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YIELD AND YIELD ATTRIBUTES OF WHEAT *(TRITICUM AESTIVUM.* L) AS INFLUENCED BY MOISTURE REGIMES, NITROGEN LEVELS AND WEED CONTROL MEASURES

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ABSTRACT

Discriminative and judicious use of agricultural inputs is need of the hour. Effect of different moisture regimes, nitrogen levels and weed control measure on the growth and yield of wheat (*Triticum aestivum* L.) was evaluated in this study. Maximum yield, grain yields (39.29 qha^{-1}) and straw yield (56.26 qha^{-1}) was recorded under 1.0 IW/CPE ratio. Highest yield and yield attributed were recorded under 150 kg ha^{-1} doze of nitrogen and in case of weed control measure Sulfosulfuron @ 33 g ha^{-1} was found to be most effective in controlling weeds and improving yield. Above combination of moisture regime, nitrogen level and weed control method was found to be most effective in improving yield and yield attributes in Wheat.

INTRODUCTION

Wheat (Triticum aestivum L.) is an important cereal crop of cool environment and is gaining popularity all over the world and especially in India (Sinha *et al.,* 2011). Farmers obtain high yield when proper crop management is matched with favourable weather conditions and appropriate agronomic management. Yields of field crops in India have decreased due to the advent of increasing water scarcity in this century. The water is a very limiting input for the crop production; its efficiency is quite low. Appropriate management of irrigation water, is the key to reap full benefit from all other resources/ inputs. Proper growth and development of wheat needs favorable soil moisture in the root zone. Extractable water capacity of soil has significant influence on wheat grain yield and water productivity response to irrigation (Arora *et al.,* 2007). The moisture content in the soil gradually decreases with time in dry season and simultaneously soil moisture tension increases. Excessive irrigation increases evapotranspiration and decreases water use efficiency and may also reduce grain yield (Sun *et al.,* 2011). Grain yield increases with the increase in the frequency of irrigation (Sharma *et al.,* 1990). Improper scheduling of irrigation results not only in wastage of water but also adversely affects crop growth and yield (Shirazi 2011). Application of irrigation based on available soil moisture, or on climatic approach has been found more appropriate for getting higher economic return, water productivity and nutrient use efficiency (Jat *et al.,* 2008).

Rational nitrogen (N) fertilization is one of the most important agronomic management practicesas it affects profitability and the environment, yet the amount and timing of N remains a huge management challenge. Crops growing with N deficiency lose greenness, they are usually smaller with less biomass, and have reduced photosynthetic capacity, resulting in poor yield and low protein content. Moreover, excessive N application will result in potential environmental impact due to nitrate leaching, ammonia volatilization, nitrous oxide emissions and soil acidification (Chen *et al*., 2008a,b; Li *et al.,* 2008). It has been estimated that more than 50% of the human population relies on N fertilizers for food production (FAO, 2008). Their global demand has increased of about 7.3 million tons of N per year (IFAI, 2008). In rainfed environments, farmers generally apply uniform rates of N without taking into account the spatial variability of soil, available water or availability of nutrients. Indiscriminative application of fertilizer can lead to over or under-fertilization, decreasing the efficiency of the fertilizer use. Weeds are important obstacles to crop production, particularly in low-input and intensive agriculture systems (Sharma, 2014). Weeds are notorious, causing several health disorders, environmental pollution, decreasing the aesthetic value of land, obstacle to aquatic life, mining-off huge quantity of water and nutrients from the soil, crop yield reducers that are, in many situations, economically more important than insects, fungi or other pest organisms (Singh, 2014 and Gupta *et al*., 2013). Weeds do not die after a critical period and herbicide remains as such, present into the soil, which will reach to the ground water through leaching and in water bodies through land degradation, causing several types of health related problems in human, animals and on the aquatic environment. At present weed management approaches used in country are mostly dependent largely on herbicide application after critical period of weed competition and thus, resources are wasted without any significant yield advantage, so selection of herbicide should be appropriate to obtain higher yield. *Primary objective of this study is to find out the suitable moisture regime, N-dose and apt herbicide options for weed management and their relative influence on yield and yield attributes in wheat crop.*

MATERIALS AND METHODS

The field experiment was conducted at Agronomy Research Farm of Narendra Deva University of Agriculture and Technology, Faizabad (UP). Soil at the experimental site is silt loam and site receives average annual rainfall of about 1200 mm. and average minimum and maximum annual temperatures are 18.6°C and 31.3°C, respectively. Mean annuals pan evaporation of the area is 4.8 mm/day. The experiment (split-split-plot), involve moisture regime-Irrigation at 0.8 IW/CPE ratio with 4 cm depth (I_1), Irrigation at 1.0 IW/CPE ratio with 4 cm depth (I_2), Irrigation at CRI, late jointing and milking with 4 cm depth (I_3) Irrigation at CRI, maximum tillering, late jointing, flowering and milking with 4 cm. depth (I_4). Nitrogen level-75% of recommended dose (120 kg ha-1) of N (F_1), 100% of recommended dose of N (F_2), 125% of recommended dose of N (F_3) was conducted in three replications. Weed control measure-Isoproturon @ 1.25 kg ha-1(W_1), Sulfosulfuron @ 33 g ha^{-1} (W_2) which affect to yield and yield attributes of wheat.

The number of spikes were counted by placing a running meter at two places randomly in each plot at complete maturity of crop and were averaged over to find out average number of spikes m^2. Length of 10 randomly selected spikes from each plot was measured and averaged to single spike. The spikelets of five sampled spikes selected from each plot and average to single spike and found out number of spikelets per spike. Grain samples were collected from the produce of each plot and 1000 grains were counted and weighed in g at 14% moisture content. The spikelets of five sampled spikes were threshed and the number of grains $spike^{-1}$ was calculated. Spikelet's from each plot was threshed separately. Grain yield was recorded in kg/plot and finally expressed in q/ha at 14 per cent moisture content. Straw yield for each plot was obtained by subtracting the grain yield from biological yield and ultimately converted into q/ha at oven dry basis.

RESULTS AND DISCUSSION

A perusal of data obviously shows that number of spike per running meter, length of spike, number of spikelets per spike, number of grains per spike, test weight, Grain and straw yield were significantly influenced due to different moisture regime (Table-1). Maximum number of spike per running meter, length of spike, number of spikelets per spike, number of grains per spike, test weight, Grain and straw yield (Fig.1) were recorded under 1.0 IW/CPE ratio followed by 0.8 IW/CPE ratio, 5 irrigations given at CRI, maximum tillering, late jointing, flowering and milking stage . Under wettest moisture regime (1.0 IW/CPE ratio) favorable vegetative growth and development was observed because adequate moisture was received during entire period of growth. For similar reasons, the plant height, leaf area index were highest contributing to highest yield attributes and increased photosynthetic activity of leaves. Besides, translocation of photosynthesis from source to sink also increased under wettest condition through higher uptake of potassium lead to better yield attributed. Minimum yield attributes were recorded where 3 irrigation were given at CRI, late jointing and milking because of plant were unable to extract more water and nutrients under moisture deficit condition which resulted in poor growth and yield attributes. This result is in close proximity to those obtained by Khatri *et al*. (2001).

The yield attributes *viz*. number of spike running $meter^{-1}$ (93.0),

Table 1: Yield and Yield attributes of wheat as affected by moisture regimes, nitrogen levels and weed control measures

Treatments Moisture regimes	No. of spike $running^{-1}$ meter	Length of spike (cm)	No. of spikelets $spike^{-1}$	No. of grains $spike^{-1}$	1000-grain weight (g)	Grain yield (q ha^{-1})	Straw yield (q ha^{-1})
I_1	89.0	8.11	12.1	36.2	39.18	36.08	53.47
I_2	92.0	8.31	13.1	38.7	40.21	39.29	56.26
I_3	78.0	7.33	11.2	33.0	38.21	30.63	46.10
I_4	88.2	8.09	12.0	35.8	38.29	34.96	52.05
S.Em ±	0.44	0.08	0.25	0.74	0.26	0.74	1.06
CD at 5 %	1.52	0.28	0.86	2.56	0.89	2.55	3.67
Nitrogen levels							
F_1	79.8	6.93	10.0	29.8	36.23	29.11	45.16
F_2	87.5	7.99	12.1	36.1	38.82	34.34	50.35
F_3	93.0	8.91	14.1	41.9	41.87	40.78	58.29
S.Em ±	0.38	0.06	0.20	0.60	0.18	0.52	0.87
CD at 5 %	1.14	0.18	0.60	1.79	0.53	1.56	2.61
Weed control measures							
W_1	86.3	7.86	12.0	35.0	38.86	33.09	50.49
W_2	87.3	8.04	12.3	36.8	39.09	34.89	51.05
S.Em ±	0.15	0.06	0.13	0.39	0.07	0.44	0.56
CD at 5 %	0.43	0.18	NS	1.15	0.20	1.28	NS

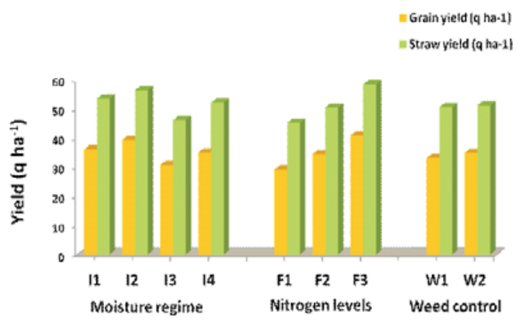

Fig.1: Effect of moisture regime, nitrogen level and weed control measures on Wheat (*Triticum aestivum* L.)

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spike length (8.91 cm), number of spikelets per spike (14.1), number of grain per spike (41.9), test weight (41.87 g), Grain (40.78 qha^{-1}) and straw (58.29 qha^{-1}) yield increased with increasing doses of nitrogen upto 125% recommended dose of nitrogen (150 kg N ha^{-1}). Balanced application of fertilizers increased fertility levels, the dry matter accumulation in assimilation organs in turn increased yield attributes. Increase in yield attributing characters with increasing doses of nitrogen was also supported by Ali *et al.* (2003) and Rajput *et al.* (2004). Increase in yield with increasing N level might be due to increase in yield attributing characters (Fig.1). The similar results were obtained by Limen *et al.* (2000).

The weed control treatment significantly influenced the number of spike per running metre. Among the weed control treatment, sulfosulfuron @ 33 g ha^{-1} was found most effective with regard to number of spike per running metre followed by isoproturon @ 1.25 kg ha^{-1} treatment Kumar and malik. (2001). However, use of sulfosulfuron and isoproturon had no significant effect on number of spikelets per spike. More number of grain per spike was recorded under sulfosulfuron treatment followed by the treatment with isoproturon (Table-1) as observed by Tomar and Vivek (2003). Test weight of wheat slightly improved under the application of sulfosulfuron as compared to isoproturon application. Effectiveness of weed control treatment favoured crop growth as well as the yield attributes enhanced the test weight increased. The results were in close proximity to results reported by Kanaujia and Nepalia (2004). Application of sulfosulfuron produced higher grain and straw yield of wheat, in comparison to treatment using isoproturon (Fig.1). Significantly increased in grain and straw yield due to weed control treatment were also reported by Diwedi (2004)

REFERENCES

Ali, L., Qarnar Mohy, U. P. D. N. and Ali, M. 2003. Effect of different dose of nitrogen fertilizers on the yield of wheat. *International J. Agriculture and Biology.* **5(4):** 438-439.

Chen, D., Suter, H., Islam, A., Edis, R., Freney, J. R. and Walker, C. N. 2008a. Prospects ofimproving efficiency of fertiliser nitrogen in Australian agriculture: a review ofenhanced efficiency fertilisers. *Australian J. Soil Research.* **46:** 289-301.

Chen, D., Li, Y., Grace, P. and Mosier, A. R. 2008b. N2O emissions from agricultural lands:a synthesis of simulation approaches. *Plant and Soil.* **309:** 169-189.

Das, Rabiratna and Varma, S. C. 2003. Management of weeds, nitrogen and tillage operation in wheat (*Triticum aestivum* L.) sown after puddle rice (*Oryza sativa* L.). *Indian J. Agricultural Science*. **73(5):** 286-288.

Dwivedi, R. K. 2004. Effect of nitrogen and weed management in wheat. *Advances in Plant Science*. **17(1):** 231-233.

Food and Agricultural Organization 2008. Current world fertilizer trends and out-look to 2011/12. *FAO*, Rome, Italy.

Gupta, A., Aggarwal, A., Rathi, M. and Khushbu 2013. Effect of herbicide Clodinafop on fungal biodiversity of wheat crop. *The Ecoscan Spe. Issue*. **(1):** 195-199.

Sun, H., Liu, C., Zhang, X., Shen, Y. and Zhang, Y. 2006. Effects of irrigation on water balance, yield and WUE of winter wheat in the North China Plain, Agricultural Water Management, vol. 85, no. 1-2, View at Publisher· *View at Google Scholar* · View at Scopus. pp. 211-218.

International Fertilizer Association Industry, 2008. *76th IFA Annual Conference*, Vienna, Austria. 19-21 May.

Alengaram, J. and Mahrez, A. 2011. Arsenic contamination of aquifers: a detailed investigation on irrigation and portability, Scientific Research and Essays, vol. 6, no. 5, *View at Google Scholar · View at Scopus*. pp. 1089-1100.

Jat, M. L., Pal, S. S., Singh, R., Singh, D. and Gill, M. S. 2008. Effect of moisture regimes and nitrogen management options on crop and water productivity and nitrogen-use efficiency in maize-wheat cropping system. *Indian J. Agric. Sci*. **78(10):** 881-883**.**

Kanaujia, Y. and Nepalia, V. 2004. Influence of herbicidal weed control on wheat (*Triticum aestivum* L.). *Research on crops.* **5(1):** 138-142.

Khatri, R. S., Goel, K. C. and Malik, P. K. 2001. Water use and application efficiency in bad and flat sowing of wheat in rice-wheat system under different irrigation level. *Crop Research*. **21(1):** 20-23.

Kumar, S., Tyagi, R. C. and Malik, R. K. 2001. Differential response to sulfosulfuron under different irrigation frequencies to control of weeks in wheat (*Triticum aestivum* L.), *Indian J. Agronomy*. **46(3):** 480-484.

Limon, Ortega. A., Sayre, K. D. and Francis, C. A. 2000. Wheat, water and nitrogen use efficiency in bed planting system in Northwest Mexico. *Agronomy J.* **92(2):** 303-309.

Li, Y., Chen, D., Baker-Reid, F. and Eckard, R. 2008. Simulation of N2O emissions fromrain-fed wheat and the impact of climate variation in southeastern Australia. *Plant and Soil.* **309:** 239-251.

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

Shirazi, S. M., Islam, M. A., Ismail, Z., Jameel, M., Sharma, U. B. D., Cheema, S. S. and Kar, S. 1990. Water and nitrogen uptake of wheat as related to nitrogen application rate and irrigation water regime, Fertilizer News.*View at Google Scholar.* **35:** 31-35.

Sharma, A. R. 2014. Weed management in conservation agriculture systems- problems and prospects. *In National Training on Advances in Weed Management*, held at DWSR, Jabalpur on 14-23 Jan, pp. 1-9.

Singh, R. 2014. Weed management in major kharif and rabi crops. *In National Training on Advance in Weed Management*, held at DWSR, Jabalpur, on 14-23 January, pp. 31-40.

Singh, R. K., Verma, S. K. and Singh, R. P. 2013. Bio-efficacy of carfentrazone-ethyl + sulfosulfuron in wheat. *Indian J. Weed Sci*. **45(4):** 243-246.

Sinha, K., Patnaik, B., Kumari, S., Utkarshini and Kumar, S. 2011. Impact of temperature on the cell doubling time of winter wheat and spring wheat seedlings. *The Ecoscan*. **5(1&2):** 59-63.

Tomar, S. S. and Vivek 2003. Effects of herbicides on *Phalaris minor* and wheat yield. *Indian J. Weed Science*. **35(3/4):** 255-256.

Arora, V. K., Singh, H. and Singh, B. 2007. "Analyzing wheat productivity responses to climatic, irrig ation and fertilizer-nitrogen regimes in a semi-arid sub-tropical environment using the CERES-Wheat model," Agricultural Water Management. **94:** 1-3, 22-30. *View at Publisher· View at Google Scholar· view at Scopus*.