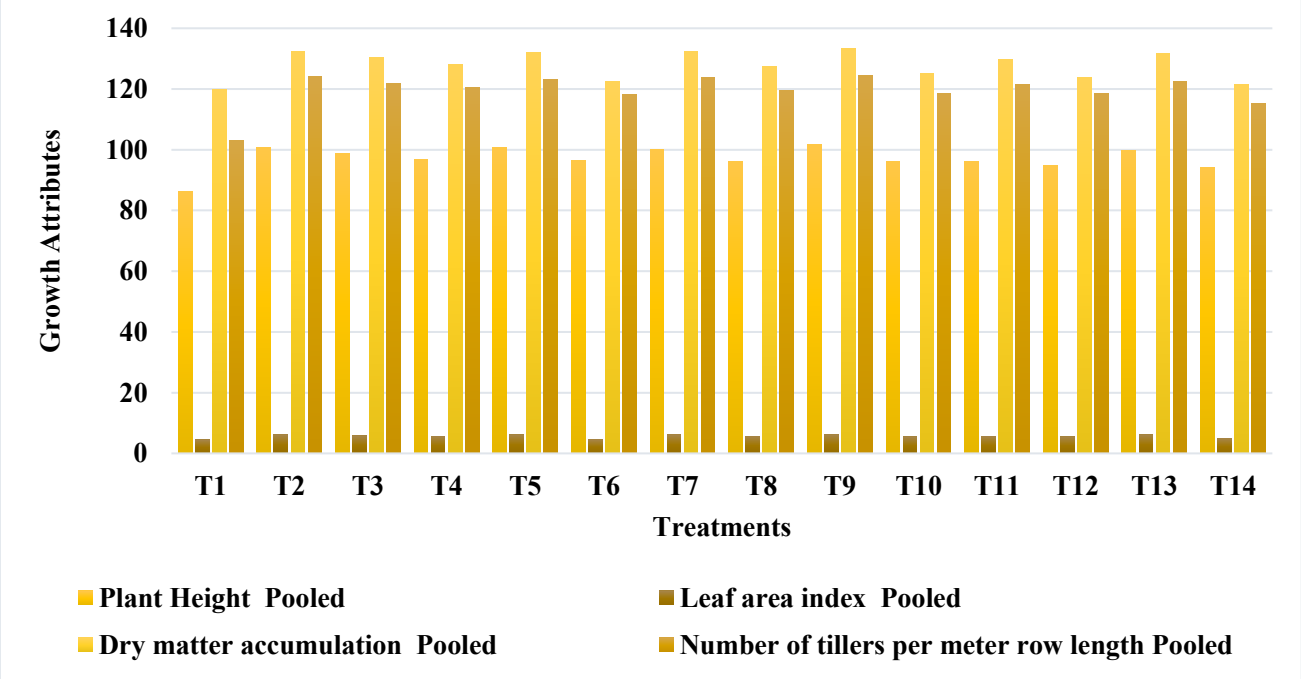

Fig.1: Effect of inorganic nutrient sources and organic manures on growth attributes of wheat

Yield Attributes

The analysis of yield attributes across different treatments reveals significant variations under the integrated nutrient management strategies show in table 2 and figure 2. The highest grain yield, straw yield, biological and harvest index were observed in treatment T_9 - (100% RDN through chemical fertilizer + 25% RDN through poultry manure) with 58.33 q ha^{-1}, 74.53 q ha^{-1}, 130.90 q ha^{-1} and0.45 % in 2023 and 59.30 q ha^{-1}, 73.97 q ha^{-1}, 131.70 q ha^{-1} and 0.45 % in 2024. Because of this, the findings

suggest that T_9 resulted in the highest grain yield, straw yield, biological yield and harvest index of wheat. This is due to the balanced nutrient supply from both inorganic and organic sources, which enhanced soil fertility and nutrient availability. The organic manure improved soil structure and microbial activity, while the RDF provided essential nutrients, promoting overall plant growth, increased photosynthetic efficiency, and optimal yield formation. This synergistic approach effectively boosted both the quantity and quality of wheat production. The lowest number of spikes was recorded in the treatment T_1 - control (no nutrient source) in all the yield attributes parameters.

Table 2: Effect of inorganic nutrient sources and organic manures on yield of wheat

Treatments		Grain yield (q ha^{-1})			Straw yield (q ha^{-1})			Biological yield (q ha^{-1})			Harvest Index (%)		
		2023	2024	Pooled	2024	Pooled	Pooled	2023	2024	Pooled	2023	2024	Pooled
T_1	Control (No nutrient sources)	44.47	47.43	45.95	59.33	63.00	61.17	103.80	110.43	107.12	0.43	0.43	0.43
T_2	100 % RDN (125 kg ha^{-1}) from fertilizers	55.90	57.10	56.50	72.21	72.33	72.27	128.11	128.77	128.44	0.44	0.44	0.44
T_3	75 % RDN (93.75 kg ha^{-1}) through fertilizer + 25% RDN through farm yard manure (FYM) (6 tons ha^{-1})	53.33	55.47	54.40	70.90	70.87	70.88	124.23	126.33	125.28	0.43	0.44	0.43
T_4	50 % RDN (62.5 kg ha^{-1}) through fertilizer + 50 % RDN through FYM (12 tons ha^{-1})	52.50	53.60	53.05	68.84	70.40	69.62	121.34	124.00	122.67	0.43	0.43	0.43
T_5	100 % RDN through fertilizer + 25 % RDN through FYM (6 tons ha^{-1})	55.80	56.80	56.30	71.96	71.39	71.67	127.76	128.19	127.97	0.44	0.44	0.44
T_6	100 % RDN through FYM (24 tons ha^{-1})	51.79	50.83	51.31	66.46	67.52	66.99	118.25	118.36	118.30	0.44	0.43	0.43
T_7	75 % RDN through fertilizer + 25% RDN through poultry manure (PM) (1.2 tons ha^{-1})	55.73	56.73	56.23	72.00	71.48	71.74	127.73	128.21	127.97	0.44	0.44	0.44
T_8	50 % RDN through fertilizer + 50 % RDN through PM (2.4 tons ha^{-1})	52.33	54.43	53.38	69.78	70.37	70.07	122.11	124.80	123.46	0.43	0.44	0.43
T_9	100 % RDN through fertilizer through PM + 25 % RDN through PM (1.2 tons ha^{-1})	58.33	59.30	58.82	74.53	73.97	74.25	130.90	131.70	131.30	0.45	0.45	0.45
T_{10}	100 % RDN through PM (4.8 tons ha^{-1})	51.83	52.17	52.00	66.95	68.02	67.48	118.78	120.18	119.48	0.44	0.43	0.44
T_{11}	75 % RDN through fertilizer + 25% RDN through Biogas Slurry (3.75 tons ha^{-1})	51.33	53.80	52.57	70.80	70.81	70.81	122.13	124.61	123.37	0.42	0.43	0.43
T_{12}	50 % RDN through fertilizer + 50 % RDN through Biogas Slurry (7.5 tons ha^{-1})	50.07	49.97	50.02	63.00	67.74	65.37	113.07	117.71	115.39	0.44	0.42	0.43
T_{13}	100 % RDN through fertilizer + 25 % RDN through Biogas Slurry (3.75 tons ha^{-1})	54.80	56.23	55.52	71.32	71.09	71.21	126.12	127.33	126.72	0.43	0.44	0.44
T_{14}	100 % RDN through Biogas Slurry (15 tons ha^{-1})	49.90	52.73	51.32	66.35	67.77	67.06	116.25	120.50	118.37	0.43	0.44	0.43
	SEm ±	0.80	1.27	0.83	0.78	0.64	0.55	1.19	1.09	1.11	0.00	0.01	0.00
	CD at 5%	2.32	3.68	2.41	2.45	1.86	1.60	3.47	3.17	3.26	0.01	0.02	0.01
	C.V. (%)	2.62	4.06	0.19	2.12	1.58	0.10	1.70	1.55	0.11	1.73	2.62	0.11

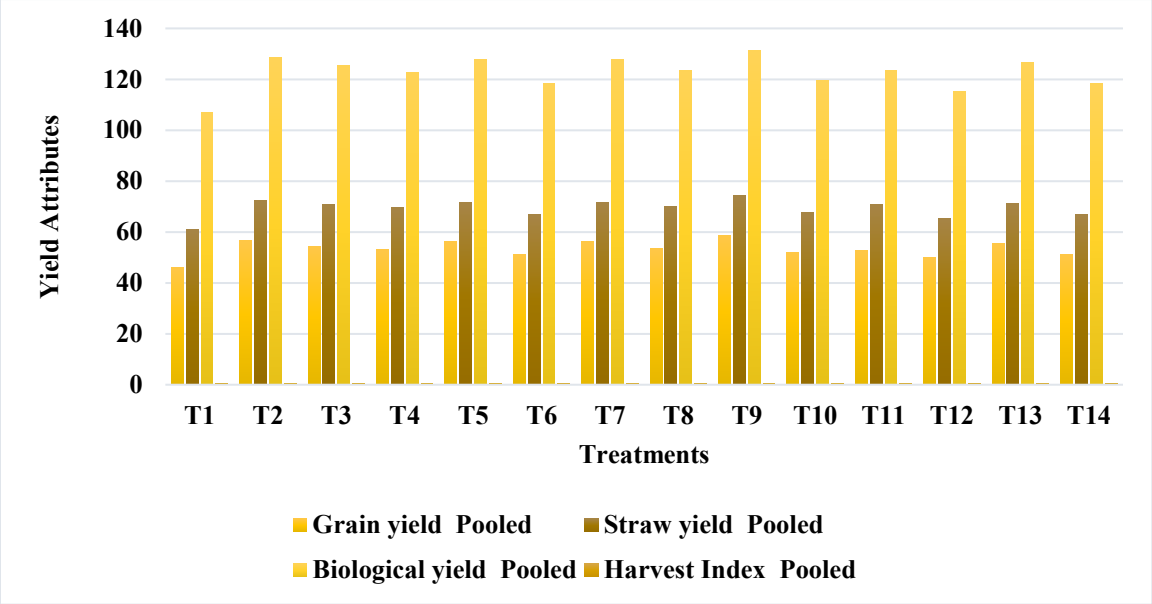

Fig.2: Effect of inorganic nutrient sources and organic manures on yield attributes of wheat

Quality parameter

The protein content significantly higher recorded in T_9 - (100 % RDN through fertilizers + 25% RDN through poultry manure) with 12.18 % during both the years present in table 3 and figure 3 which was statistically at par with T_2 – (100 % RDF (125 kg ha^{-1}) from fertilizers) (12.07 %), T_5 – (100 % RDN through fertilizer + 25 % RDN through FYM) (12.03 %), T_7 - (75% RDN through fertilizer + 25% RDN through poultry manure) (12.05 %) and T_{13} - (100% RDN through fertilizer + 25% RDN through biogas slurry) (12.03 %) during year 2023 and 2024. Due to this, Organic manures contribute to sustainable agriculture by enhancing nutrient uptake, improving soil microbial activity, and reducing dependence on synthetic fertilizers while maintaining superior crop quality.

Table 3: Effect of inorganic nutrient sources and organic manures on quality parameter of wheat

Treatments		2023	2024	Pooled
T1	Control (No nutrient sources)	10.77	10.65	10.71
T2	100 % RDN (125 kg ha-1) from fertilizers	12.04	12.10	12.07
T3	75 % RDN (93.75 kg ha-1) through fertilizer + 25% RDN through farm yard manure (FYM) (6 tons ha-1)	11.83	11.90	11.86
T4	50 % RDN (62.5 kg ha-1) through fertilizer + 50 % RDN through FYM (12 tons ha-1)	11.71	11.83	11.77
T5	100 % RDN through fertilizer + 25 % RDN through FYM (6 tons ha-1)	12.00	12.06	12.03
T6	100 % RDN through FYM (24 tons ha-1)	11.63	11.73	11.68
T7	75 % RDN through fertilizer + 25% RDN through poultry manure (PM) (1.2 tons ha-1)	12.06	12.04	12.05
T8	50 % RDN through fertilizer + 50 % RDN through PM (2.4 tons ha-1)	11.58	11.58	11.58
T9	100 % RDN through fertilizer through PM + 25 % RDN through PM (1.2 tons ha-1)	12.15	12.21	12.18
T10	100 % RDN through PM (4.8 tons ha-1)	11.52	11.60	11.56
T11	75 % RDN through fertilizer + 25% RDN through Biogas Slurry (3.75 tons ha-1)	11.63	11.69	11.66

T12	50 % RDN through fertilizer + 50 % RDN through Biogas Slurry (7.5 tons ha-1)	11.54	11.60	11.57
T13	100 % RDN through fertilizer + 25 % RDN through Biogas Slurry (3.75 tons ha-1)	12.02	12.04	12.03
T14	100 % RDN through Biogas Slurry (15 tons ha-1)	11.46	11.52	11.49
	SEm ±	0.09	0.09	0.08
	CD at 5%	0.26	0.27	0.24
	C.V. (%)	1.31	1.36	0.09

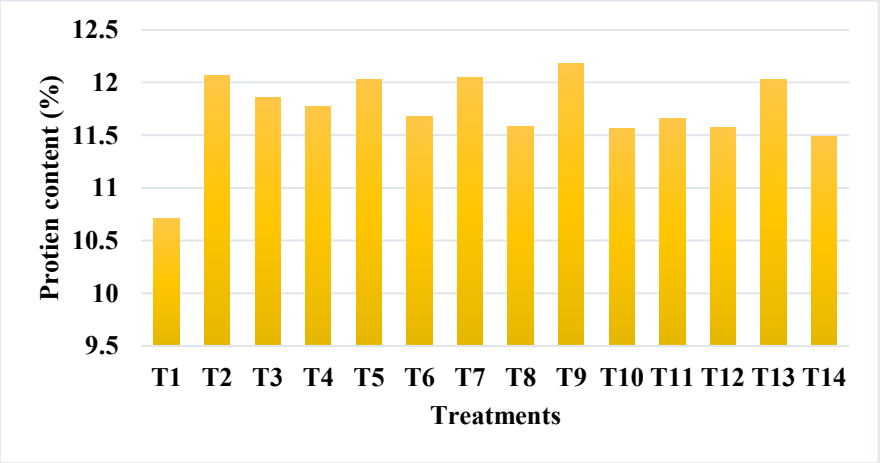

Fig.3: Effect of inorganic nutrient sources and organic manures on quality parameter of wheat

IV. CONCLUSION

Based on present study it was concluded that the combination of RDF and organic amendments helps to improve the growth and yield attributes of wheat which plays important role in the sustainable agriculture. Moreover, the significant improvement in growth parameters viz. plant height, leaf area index, dry matter accumulation and number of tillers per meter row length and yield parameters such as grain yield, straw yield, biological yield and harvest index were also recorded under T_9 (100% RDN through chemical fertilizer + 25% RDN through poultry manure) as compared to other treatments. Moreover, similar results were found under protein content in wheat which was maximum in T_9. The treatment T_1 Control (no nutrient source) recorded minimum results under all the growth and yield attributes of wheat in both the years.

REFERENCES

[1] Abdulrahimzai Z (2019). Thesis.7. Effect of different organic sources of nutrients on growth, yield and quality of wheat (*Triticum aestivum* L.) in western U.P.

[2] Anonymous (2024). *Package Practices for crops of Punjab - rabi*. pp 1. Punjab Agricultural University, Ludhiana.

[3] Bohme and Bohme 2006. Soil microbiological and biochemical properties affected by plant growth and different long-term fertilization. *European J. Soil Biol* **4**(2): 1-12.

[4] Brar B S, Singh J, Singh G and Kaur G (2015). Effect of long-term application of inorganic and organic fertilizers on soil organic carbon and physical properties in maize wheat rotation. Agron. 5, 220-238.

[5] Gangwar R M, Pandove G, Brar S K, Sekhon K S, Kaur S and Kumar R (2018). Integrated nutrient management in wheat by use of *azotobacter sp*. and *streptomyces badius*. *International Journal of Agriculture Innovations and Research* **6**(4): 1468- 1473.

[6] Ghosh P K, Ramesh P, Bandyopadhyay K K, Tripathi A K, Hati K M, Misra A K, Misra C L and Acharya C L (2004). Comparative effectiveness of cattle manure, poultry manure, phosphor compost and fertilizer – NPK on three cropping system in vertisols of semi-arid tropics. *Bioresource Technology* **95**: 77-83.

[7] Jat K, Singh Y V, Meena S K, Meena S K, Parihar M, Jatav H S, Meena R K and Meena, V S 2015. Does INM enhance agricultural productivity? *Journal of Pure and Applied Microbiology* **9**(2): 1211-1221.

[8] Mohammadi-joo S, Mishra A, Saediabueshaghi R and Amiri M 2015. Evaluation of bread wheat (*Triticum aestivum* L.) based on resistance indices under field conditions. *Journal of Biosciences*. **6** (2), Pp. 331-337