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Effect of nutrient and weed management practices on the yield attributes, yield and economics of wheat (*Triticum aestivum* L.)

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Abstract
A field experiment entitled *"*Effect of nutrient and weed management practices on the yield attributes, yield and economics of wheat (*Triticum aestivum*)*"* was carried out during the *rabi* season of 2024-25 at the Instructional Farm, Dau Kalyan Singh College of Agriculture and Research Station, Bhatapara (C.G.), to evaluate the influence of nutrient and weed management practices on yield attributes, yield and economics of wheat. The experiment was laid out in a split-plot-design with three replications, comprising four nutrient management treatments N_1: 100% RDF, N_2: 150% RDF, N_3: 100% RDF + Biofertilizer, and N_4: 150% RDF + Biofertilizer and four weed management practices S_1: Weedy check, S_2: Two hand weeding at 20 and 40 DAS, S_3: Ready-mix clodinafop-propargyl 60 g ha^{-1} + metsulfuron-methyl 4 g ha^{-1} at 25-30 DAS, and S_4: Ready-mix clodinafop-propargyl 24 g ha^{-1} + metribuzin 42 g ha^{-1} at 25-30 DAS. The results revealed that yield attributes such as spike length, grains ear^{-1}, 1000 seed weight, grain yield, and straw yield were significantly influenced by nutrient management. Application of 150% RDF + Biofertilizer produced the highest yield attributes and yield, followed by 150% RDF. Among the weed management practices, treatment 2 Hand weeding at 20 and 40 DAS (S_2) recorded significantly higher yield attributes *viz.*, spike length, number of grain ear $head^{-1}$, 1000 seed weight, grain yield and straw yield under study. Treatment Weedy check (S_1) recorded the lowest value of these parameters. Interaction effects between nutrient and weed management practices were found non-significant for yield attributes and yield. Economic analysis indicated that 150% RDF + Biofertilizer (N_4) achieved the highest gross returns (₹83,868 ha^{-1}), net returns (₹41,069 ha^{-1}), and B:C ratio (1.96). Among weed control options, two hand weeding (S_2) was most profitable, recording gross returns of ₹84,391 ha^{-1}, net returns of ₹43,745 ha^{-1}, and a B:C ratio of 2.08. Conversely, weedy check (S_1) resulted in the lowest economic gains. Overall, the study highlighted the superiority of integrated nutrient management with 150% RDF + biofertilizer in combination with effective weed management, particularly two hand weeding, for maximizing wheat productivity and profitability under Chhattisgarh conditions.

Keywords: Wheat, biofertilizer, metribuzin, metsulfuron methyl and clodinafop-propargyl

Introduction
Wheat (*Triticum aestivum*) is one of the most widely cultivated staple crops globally and has significantly contributed to human civilization for millennia. Thought to have originated in South western Asia, it gradually spread across continents, including Asia, Europe, Africa and the Americas, due to its adaptability to different climatic conditions. Wheat is a key dietary component, processed into various products such as bread, cakes, biscuits and other baked goods. Its flour is highly valued for its rich nutritional content, comprising 65-75% carbohydrates, 8-13% protein, 0.8-1.5% oil, 0.3-0.5% minerals and 0.2% cellulose (Hussain *et al.*, 2018) [8].

Wheat is the most dominant cereal crop worldwide, covering an area of 224.05 million hectares with a total production of 793.37 million tonnes. In India, it is cultivated on 31.82 million hectares, yielding 112.74 million tonnes with a productivity of 3,543 kg ha^{-1}. It ranks second among cereals in the country in terms of both area and production, following rice (Anonymous, 2022) [1]. In Chhattisgarh, wheat was grown on approximately 127,000 hectares, producing

191,000 tonnes with a productivity of 1,501 kg ha^{-1} during 2022-23 (Anonymous, 2023) [2].

Soil fertility and proper agronomic practices are crucial for maximizing the economic yield and quality of wheat. Fertilizers remain a vital component in meeting the country's food grain production targets. Among essential nutrients, nitrogen plays a fundamental role in wheat cultivation and has long been recognized as the cornerstone of fertilizer management programs. It is the most critical nutrient, required in larger quantities compared to phosphorus and potassium.

Nitrogen is a key nutrient essential for plant growth and yield enhancement in wheat. Among various agronomic practices, nitrogen application plays a crucial role in influencing both grain yield and quality. Wheat plants primarily absorb nitrogen in the form of ammonium (NH^{4+}) and nitrate (NO^{3-}), which are vital for chlorophyll synthesis, photosynthesis and the formation of amino acids and proteins-key components determining wheat quality. The rate and timing of nitrogen application significantly impact wheat yield and quality, with different cultivars exhibiting varying responses to nitrogen management strategies (Fazily *et al.*, 2020) [6].

Economic and environmental losses due to excessive use of chemical fertilizers in agriculture were recognized. Therefore, replacement of these types of fertilizers with good alternative is need of hour. Use of vermicompost and bio-fertilizers may be a good alternative in this direction (Singh *et al.*, 2024) [20].

Promoting the use of biofertilizers is essential as a cost-effective technology to reduce reliance on chemical fertilizers and support a pollution-free environment, which is crucial in today's agricultural landscape. Nitrogen-fixing bacteria have been successfully utilized in cereal crops, offering a sustainable alternative to synthetic nitrogen fertilizers at a lower cost. Numerous studies have documented significant yield improvements in various crops with the application of *Azotobacter* (Bahlool *et al.*, 2019 and Deepa *et al.*, 2022) [3, 5].

Azotobacter is a significant non-symbiotic nitrogen-fixing microorganism, playing a crucial role in nitrogen fixation for non-leguminous plants. Its application has been shown to enhance crop yields by 15-30%, with increases ranging from 2-45% in vegetables, 7-28% in cotton and 9-24% in sugarcane (Rabi *et al.*, 2019) [16]. Studies indicate that the use of *Azotobacter* can improve the yields of wheat, rice, maize, pearl millet and sorghum by 5-30% compared to untreated controls. Inoculation of soil or seeds with *Azotobacter* is particularly effective in well-manured soils with high organic matter content (Singh *et al.*, 2023) [24]. Beyond nitrogen fixation, *Azotobacter* also synthesizes biologically active compounds such as B-vitamins, Indole Acetic Acid, and Gibberellins in pure culture (Kakraliya *et al.*, 2017) [10]. These plant hormones stimulate root growth and development, enhancing nutrient uptake from applied chemical fertilizers.

Weed management is crucial for maximizing wheat productivity, as weeds compete with crops for vital resources such as nutrients, water, sunlight and space, ultimately reducing yields. Despite being a serious challenge, weed infestation is often underestimated compared to other yield-reducing factors like pests and diseases. The critical period for crop-weed competition in wheat occurs 11-21 days after crop emergence (Sahu *et al.*, 2018) [18]. In late-sown wheat, mixed weed flora infestation can cause grain yield losses of up to 34.3% (Hussain *et al.*, 2020) [7]. Before the widespread use of herbicides, weed control relied on traditional methods such as tillage, manual weeding and crop rotation. However, with the advent of herbicides, chemical weed control has become the most preferred approach worldwide. In India, herbicides are now extensively used for weed management across various crops (Rana and Niaz 2023) [17]. In wheat cultivation, chemical weed control is particularly favored due to labor shortages, high labor costs, and the limited feasibility of manual or mechanical weeding. The introduction of ready-mix herbicide formulations has further improved weed management by effectively controlling a broad spectrum of weeds in wheat (Sharma *et al.*, 2018) [19].

Materials and Methods

A field experiment was carried out during the *rabi* season of 2024-25 at the Instructional Farm, Dau Kalyan Singh College of Agriculture and Research Station, Bhatapara, Chhattisgarh (22.09° N latitude, 82.15° E longitude, 262 m above mean sea level). The experimental soil was sandy loam in texture, slightly alkaline in reaction (pH 7.10), low in organic carbon (0.49%), low in available nitrogen (214 kg ha^{-1}), medium in available phosphorus (11.06 kg ha^{-1}), and high in available potassium (326 kg ha^{-1}). The experiment was laid out in a split-plot-design (SPD) with three replications and 16 treatment combinations. The treatments consisted of four nutrient management *viz.*, N_1 - 100% RDF, N_2 - 150% RDF, N_3 - 100% RDF + Biofertilizer and N_4 - 150% RDF + Biofertilizer and four weed management practices *viz.*, S_1 - Weedy check, S_2 - 2 Hand weeding at 20 and 40 DAS, S_3 - Ready-mix Clodinafop-propargyl 60 g ha^{-1} + Metsulfuron methyl 4 g ha^{-1} at 25-30 DAS and S_4 - Ready mixture of clodinafop-propargyl 24 g ha^{-1} + Metribuzin 42 g ha^{-1} at 25-30 DAS. Weather data during the crop season were recorded at the Meteorological Observatory, DKS CARS, Bhatapara. No rainfall was received during the crop growth period. Relative humidity ranged from 37.8% (15th SMW, 2025) to 94.6% (48th SMW, 2024). The weekly mean maximum temperature varied from 22.9 °C (6th SMW, 2025) to 34.9 °C (15th SMW, 2025), while bright sunshine hours ranged from 2.58 to 9.32 hrs day^{-1}. The test crop was wheat (*Triticum aestivum*) variety CG Gehu - 4 (CG-1015), sown on 16th November 2024 at a spacing of 20 cm × 10 cm using a seed rate of 100 kg ha^{-1}. Seeds were treated with PSB and *Azotobacter* biofertilizers at the rate of 5 ml kg^{-1} seed prior to sowing. The RDF (120:60:40 kg N:P_2O_5:K_2O ha^{-1}) was applied as basal through urea, diammonium phosphate (DAP), and muriate of potash (MOP). The gross plot size was 4.0 m × 4.0 m, while the net plot size was 3.2 m × 3.6 m. Weed management practices were executed as per the experimental treatments. In S_2, two hand weeding were carried out at 20 and 40 DAS. In S_3, clodinafop-propargyl 15% WP @ 60 g ha^{-1} + metsulfuron-methyl 4 g ha^{-1} was applied as a post-emergence treatment at 25 DAS, while in S_4, clodinafop-propargyl 24 g ha^{-1} + metribuzin 42 g ha^{-1} was applied post-emergence at 25 DAS. Herbicides were applied at recommended doses with 500 L ha^{-1} water using a knapsack sprayer fitted with a flat fan nozzle. Standard agronomic practices were followed, and the crop was harvested manually at physiological maturity. Observations were recorded on yield attributes (spike length, grains spike^{-1}, 1000 seed weight, seed and straw yield, harvest index) using standard procedures. Economics of treatments was computed considering gross returns, net returns, and B:C ratio based on prevailing market prices, while statistical analysis was carried out using split-plot design.

Results and Discussion

Yield attributes

The data (Table 1) revealed that nutrient and weed management

practices exerted significant influence on the yield-attributing traits of wheat.

Effect of nutrient management: Among nutrient treatments, the application of 150% RDF + biofertilizer (N_4) produced the maximum spike length (10.4 cm), number of grains ear^{-1} (32.6), and 1000 seed weight (43.0 g). This was followed by 150% RDF alone (N_2), which recorded a spike length of 10.0 cm, grains ear^{-1} of 30.6, and 1000 seed weight of 42.3 g. The lowest values were recorded under 100% RDF (N_1), with 8.32 cm spike length, 25.4 grains ear^{-1}, and 38.3 g 1000 seed weight. The improvement in growth and yield attributes under 150% RDF + biofertilizer may be attributed to higher nutrient availability coupled with enhanced nutrient mobilization by biofertilizers, leading to better assimilate partitioning towards reproductive structures. Similar findings were reported by (Singh *et al.*, 2018) [21].

Effect of weed management: Weed management practices also exhibited a significant effect. The treatment of two hand weeding at 20 and 40 DAS (S_2) recorded the maximum spike length (10.8 cm), grains ear^{-1} (32.0), and 1000 seed weight (42.0 g). It was closely followed by clodinafop-propargyl 60 g ha^{-1} + metsulfuron methyl 4 g ha^{-1} (S_3), which produced 9.63 cm spike length, 29.3 grains ear^{-1}, and 41.6 g 1000 seed weight. The lowest values were observed in the weedy check (S_1), where spike length, grains ear^{-1}, and 1000 seed weight were 7.98 cm, 25.3, and 39.4 g, respectively. The superiority of two hand weeding at 20 and 40 DAS (S_2) could be due to complete removal of weeds at critical stages, ensuring better crop-weed competition in favour of wheat, which enhanced nutrient utilization and translocation of photosynthates to sink. These results are consistent with the findings of (Jat *et al.*, 2019) [9], who reported maximum yield attributes of wheat under manual weeding followed by post-emergence herbicide application.

Interaction effect: The interaction between nutrient and weed management was found non-significant for all the yield-attributing traits, indicating that the effect of nutrient and weed management was independent of each other. Similar trends of non-significant interaction effects were observed by (Kumar *et al.*, 2020) [11] in wheat under varying nutrient and weed control practices.

Table 1: Spike length, number of grains and 1000 seed weight of wheat as influenced by nutrient and weed management practices

Treatments	Spike length (cm)	Number of grains ear head^{-1}	1000 seed weight (gm)
Nutrient management			
N_1: 100% RDF	8.32	25.4	38.3
N_2: 150% RDF	10.0	30.6	42.3
N_3: 100% RDF + Biofertilizer	8.79	26.8	39.7
N_4: 150% RDF + Biofertilizer	10.4	32.6	43.0
S.Em (±)	0.31	0.88	1.2
CD (5%)	1.07	3.05	NS
Weed management			
S_1: Weedy check	7.98	25.3	39.4
S_2: 2 Hand weeding at 20 and 40 DAS	10.8	32.0	42.0
S_3: Ready-mix Clodinafop-propargyl 60 g ha^{-1} + Metsulfuron methyl 4 g ha^{-1} at 25-30 DAS	9.63	29.3	41.6
S_4: Ready-mix of clodinafop-propargyl 24 g ha^{-1} + Metribuzin 42 g ha^{-1} at 25-30 DAS	9.09	28.8	40.1
S.Em (±)	0.46	1.26	1.87
CD (5%)	1.37	3.7	NS
Weed management at same level of nutrient management			
S.Em (±)	0.61	1.76	2.39
CD (5%)	NS	NS	NS
Nutrient management at same or different level of weed management			
S.Em (±)	0.86	2.35	3.46
CD (5%)	NS	NS	NS

Yield

Effect of nutrient management: Nutrient management significantly influenced grain yield and straw yield, while harvest index was not affected (Table 2). Application of 150% RDF + biofertilizer (N_4) recorded the highest grain yield (36.3 q ha^{-1}), straw yield (39.6 q ha^{-1}), and harvest index (47.9%). This was followed by 150% RDF alone (N_2), which yielded 30.1 q ha^{-1} grain, 33.5 q ha^{-1} straw, and 47.3% harvest index. The lowest productivity was obtained under 100% RDF (N_1), with grain and straw yields of 20.0 and 25.0 q ha^{-1}, respectively. These results are in close agreement with the findings of (Singh *et al.*, 2017) [22] and (Kumar *et al.*, 2021) [12], who reported enhanced yield attributes and productivity of wheat under integrated nutrient management involving higher RDF levels and biofertilizers.

Effect of weed management: Weed management practices exerted a significant impact on yield. Two hand weeding at 20 and 40 DAS (S_2) produced the maximum grain yield (36.5 q ha^{-1}), straw yield (39.3 q ha^{-1}), and harvest index (48.0%). This was statistically at par with the post-emergence application of clodinafop-propargyl 60 g ha^{-1} + metsulfuron methyl 4 g ha^{-1} (S_3), which resulted in 29.8 q ha^{-1} grain, 34.6 q ha^{-1} straw, and 46.2% harvest index. The lowest grain yield (20.1 q ha^{-1}) and straw yield (25.1 q ha^{-1}) were observed in the weedy check (S_1), which also recorded a lower harvest index (45.4%). These findings corroborate with (Jat *et al.*, 2019) [9] and (Meena *et al.*, 2020) [14], who reported higher productivity of wheat with effective manual or chemical weed control compared to weedy checks.

Interaction effect: The interaction between nutrient and weed management was found non-significant for grain yield, straw yield, and harvest index. This suggests that the beneficial effects of nutrient and weed management operated independently rather than synergistically. Similar non-significant interactions were also reported by (Sharma *et al.*, 2018) [19] under varying fertility and weed management regimes in wheat.

Table 2: Grain yield, straw yield and harvest index of wheat as influenced by nutrient and weed management practices

Treatments	Grain yield (q ha^{-1})	Straw yield (q ha^{-1})	Harvest index (%)
Nutrient management			
N_1: 100% RDF	20.0	25.0	44.8
N_2: 150% RDF	30.1	33.5	47.3
N_3: 100% RDF + Biofertilizer	27.9	31.7	46.9
N_4: 150% RDF + Biofertilizer	36.3	39.6	47.5
S.Em (±)	0.87	1.13	1.57
CD (5%)	3.02	3.92	NS
Weed management			
S_1: Weedy check	20.1	25.1	45.4
S_2: 2 Hand weeding at 20 and 40 DAS	36.5	39.3	48.0
S_3: Ready-mix Clodinafop-propargyl 60 g ha^{-1} + Metsulfuron methyl 4 g ha^{-1} at 25-30 DAS	29.8	34.0	46.2
S_4: Ready-mix of clodinafop-propargyl 24 g ha^{-1} + Metribuzin 42 g ha^{-1} at 25-30 DAS	27.9	31.2	47.0
S.Em (±)	1.30	1.71	2.20
CD (5%)	3.84	5.02	NS
Weed management at same level of nutrient management			
S.Em (±)	1.74	2.26	3.14
CD (5%)	NS	NS	NS
Nutrient management at same or different level of weed management			
S.Em (±)	2.42	3.17	4.12
CD (5%)	NS	NS	NS

Economics

Effect of Nutrient Management: The data (Table 3) revealed that nutrient management practices exerted a significant influence on the economics of wheat cultivation. The highest gross returns (₹83868 ha^{-1}), net returns (₹41069 ha^{-1}) and B:C ratio (1.96) were recorded with the application of 150% RDF + Biofertilizer (N_4), followed by 100% RDF + Biofertilizer (N_3) which registered a net returns of ₹25660 ha^{-1} with a B:C ratio of 1.66. In contrast, the lowest net returns (₹8682 ha^{-1}) and B:C ratio (1.23) were obtained under 100% RDF (N_1).

Similar findings were reported by (Kumawat *et al.*, 2019) [13], who observed that the combined application of organic and inorganic sources improved nutrient availability and enhanced wheat productivity. Likewise, (Singh *et al.*, 2020) [23] emphasized that integrated nutrient management not only enhanced yields but also improved economic returns by maintaining soil fertility.

Effect of Weed Management: Among weed management practices, two hand weeding at 20 and 40 DAS (S_2) recorded the highest gross returns (₹84,391 ha^{-1}), net returns (₹43,745 ha^{-1}), and B:C ratio (2.08) due to effective weed removal during critical growth stages, reducing crop-weed competition. Comparable profitability was obtained with clodinafop-propargyl + metsulfuron-methyl (S_3), which yielded a net returns of ₹35,164 ha^{-1} and a B:C ratio of 2.04. The treatment clodinafop-propargyl + metribuzin (S_4) also proved economical (net returns ₹31,104 ha^{-1}, B:C ratio 1.93), indicating its suitability where manual weeding is labor-intensive. Similar advantages of chemical weed management were earlier reported by (Meena *et al.*, 2016) [15] and (Chopra *et al.*, 2021) [4].

Table 3: Economics of wheat as influenced by nutrient and weed management practices

Treatments	Cost of cultivation (₹ ha^{-1})	Gross return (₹ ha^{-1})	Net return (₹ ha^{-1})	B:C ratio
Nutrient management				
N_1: 100% RDF	37885	46567	8682	1.23
N_2: 150% RDF	41674	69702	28028	1.67
N_3: 100% RDF + Biofertilizer	39027	64687	25660	1.66
N_4: 150% RDF + Biofertilizer	42816	83886	41069	1.96
Weed management				
S_1: Weedy check	30206	46785	16579	1.55
S_2: 2 Hand weeding at 20 and 40 DAS	40646	84391	43745	2.08
S_3: Ready-mix Clodinafop-propargyl 60 g ha^{-1} + Metsulfuron methyl 4 g ha^{-1} at 25-30 DAS	33974	69138	35164	2.04
S_4: Ready-mix of clodinafop-propargyl 24 g ha^{-1} + Metribuzin 42 g ha^{-1} at 25-30 DAS	33424	64528	31104	1.93

Conclusion

The study demonstrated that nutrient management with 150% RDF + biofertilizer (N_4) significantly enhanced yield attributes, grain and straw yield, and profitability of wheat, followed by 150% RDF (N_2). Among the weed management practices, treatment 2 Hand weeding at 20 and 40 DAS (S_2) recorded significantly higher yield attributes and yield under study. Treatment Weedy check (S_1) recorded the lowest value of these parameters. Interaction effects between nutrient and weed management were non-significant. Economic analysis further confirmed the superiority of 150% RDF + biofertilizer (N_4) and two hand weeding (S_2), with maximum gross and net returns and higher B:C ratios. Thus, the integration of 150% RDF + biofertilizer with two hand weeding is recommended for achieving enhanced wheat productivity and profitability under the agro-climatic conditions of Chhattisgarh.

References

1. Anonymous. Progress report of AICRP on wheat and barley 2022-23, Social Science. Karnal: ICAR-Indian Institute of Wheat and Barley Research; 2022. p.30.
2. Anonymous. Area and production of wheat in Chhattisgarh.

Agric Stat 2022. 2023. p.41-65.
3. Bahlool NG, Kreem JA, Jasim AR. Influence of bacterial inoculants of local isolates of *Azotobacter vinelandii* and irrigation water quality on growth and yield of wheat (*Triticum aestivum*). Indian J Public Health Res Dev. 2019;10(2):376-380.
4. Chopra N, Singh A, Kumar R. Economic evaluation of chemical weed management practices in wheat (*Triticum aestivum*). Agric Rev. 2021;42(1):67-72.
5. Deepa, Singh YV, Tyagi S. Effect of biofertilizer, herbicide application and nitrogen management on growth and productivity of wheat (*Triticum aestivum*). Int J Curr Microbiol Appl Sci. 2022;8(4):2712-2719.
6. Fazily T, Thakral SK, Dhaka AK, Sharma MK. Effect of integrated use of inorganic and organic sources of nitrogen on nutrient uptake by wheat and soil fertility. Int J Curr Adv Res. 2020;9(2):201-204.
7. Hussain S, Khaliq A, Bajwa AA, Matloob A, Areeb A, Ashraf U, *et al*. Interference and economic threshold level of little seed canary grass in wheat under different sowing times. Environ Sci Pollut Res. 2020;22:441-449.
8. Hussain S, Sharifa M, Ahmad W, Khan F, Nihar H. Soil and plant nutrient status and wheat growth after mycorrhiza inoculation with and without vermicompost. J Plant Nutr. 2018;41(2):1-13.
9. Jat RS, Meena RH, Kumar A. Efficacy of weed management practices on growth and yield attributes of wheat. Indian J Weed Sci. 2019;51(2):129-133.
10. Kakraliya SK, Kumar N, Dahiya S, Kumar S, Yadav DD, Singh M. Effect of integrated nutrient management on growth dynamics and productivity trend of wheat (*Triticum aestivum*) under irrigated cropping system. J Plant Dev Sci. 2017;9(1):11-15.
11. Kumar P, Singh V, Choudhary SK. Influence of nutrient and weed management on productivity of wheat under irrigated conditions. J Pharmacogn Phytochem. 2020;9(2):453-457.
12. Kumar P, Singh V, Yadav R. Effect of integrated nutrient management on growth, yield and quality of wheat. J Pharmacogn Phytochem. 2021;10(1):1865-1870.
13. Kumawat N, Sharma RK, Singh P. Effect of integrated nutrient management on productivity and profitability of wheat (*Triticum aestivum*). J Pharmacogn Phytochem. 2019;8(2):2561-2565.
14. Meena MK, Singh A, Choudhary S. Integrated weed management in wheat for higher productivity and profitability. J Cereal Res. 2020;12(1):55-61.
15. Meena RS, Jat RD, Meena H. Herbicide combinations for effective weed control and productivity of wheat. Res Crops. 2016;17(3):456-461.
16. Rabi F, Sewhag M, Shweta, Kumar P, Kumar A, Devi U. Effect of integrated nitrogen management on economics of desi wheat. J Plant Dev Sci. 2019;11(12):747-750.
17. Rana M, Niaz A. Efficacy of various herbicides against weeds in wheat (*Triticum aestivum*). Afr J Biotechnol. 2023;11(4):791-799.
18. Sahu R, Kumari S, Kumar D, Mandal SK. Weed population, weed biomass and grain yield of wheat as influenced by herbicides application. Indian J Weed Sci. 2018;50(3):302-304.
19. Sharma J, Tomar SS, Singh A, Rajput RL, Tomar SS, Gupta V. Effect of fertility levels and weed management practices on weed dynamics, yield and economics of wheat (*Triticum aestivum*). J Pharmacogn Phytochem. 2018;2:25-28.
20. Singh MP, Kumar P, Kumar A, Kumar R, Diwedi A, Gangwar S, *et al*. Effect of NPK with biofertilizers on growth, yield and nutrient uptake of wheat (*Triticum aestivum*) in Western Uttar Pradesh condition. Soc Recent Dev Agric. 2024;16(1):83-86.
21. Singh R, Sharma P, Verma S. Effect of nutrient management on growth and yield of wheat (*Triticum aestivum*). Int J Curr Microbiol Appl Sci. 2018;7(5):1456-1463.
22. Singh R, Verma SK, Choudhary R. Influence of integrated nutrient management on yield and economics of wheat (*Triticum aestivum*). Int J Agric Sci. 2017;9(2):402-406.
23. Singh R, Yadav S, Mehta RK. Impact of nutrient management practices on yield, nutrient uptake and economics of wheat. Int J Chem Stud. 2020;8(3):234-239.
24. Singh V, Singh SP, Singh S, Shivay YS. Growth, yield and nutrient uptake by wheat (*Triticum aestivum*) as affected by biofertilizers, FYM and nitrogen. Indian J Agric Sci. 2023;83(3):331-335.