https://doi.org/10.48047/AFJBS.6.Si3.2024.3463-3470

African Journal of Biological Sciences

Journal homepage: http://www.afjbs.com

Research Paper Open Access

Effect of Nutrient Management and Weed Control Practices on Yield Attributes and yield of Wheat (*Triticum aestivum* L.)

Mohammad Nabi Marufi[1]

[1]Research Scholar, Department of Agronomy, Acharya Narendra Deva University of Agriculture & Technology, Kumarganj, Ayodhya, Uttar Pradesh, India

Dr. Rajesh Kumar[2]

[2]Associate Professor, Department Agronomy, Acharya Narendra Deva University of Agriculture & Technology, Kumarganj, Ayodhya, Uttar Pradesh, India

***CorrespondingAuthor-:**Dr. Rajesh Kumar,Associate Professor, Department Agronomy, Acharya Narendra Deva University of Agriculture & Technology, Kumarganj, Ayodhya, Uttar Pradesh, India.**Email:**drrajeshkumaragro@nduat.org

Article Info

Volume 6, Issue Si3, 2024

Received: 20 Apr 2024

Accepted: 05 May 2024

DOI:

10.48047/AFJBS.6.Si3.2024.3463-3470

Abstract

An experiment was carried out at Agronomy Research Farm of Acharya Narendra Deva University of Agriculture and Technology, Kumarganj, Ayodhya (Uttar Pradesh) in Rabi season of 2022-23 & 2023-24 to determine the effect of nutrient management and weed control practices on yield attributes and yield of various treatments on wheat crop. The experiment was laid out in split plot design with three nutrient levels and six weed control practices and replicated thrice. Application of 75% RDF + 10 t ha^{-1} FYM + one spray of nano-urea @ 4ml/lit found to be more effect on yield attributes and yield of wheat crop during both years of experimentation. In case of weed management spray of Clodinofop + Metsulfuron (60 + 4 g a.i. ha^{-1}) was more effective to control weeds and increase the yield attributes and yield of wheat during both year of experiment. This treatment having better weed control and higher nutrient uptake resulted in higher yield. Thus, it can be concluded that application of 75% RDF +10 t ha^{-1} FYM + one spray of nano-urea @ 4ml/lit with the spraying of Clodinofop + Metsulfuron (60 + 4 g a.i. ha^{-1}) proved better to increase the yield of wheat crop.

Keywords: Nutrient, weed, herbicide, nano urea, wheat

1. Introduction

Wheat (*Triticum aestivum* L.) belongs to family Poaceae, is the most important cereal crop for the majority of world population. It is the most important staple food of about two billion people (36% of the world population) worldwide. It provides nearly 55% of the carbohydrates and 20% of the food calories consumed globally and straw is a good source of feed for a large population of cattle in our country. It exceeds in acreage and production every other grain crop (including rice, maize, etc.) and therefore, the most important cereal grain crop of the world, which is cultivated over a wide range of climatic conditions. It is primarily grown in temperate regions at a high altitude as well as medium altitude in tropical and subtropical regions. It is grown in the world with an area of 215.9 million hectare, production 771.78 million tonnes and productivity of 3.53 tonnes per hectare. In India, it is grown in an area of 31.61 million hectare, production 109.52 million tonnes with a productivity of 3544 kg per hectare and Uttar Pradesh having first rank in respect to both area (9.85 million hectare) and production (31.16 million tonnes) with a productivity of 3604 kg per hectare (Agriculture Statistics at a Glance, 2021).

Among the different management practices, nutrient management is crucial in crop nutrition for achieving higher yields (Raun and Johnson,1999). The soils of India are deficient in nitrogen and are supplemented with chemical fertilizer for enhancing the crop productivity. Nitrogenous fertilizers play a vital role in modern farm technology, however only 20-50% of the soil applied nitrogen is recovered by the annual crops (Bajwa, 1992). The left-over nitrogen is lost from the soil system through denitrification, volatilization and leaching.

Nutrient application in agricultural system is expected to increase in the coming years to produce more food, feed and fiber from lesser land area. Efficient utilization of applied nutrients will be the key to sustainability in such high input-high output systems. Efficient fertilization is important from both economic and environmental point of view. It is synonymous with minimizing nutrient losses to the environment, while optimizing crop yields. It is appropriate here to mention that efficient nutrient use is essentially an offspring of balanced fertilizer use and sound management practices and decision. The balance nutrition plays an important role in raising the production potential of wheat because the wheat crop is extremely responsive to applied nutrient through numerous sources. Among various nutrients, nitrogen is required by wheat crop in large amount and usually supplied through outside sources like fertilizer and manures as most of the soil in wheat growing areas are deficient in nitrogen availability.

Nano-fertilizers are the important tools in agriculture to improve crop growth, yield and quality parameters with increase nutrient use efficiency, reduce wastage of fertilizers and cost of cultivation. Nano-fertilizers are very effective for precise nutrient management in precision agriculture with matching the crop growth stage for nutrient and may provide nutrient throughout the crop growth period. Nano-fertilizers increase crop growth up to optimum concentrations further increase in concentration may inhibit the crop growth due to the toxicity of nutrient. (Qureshi *et al*., 2018).

Among numerous factors answerable for low yield, weeds infestation and their management is one of the important factors. Weed competes with crop plants which results in yield reduction by 20-50%. The prominent weeds distinguished in wheat fields are *P. minor, Chenopodium album, Melilotus alba, Fumeria parviflora, Medicago denticulata, Vicia hirsuita, Vicia sativa, Avena ludoviciana, Coronopus didymus and Reumex acetocel.*

2. Material and methods

The field experiment was conducted during 2022-23 and 2023-24 at Agronomy Research farm, Acharya Narendra Deva University of Agriculture and Technology, Kumarganj, Ayodhya (U.P.). Geographically the experimental site falls under sub-tropical climate of Indo-gangatic plains (IGP), the soil of the experimental field was silty loam in reaction (*p*H 8.40), low in organic carbon (0.32%), available nitrogen (174.30 kg N/ha), and medium in available phosphorus (16.10 kg P/ha) and potassium (248.34 kg/ha). Treatments were laid down in a split plot design, replicated three times with 2 factors. First factor included of three nutrient levels, *viz*. 100% RDF (150:60:40 kgha^{-1}), 75% RDF + 10 t ha^{-1} FYM + one spray of nano-urea @ 4ml/lit and 50% RDF + 15 t ha^{-1} FYM + one spray of nano-urea @ 4ml/lit and six weed control practices Sulfosulfuron + Metsulfuron (30 + 2 g a.i. ha^{-1}), Clodinofop + Metsulfuron (60 + 4 g a.i. ha^{-1}), Sulfosulfuron + Carfentrazone (25 + 20g a.i. ha^{-1}), Sulfosulfuron + Carfentrazone (25 + 20g a.i. ha^{-1}), Clodinofop + Carfentrazone (60 + 20g a.i. ha^{-1}), Weed free, and Weedy check. In all, there were 18 treatment combinations included in the experiment. Wheat variety 'HD-2967' was sown on the 25 November, 2022 and 27 November, 2023 with 100 kg seed/ha, keeping row-to-row distance of 20 cm during both the years of experimentation. Nitrogen was applied as per treatment, but full amount of P and K were applied at the time of sowing and FYM was applied as per treatments and incorporated into the soil before the sowing of the crop. As per treatments, all the post-emergence herbicides were dissolved in water and applied 35 days after sowing, using knapsack sprayer fitted with flat- fan nozzle. Spray of nono-urea was done at 45 DAS with 315 liter water solution ha^{-1}.The experimental field was divided into 54 plots. Each gross plot size was 5.0 m x 4.0 m and net plot size was 4.0 m x 3.6 m and row to row distance was maintained 20 cm. At the time of harvesting, effective tillers were recorded from

same spots and averaged.

Total number of effective tillers of wheat in meter row-length were counted and expressed as number effective tillers m^{-2}. The random selection of ten spikes of wheat was done at harvest and their length was measured in centimeter from the base of the spike/lower spikelet to the tip of the spikelets and mean length of spike was computed. Number of spikelets from the ten spikes from each plot which was selected to compute the spikelet per spike and average was computed. From the ten selected spikes of wheat, grains were separated, cleaned and counted and the mean value of grains $spike^{-1}$ was computed. After threshing and weighing, a random sample of grains was drawn from grain yield of each plot. From this sample, 1000-grains were counted at random and their weight (g) was recorded. The above ground portion of plants after harvest was sun dried for one week and then weighed to work out biomass yield. After threshing and winnowing, grain yields from each plot were weighed separately. The harvest index was computed as suggested by Donald and Hamblin (1976) and calculating by formula:

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

3. Results and discussion

Effect on yield attributes

The data pertaining to yield attributes *viz*., number of effective tillers m^{-2}, length of spike (cm), number of grains per spike, grain weight $spike^{-1}$ (g), and test weight (g) have been presented in Table-1 and depicted in fig.1a and fig.1b. Among nutrient management application of75% RDF + 10 t ha^{-1}FYM + one spray of nano-urea @ 4ml/lit recorded significantly maximum number of effective tillers, Length of spike, grains $spike^{-1}$, grain weight $spike^{-1}$ and test weight and being at par with 100% RDF (150:60:40 kg ha^{-1}). However, the minimum yield parameters were recorded with application of 50% RDF + 15 t ha^{-1}FYM + one spray of nano-urea @ 4ml/lit. Similar results have been reported by the scientist like Yadav *et al.* (2003), Ram and Mir (2006), Rehman *et al.* (2010) and Deepa *et al.* (2019). The maximum yield attributes recorded with 75% RDF + 10 t ha^{-1}FYM + one spray of nano-urea @ 4ml/lit. might be due to effective fertile of plant with combined of fertilizers (RDF, FYM and nano-urea) that make it easy to plant to absorb the essential nutrients at different stages of crop growth.

In case of weed management, the maximum and minimum yield attributes *viz*. number of effective tillers, Length of spike, grains $spike^{-1}$, grain weight $spike^{-1}$ and test weight were recorded with weed free and weedy check and being at par with Clodinofop + Metsulfuron (60 + 4 g a.i. ha^{-1}), and Sulfosulfuron + Metsulfuron (30 + 2 g a.i. ha^{-1}) during 2022-23 and 2023-24 respectively. Among herbicidal treatments spray of Clodinofop + Metsulfuron (60 + 4 g a.i. ha^{-1}) recorded significantly maximum yield attributes and being at par with Sulfosulfuron + Metsulfuron (30 + 2 g a.i. ha^{-1}) during both years of investigations. Singh *et al. (*2007), Desai *etal.* (2015) and Aatif *et al.* (2017) reported the similar result.

TABLE1: EFFECT OF WEED AND NUTRIENT MANAGEMENT ON YIELD ATTRIBUTE OF WHEAT CROP

Treatment		Yield attribute									
		Effective tillers (m^{-2})		Spike length (cm)		No. of grains/spike		Grain weight/ spike(g)		Test weight (g)	
		2022-23	2023-24	2022-23	2023-24	2022-23	2023-24	2022-23	2023-24	2022-23	2023-24
A. Main plot (Nutrient Management)											
F_1	100% RDF (150:60:40 kg ha^{-1})	280.13	281.60	10.27	10.37	43.05	44.62	1.72	1.80	39.90	40.05
F_2	75% RDF + 10 t ha^{-1}FYM + one spray of nano-urea @ 4ml/lit	288.42	289.48	10.58	10.67	44.27	45.85	1.79	1.87	40.20	40.35
F_3	50% RDF + 15 t ha^{-1}FYM + one spray of nano-urea @ 4ml/lit	257.32	257.72	9.43	9.52	39.55	40.95	1.56	1.65	39.30	39.45
	SEm±	5.238	5.269	0.188	0.208	0.771	0.844	0.031	0.036	0.867	0.768
	C.D. at 5%	20.566	20.687	0.736	0.818	3.026	3.313	NS	NS	NS	NS
B. Sub plot (Weed Management)											
W_1	Sulfosulfuron + Metsulfuron (30 + 2 g	281.60	282.53	10.40	10.50	43.50	45.07	1.78	1.84	40.80	40.96

	a.i. ha^{-1})										
W_2	Clodinofop + Metsulfuron (60 + 4 g a.i. ha^{-1})	285.37	286.30	10.50	10.60	44.10	45.67	1.80	1.92	40.90	41.06
W_3	Sulfosulfuron + Carfentrazone (25 + 20g a.i. ha^{-1})	276.70	277.63	10.20	10.30	42.73	44.27	1.69	1.76	39.60	39.75
W_4	Clodinofop + Carfentrazone (60 + 20g a.i. ha^{-1})	267.77	264.63	9.03	9.23	40.43	41.97	1.67	1.73	39.30	39.45
W_5	Weed free (two hand weeding at 20 and 45 DAS)	297.80	299.10	10.67	10.70	44.60	46.20	1.84	1.99	41.30	41.45
W_6	Weedy check	235.50	236.40	8.67	8.77	36.37	37.67	1.34	1.40	36.90	37.04
	SEm±	6.013	7.320	0.219	0.297	0.915	1.165	0.037	0.052	1.108	1.037
	C.D. at 5%	17.366	21.142	0.632	0.857	2.641	3.365	0.106	0.151	NS	NS

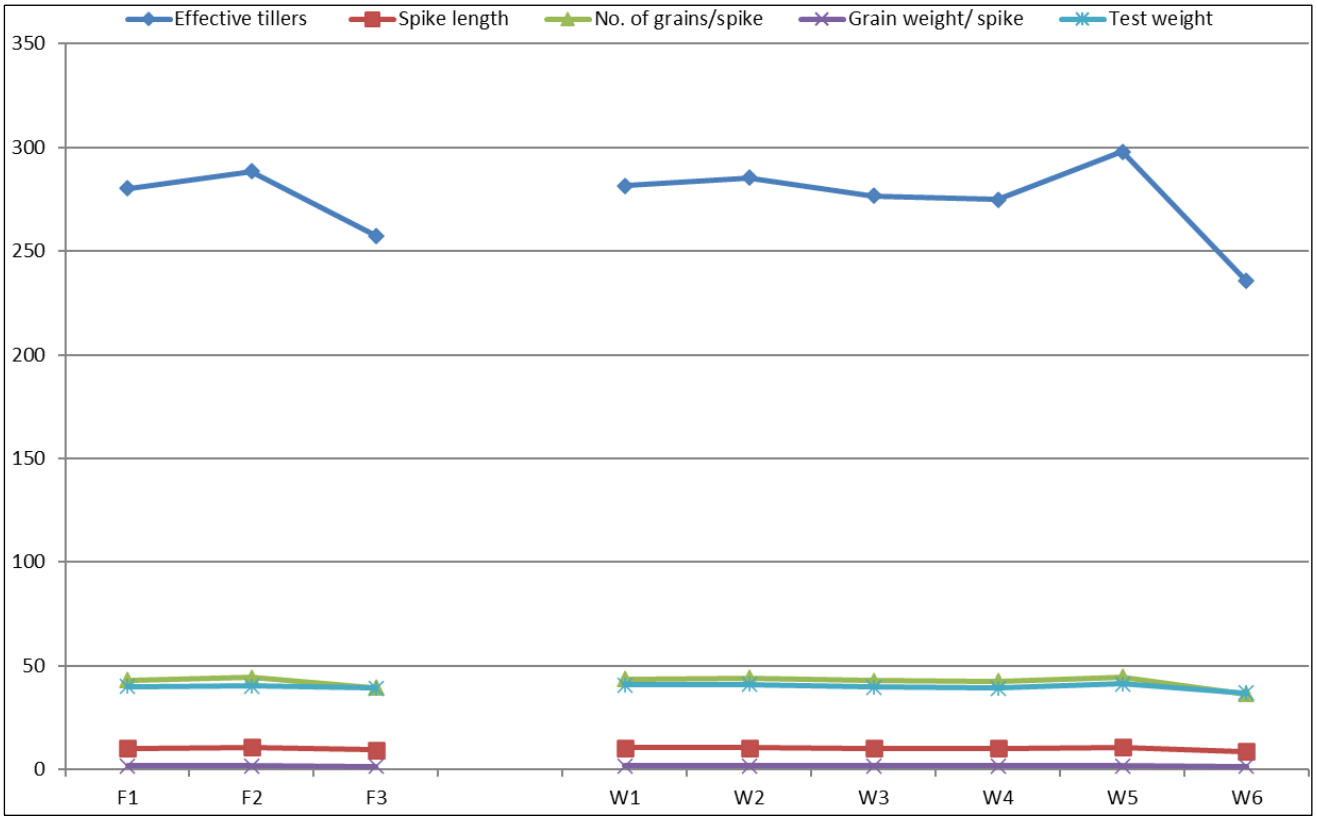

FIG1A: EFFECT OF WEED AND NUTRIENT MANAGEMENT ON YIELD ATTRIBUTE OF WHEAT CROP DURING 2022-23

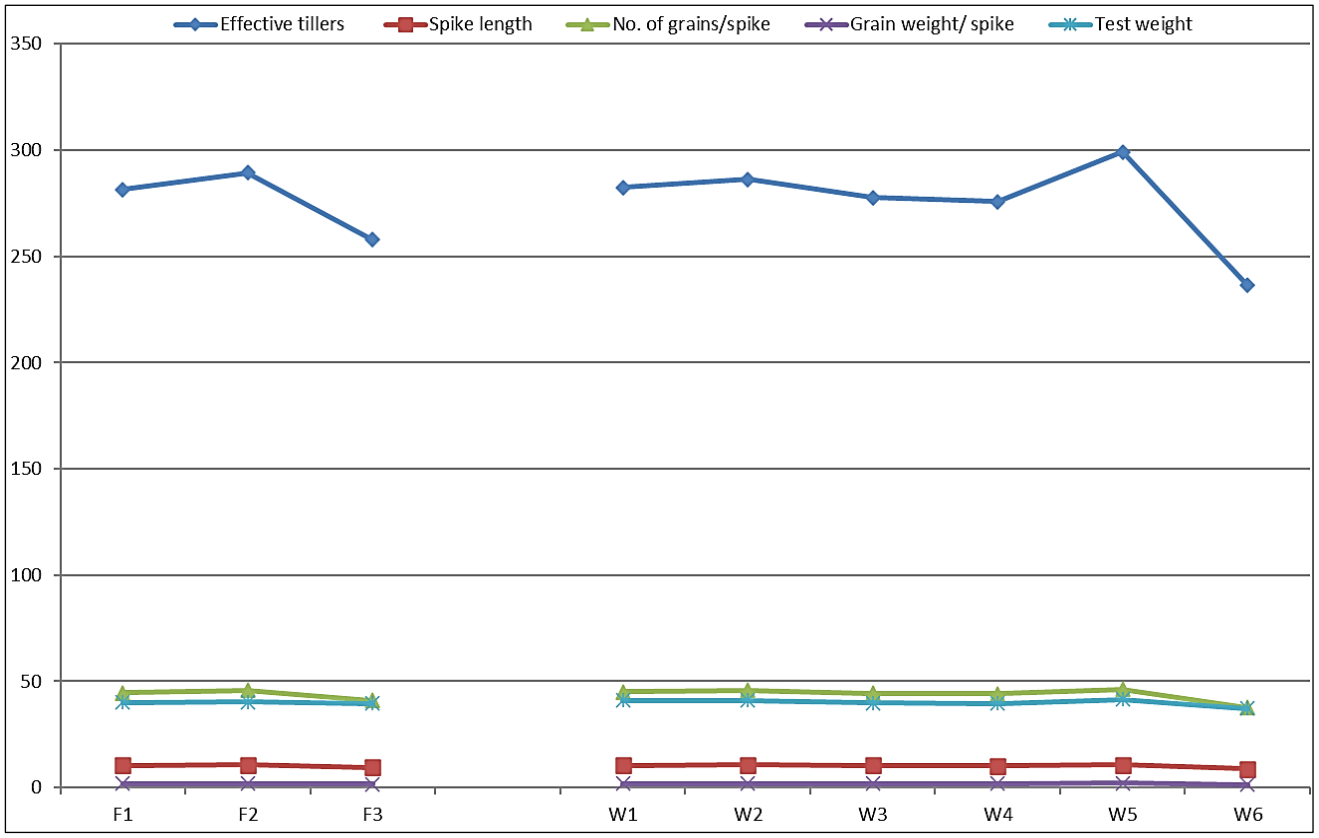

FIG1B: EFFECT OF WEED AND NUTRIENT MANAGEMENT ON YIELD ATTRIBUTE OF WHEAT CROP DURING 2023-24

Effect on yield

Grain yield

Data presented in Table 2 and depicted in fig. 2a. and fig. 2b. indicated that nutrient management and weed control practices had significant effect on grain yield of wheat during both the years of investigation.

Among nutrient management application of 75% RDF + 10 t ha^{-1}FYM + one sprayof nano-urea @ 4ml/lit recorded the maximumgrain yield i.e. (47.00 and 48.30), during 2022-23 and 2023-24 respectively which was at par with 100% RDF (150:60:40 kg ha^{-1}), while significantly higher than rest of the nutrient management practices during both the years of investigation. Maximum grain yield in these treatments were due to adequate supply of nutrients at active growth stages tends to maximum numbers of effective tillers, no. of grains spike^{-1}, length of spike and test weight resulted in maximum grain yield. Similar findings have been reported by Goyal *et al.* (2018) and Chattha *et al.* (2019). The application of 75% RDF + 10 t ha^{-1} FYM + one spray of nano-urea @ 4ml/lit increase the grain yield of wheat to the tune of 2.62% and 17.20% in 2022-23 and 6.90% and 18.38% in 2023-24 over 100% RDF (150:60:40 kg ha^{-1}) and 50% RDF + 15 t ha^{-1} FYM + one spray of nano-urea @ 4ml/lit, respectively.

Likewise fertility level, weed management practices also showed significant effect on grain yield during both the years of investigation. The data further revealed that maximum grain yield i.e. (50.20 and 51.10), during 2022-23 and 2023-24 recorded with weed free which was found at par with Clodinofop + Metsulfuron (60 + 4 g a.i. ha^{-1}) and Sulfosulfuron + Metsulfuron (30 + 2 g a.i. ha^{-1}) while significantly higher than rest of the weed control practices during both the years. Among herbicidal treatments the maximum grain yield was recorded with Clodinofop + Metsulfuron (60 + 4 g a.i. ha^{-1}) which was found at par with Sulfosulfuron + Metsulfuron (30 + 2 g a.i. ha^{-1}) during both years. Increase in grain yield by these treatments might be due improvement in physical condition of soil with weeding and effective control of weeds tends to maximum numbers of effective tillers, no. ofgrains spike^{-1}, length of spike and test weight resulted maximum grain yield. Similar findings reported by Singh *et al.* (2011) and Shehzad *et al.* (2012).

The yield of a crop depends upon the source and sinks relationship and it's the cumulative function of various growth parameters and yield attributing components viz., number of effective tillers, grains spike^{-1}, length of spike and test weight (1000 grain weight). Any factor affecting their parameters ultimately affects the biological and economic yield of a crop. Source components may be number of leaves, number of tillers and dry matter of the plants before anthesis and sink components viz., number of spikelets spike^{-1}, no. of spike m^{-2}, length of spike, no. of grain spike^{-1} and test weight. Final yield of wheat is the function of no. of spike m^{-2}, no. of grain spike^{-2} and 1000 grain weight, grain yield, being the economic

objective of the producers, assumes a vital importance and as such after basis of the comparison values of a particular treatment with other.

Straw Yield (q ha^{-1}):

Data presented in Table 2 and depicted in fig. 2a. and fig. 2b. indicated that nutrient management and weed control practices had significant effect on straw yield of wheat during both the years of investigation.

Among nutrient management application of 75% RDF + 10 t ha^{-1}FYM + one sprayof nano-urea @ 4ml/lit recorded the maximumstraw yield i.e. (69.43 and 70.87), during 2022-23 and 2023-24 respectively which was at par with 100% RDF (150:60:40 kg ha^{-1}), while significantly higher than rest of the nutrient management practices during both the years of investigation. Maximum straw yield in these treatments were due to adequate supply of nutrients at active growth stages tends to more no. of tillers, plant height and leaf area index resulted in maximum straw yield. Similar finding also was reported by Rajput *et al.* (2004) and Gupta *et al*. (2007).

Likewise the fertility level, weed management practices also showed significant effect on straw yield during both the years of investigation. The data further revealed that maximum straw yield i.e. (73.77 and 74.58), recorded with weed free during 2022-23 and 2023-24 which was found at par with Clodinofop + Metsulfuron (60 + 4 g a.i. ha^{-1}) and Sulfosulfuron + Metsulfuron (30 + 2 g a.i. ha^{-1}), while significantly higher than rest of the weed control practices during both the years. Among herbicidal treatments the maximum straw yield was recorded with Clodinofop + Metsulfuron (60 + 4 g a.i. ha^{-1}) which was found at par with Sulfosulfuron + Metsulfuron (30 + 2 g a.i. ha^{-1}) during both years. Increase in straw yield by these treatments might be due improvement in physical condition of soil with weeding and effective control of weeds tends to more no. of tillers, plant height and leaf area index resulted maximum straw yield. Similar findings have been reported by Paswan *et al*. (2017).

Biological yield (q ha^{-1}):

Data presented in Table 2 and depicted in fig. 2a. and fig. 2b. indicated that nutrient management and weed control practices had significant effect on biological yield of wheat during both the years of investigation.

Among nutrient management application of 75% RDF + 10 t ha^{-1}FYM + one sprayof nano-urea @ 4ml/lit recorded the maximumbiological yield i.e. (116.43 and 119.17), during 2022-23 and 2023-24 respectively which was at par with 100% RDF (150:60:40 kg ha^{-1}), while significantly higher than rest of the nutrient management practices during both the years of investigation. Maximum biological yield in these treatments were due to adequate supply of nutrients at active growth stages tends to more values of plant growth and yield attributes resulted in maximum biological yield. Similar findings also have been reported by Singh *et al*. (2013) and Maqsood *et al.* (2014).

Weed management practices also showed significant effect on biological yield during both the years of investigation. The data further revealed that maximum biological yield i.e. (123.97 and 125.68), recorded with weed free during 2022-23 and 2023-24, which was found at par with Clodinofop + Metsulfuron (60 + 4 g a.i. ha^{-1}) and Sulfosulfuron + Metsulfuron (30 + 2 g a.i. ha^{-1}) while significantly higher than rest of the weed control practices during both the years. Among herbicidal treatments the maximum biological yield was recorded with Clodinofop + Metsulfuron (60 + 4 g a.i. ha^{-1}) which was found at par with Sulfosulfuron + Metsulfuron (30 + 2 g a.i. ha^{-1}) during both years. Increase in biological yield by these treatments might be due improvement in physical condition of soil with weeding and effective control of weeds result in more plant height more plant population and yield attributes resulted maximum biological yield. Similar results have been reported by Paswan *et al*. (2017).

Harvest index

It is observed that the harvest index of wheat was not affected significantly by different levels of fertility and weed control practices during both years of investigation. However, the maximum values of harvest index was recorded with the application of 75% RDF + 10 t ha^{-1} FYM + one spray of nano-urea @ 4ml/lit and lowest being with 50% RDF + 15 t ha^{-1} FYM + one spray of nano-urea @ 4ml/lit during both years. Among weed management Weed free treatment recorded the maximum values of harvest index and lowest being with weedy check during both years of experimentation (Table 2 and fig. 2a. and fig. 2b.).

TABLE2: EFFECT OF NUTRIENT MANAGEMENT AND WEED CONTROL PRACTICES ON GRAIN, STRAW, BIOLOGICAL YIELD AND HARVEST INDEX (%) OF WHEAT CROP

Treatment	Yield (q ha^{-1})						Harvest index (%)	
	Grain yield		Straw yield		Biological yield			
	2022-23	2023-24	2022-23	2023-24	2022-23	2023-24	2022-23	2023-24

A. Main plot (Nutrient Management)									
F_1	100% RDF (150:60:40 kg ha^{-1})	45.80	46.50	68.22	68.81	114.02	115.31	40.14	40.30
F_2	75% RDF + 10 t ha^{-1}FYM + one spray of nano-urea@ 4ml/lit	47.00	48.30	69.43	70.87	116.43	119.17	40.34	40.50
F_3	50% RDF + 15 t ha^{-1}FYM + one spray of nano-urea @ 4ml/lit	40.10	40.80	59.53	60.17	99.63	100.97	40.22	40.38
	SEm±	0.820	0.860	1.189	1.344	1.940	2.129	0.746	0.829
	C.D. at 5%	3.218	3.378	4.670	5.279	7.619	8.360	NS	NS
B. Sub plot (Weed Management)									
W_1	Sulfosulfuron + Metsulfuron (30 + 2 g a.i. ha^{-1})	48.30	49.20	71.21	72.05	119.51	121.25	40.41	40.57
W_2	Clodinofop + Metsulfuron (60 + 4 g a.i. ha^{-1})	49.20	50.10	72.45	73.27	121.65	123.37	40.44	40.60
W_3	Sulfosulfuron + Carfentrazone (25 + 20g a.i. ha^{-1})	43.10	44.00	64.40	65.31	107.50	109.31	40.09	40.25
W_4	Clodinofop + Carfentrazone (60 + 20g a.i. ha^{-1})	40.60	41.50	60.71	61.64	101.30	103.14	40.07	40.23
W_5	Weed free (two hand weeding at 20 and 45 DAS)	50.20	51.10	73.77	74.58	123.97	125.68	40.49	40.65
W_6	Weedy check	34.40	35.30	51.83	52.83	86.23	88.13	39.89	40.05
	SEm±	0.962	1.182	1.415	1.926	2.359	2.923	0.874	1.150
	C.D. at 5%	2.779	3.413	4.087	5.562	6.813	8.442	NS	NS

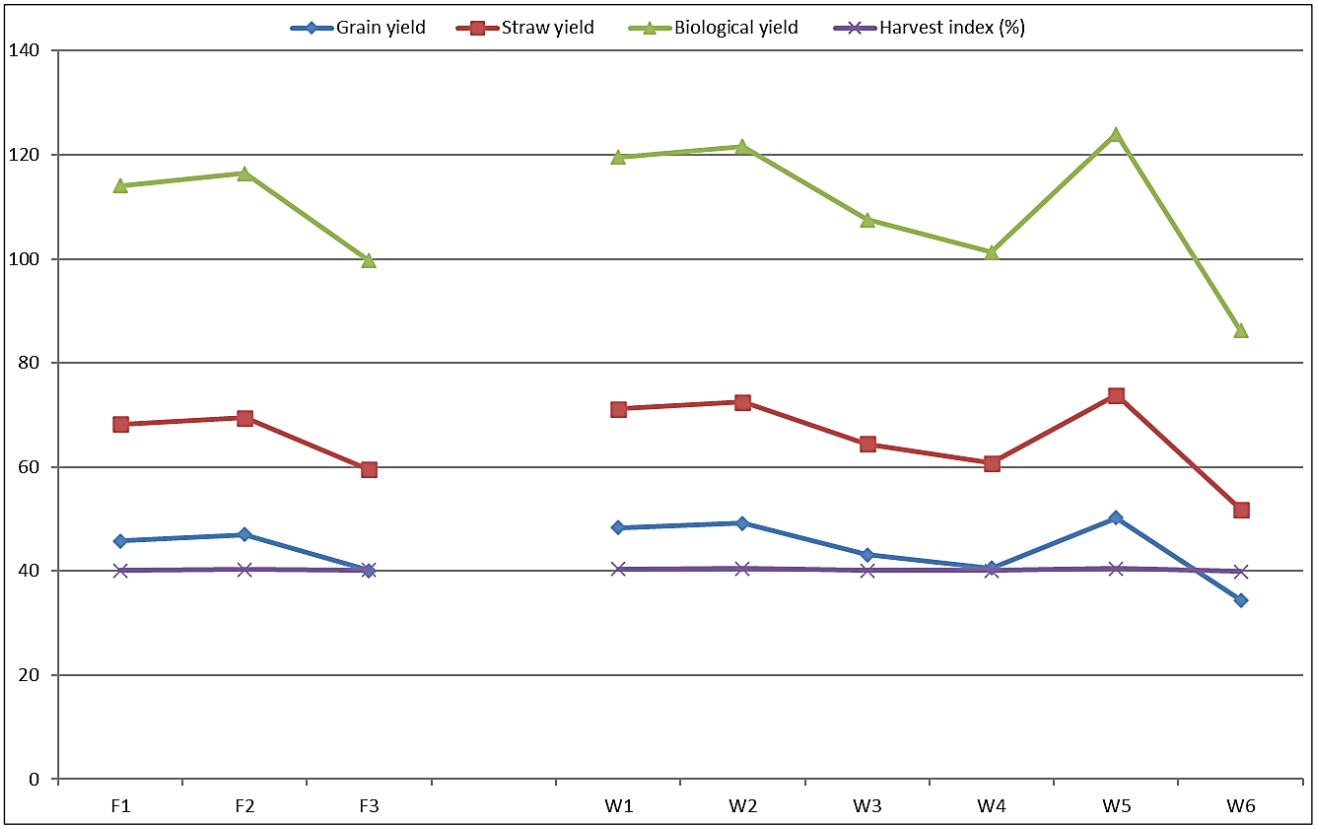

FIG2A: EFFECT OF NUTRIENT MANAGEMENT AND WEED CONTROL PRACTICES ON GRAIN, STRAW, BIOLOGICAL YIELD AND HARVEST INDEX (%) OF WHEAT CROP DURING 2022-23

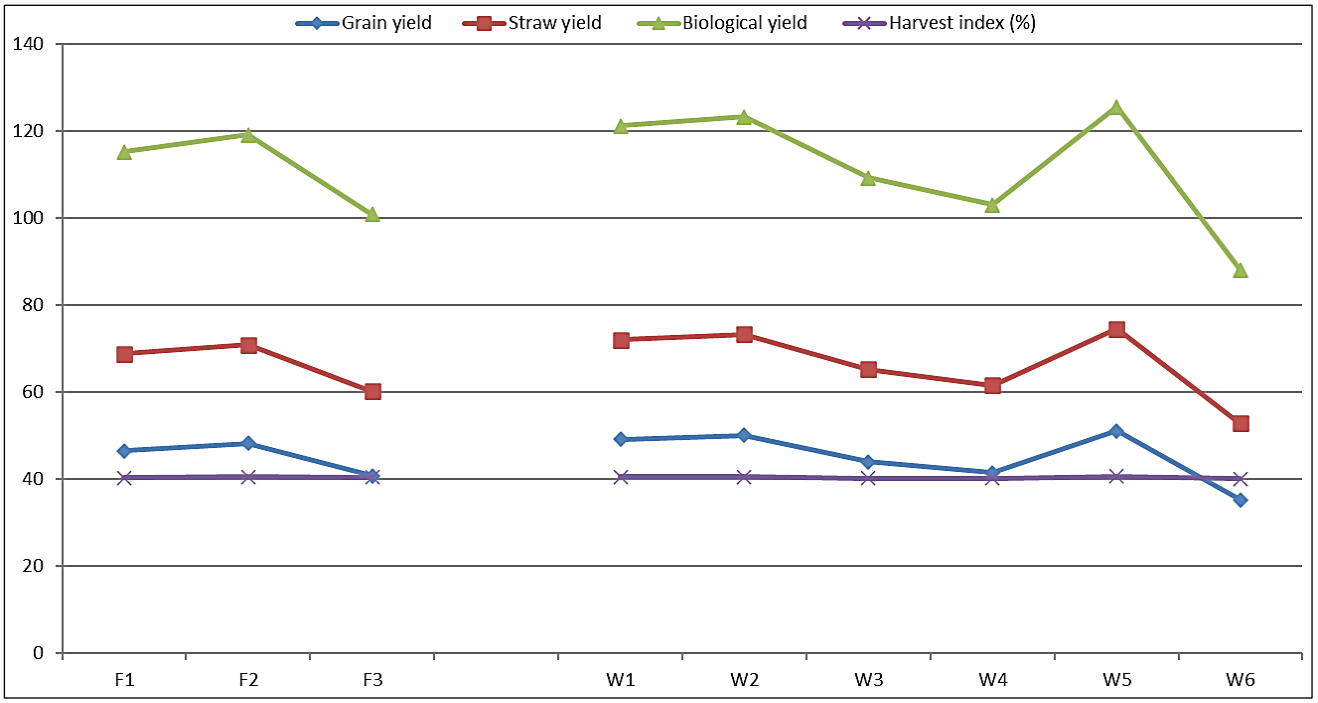

FIG2B. EFFECT OF NUTRIENT MANAGEMENT AND WEED CONTROL PRACTICES ON GRAIN, STRAW, BIOLOGICAL YIELD AND HARVEST INDEX (%) OF WHEAT CROP DURING 2023-24

4. Conclusion

On the basis of experiment, it can be concluded that application of 75% RDF + 10 t ha^{-1} FYM + one spray of nano-urea @ 4ml/lit with the spraying of herbicide Clodinofop + Metsulfuron (60 + 4 g a.i. ha^{-1}) found superior for increasing the yield attributes as well as the grain, straw, biological yield and harvest index of wheat in such treatments.

5. Reference

[1] Aatif, M., Khan, H., Anjum, M. M., Ali, N. and Hamid, M. (2017). Effect of farm yard manure and phosphorus levels on yield and yield components of wheat. *Int. J Environ Sci. Nat. Res.,* 2(4): 133-137.

[2] Agricultural statistics at a glance 2021. Directorate of Economics and Statistics, Department of Agriculture and Co-operation, Ministry of Agriculture, Government of India, New Delhi.

[3] Bajwa, M.I. 1992. Soil fertility management for sustainable agriculture. *In:* Proceeding 3rd National Congress of Soil Science. *Lahore, Pakistan.* March 20-22, 1990, P. 7-25.

[4] Chattha, M.U., Hassan, M.U., Barbanti, L., Chattha, M.B., Khan, I., Usman, M., Ali, A., & Nawaz, M. (2019). Composted Sugarcane By-Product Press Mud Cake Supports Wheat Growth and Improves Soil Properties. *International Journal of Plant Production,* 13: 241-249.

[5] Deepa, Singh, Y. V. and Tyagi, S. (2019). Effect of biofertilizer, herbicide application and nitrogen management on growth, productivity of wheat (*Triticum aestivum* l.). *Int. J. Curr. Microbial. App. Sci.,* 8(4): 2712-2719.

[6] Desai, H. A., Dodia I. N., Desai, C. K., Patel, M. D. and Patel, H. K. (2015). Integrated nutrient management in wheat (*Triticum aestivum* L.) *Trends in Bio sci.,* 8(2): 472-475.

[7] Goyal, G., Verma, V.K., Pyare, R., Yadav, D.D., Husain, K. & Verma, K.B. (2018). Studies on The Effect of Zinc, Iron and FYM on Growth, Yield and Quality Improvement in Timely Sown Wheat (*Triticum aestivum* L.) Varieties. *International Journal of Chemical Studies*, 6(5): 2078-2082.

[8] Gupta, M., Bali, A.S., Sharma, B.C., Kachroo, D. and Bharat, A. (2007). Productivity, nutrient uptake and economics of wheat (*Triticum aestivum*) under various tillage and fertilizer management practices. *Ind. J. Agro.,* 52(2): 127-130.

[9] Maqsood, M., Shehzad, M. A., Ramzan, Y. and Sattar, A. (2014). Effect of nitrogen nutrition on growth, yield and radiation use efficiency of different wheat (*Triticum aestivum* l.) cultivars. *Pak. J. Agri. Sci.,* 51(2): 441-448.

[10] Paswan, A.K., Mandal, D., Kumar, J. & Kumar, R. (2017). Influence of Weed Management Practices on Productivity of Wheat (*Triticum aestivum* L.) Under Middle Indo-Gangetic Plains of Eastern India. *International Journal of Current Microbiology and Applied Sciences*, 6 (6): 2486-2491.

[11] Qureshi, A., Singh, D.K., and Dwivedi, S. 2018. Nano-fertilizers: A Novel Way for Enhancing Nutrient Use Efficiency and Crop Productivity. *Int.J.Curr.Microbiol.App.Sci*7(2): 3325-3335.

[12] Rajput, M. I. Soomro, Z. A. and Siddiqui, S. A. (2004). Evaluation of bread wheat on different fertilizer levels. *Asian J. Plant Sci.,* 3(1): 143-144.

[13] Ram, T. and Mir, M. S. (2006). Effect of integrated nutrient management on yield and yield attributing characters of wheat (*Triticum aestivum*). *Ind. J. Agro.,* 31(3): 189-192.

[14] Raun, W. R., and Johnson, G.V. 1999. Improving nitrogen use efficiency for cereal production. *Agronomy Journal*, 91: 357-363

[15] Rehman, S., Khalil. S., Muhammad. F., Rehman, A., Khan, A. Z. Amanullah, Saljoki., A. R. Zubair, M. and Khalil, I. H. (2010). Phenology Leaf area index and grain yield of rainfed wheat influenced by organic and inorganic fertilizer. *Pakistan J. Botany,* 42(5): 3671-3685.

[16] Shehzad, M. A., Nadeem, M. A. and Iqbal, M. (2012). Weed control and yield attributes against post-emergence herbicide application in wheat crop. *Global advanced res. J. Agril. Sci.,* 1(1): 007-016.

[17] Singh, A.K., Kumar, R., Singh, A.K. and Kumari, A. (2011). Performance of sulfosulfuron against weeds in irrigated wheat (*Triticum aestivum*). *Environment and Ecology* 29(2A): 831-833.

[18] Singh, R. K.; Singh, S. K. and Singh, L. B. (2007). Integrated nitrogen management in wheat (*Triticum aestivum*). *Ind. J. Agro.,* 52(2): 124-126.

[19] Singh, V., Singh, S. P. Singh, S. and Shivay, Y. S. (2013). Growth, yield and nutrient uptake by wheat (*Triticum aestivum*) as affected by biofertilizers, FYM and nitrogen. *Ind. J. Agril. Sci.,* 83(3): 331–334.

[20] Yadav, R. S., Yadav, P. C. and Dahama, A. K. (2003). Integrated nutrient management in wheat (*Triticum aestivum*) mungbean (*Phaseolus radiatus*) cropping sequence in arid region. *Ind. J. Agro.,* 48(1): 23-26.