Available online at www.ijpab.com

DOI: http://dx.doi.org/10.18782/2582-2845.8050

ISSN: 2582 – 2845

Ind. J. Pure App. Biosci. (2020) *8*(2), 248-252

Research Article

Indian Journal of Pure & Applied Biosciences

Growth and Productivity of Different Wheat (*Triticum aestivum* L.) Varieties as Influenced by Low Fertility with Two Irrigations in the Central Plains Zone

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Received: 14.03.2020 | Revised: 17.04.2020 | Accepted: 22.04.2020

ABSTRACT

A field experiment was conducted at crop research farm, Department of Agronomy, Allahabad School of Agriculture, Sam Higginbottom Institute of Agricultural, Technology & Sciences, Allahabad (U. P). It is on the near of the river Yamuna to study the varietal/Accession evaluation of Wheat (Triticum aestivum L.) under low fertility & two irrigations during (Rabi) season 2012. It was consisting of combination of nine varieties of Wheat. The field experiment was laid out in randomized block design with three replications. The results showed that number of plants per meter row length, plant height, number of tillers of per plant, number of grains per spike, grain and straw yield was recorded non significantly, whereas dry matter accumulation recorded significantly under treatment T_1 (AAG-W-9) but it was at par with treatment T_4 (AAG-W-9). Results further recorded that length of spike (11.04 cm) recorded significantly in treatment T_4, where as test weight (41.23 g) recorded significantly higher in T3 (AAG-W-9) , which was statistically at par with T1 (PBW-343). The maximum grain yield (2.76 t/ha) and straw yield (6.40 t/ha) recorded in treatment T4 (AAG-W-6).

Keywords: *Low fertility, Irrigation, Wheat*

INTRODUCTION

Wheat is a staple food for nearly 38 percent of world's population. This crop contributes 33 to 37 % of the national food grain production and will continue to play a crucial role in the food security of the country. Nutritional value of wheat is as good as other food grains comprising 71.2 gm Carbohydrate, 11-12 gm proteins, 1.5 gm fat, 1.2 gm. crude fiber, 306 mg phosphorous and 41 mg calcium per 100gm of grains (Rai & Mauria, 1999). During the year 2011-12, wheat was grown over an area of 29.9 m ha with a production of 94.8 m t and an average productivity of 3173 kg/ha (Anon., 2012).

Cite this article: Kumar, N., Choudhary, A., Kumar, S., & Sharma, R. (2020). Growth and Productivity of Different Wheat (*Triticum aestivum* L.) Varieties as Influenced by Low Fertility with Two Irrigations in the Central Plains Zone, *Ind. J. Pure App. Biosci. 8*(2), 248-252. doi: http://dx.doi.org/10.18782/2582-2845.8050

Uttar Pradesh is the maximum wheat producing state in India and Punjab has the best productivity. Wheat is grown in almost all the states in northern and central India. Wheat production in India has gone up to 80 million tonnes (2009-10). High yielding wheat varieties demand adequate nutrient supply to produce maximum grain yield (Ali & Yasin 1991). Varieties, however, respond differently to nutrient with respect to their genetic makeup and physiological life processes (Chandra et al., 1992). Fertilizers play a pivotal role in increasing yield and improving the quality of crops. (Ali et al., 1997) Phosphorous application along with Nitrogen has a significant effect in increase the number of tillers, plant height, number of grains per spike, 1000-grain weight and grain yield.

As water for irrigation is a scarce resource, its use optimization is fundamental to water resource use. It permits better utilization of all other production factors and thus leads to increased yields per unit area and time. Efficient water management requires a thorough study of plant water relationship, climate, agronomic practices and economic assessment. Farmer, agronomist, economist and engineers need to know the response of yield to irrigation. Grain yield of different wheat cultivars have been found to be significantly reduced by water stress at all critical growth stages and greatest reduction was at anthesis stage (Jamal et al., 1996).

Since the time of green revolution numerous varieties have been developed with different response pattern to applied nutrients and irrigation frequency. It has been observed that recommended nutrient had been initially 100:60:40 kgs of NPK/ha respectively, which was later enhanced to 120:60:40 kgs NPK/ha respectively but the varieties failed in sustaining their yield. Therefore, the present recommendation has gone up to 150:80:60 kg of NPK/ha respectively. Thus, the ever increasing doses of nutrients are possing a serious economic consequence to farmers and they are reluctant to adopt such high doses.

MATERIALS AND METHODS

The experiment was conducted during the Rabi season 2012, at Crop Research Farm, Department of Agronomy, SHIATS, Allahabad (U.P.). The experimental farm is situated at 250 24 42 N latitude, 810 50 56 E longitude and at 98 meter altitude above mean sea level. This area is situated on the right side of the river Yamuna and by the side of Allahabad-Rewa Road 5 km away from Allahabad city. All the facilities, which are required for crop cultivation, are available. The mean maximum temperature varied between 38.85^0C and the minimum temperature varied between 6.5^0C during the *Rabi* season of 2012-13, as against the normal mean weekly relative humidity which was ranged from 38.14 to 89.14% received during the crop growing season. The soil is experimental plot was sandy loam in texture having pH of 7.60 with low level of organic carbon 0.39 %, available N (185.5 kg ha-1), available medium level of P (36 kg ha-1) and higher level of K (98 kg ha-1). The experiment was laid out randomized block design, comprising of nine combinations each replicated thrice. The treatments consisted of six varieties was developed by university and 3 was standard check varieties were taken. The varieties were PBW – 343, AAG-W-7, AAG-W-9, AAG-W-6, PB/W-550, AAG-W-4, AAG-W-8, AAG-W-10 and DBW-17.

Statistical analysis

Data collected on different aspect of crop, *viz*., growth, yield attributes and yield were tabulated for statistical analysis (Fisher, 1950). Significance of difference between treatment means was tested through 'F' test and the critical difference (CD) was worked out wherever 'F' value was found to be significant for treatment effect. The analysis of variance for all the data have been given in appendix.

RESULTS AND DISCUSSION

Growth attributes

Number of plants/meter row length: The table 1 indicates that the number of plants/ running row meter differed non significantly due to treatments. The maximum number of plants/ running row meter (28.53) was recorded in the treatment T_2 (AAG-W-7), followed by treatments T_9 (PBW-550) and T_5

(DBW-17) respectively, whereas, the minimum number of plants/ running row meter (23.87) was recorded in the treatment T_4 (AAG-W-6). The probable reasons for such finding might be due to varietal character.

Plant height (cm): The highest plant height (20.05 cm and 48.47 cm) at 30 DAS and 60 DAS was recorded in treatment T_4 (AAG-W-6).The plant height of treatment T_5 (PBW-550) were statistically at par with T_4 (Table 1). However, plant height at 90 DAS the differences were non statistically significant. At 90 DAS highest plant height was recorded in treatment T_4 (92.26 cm), while lowest (75.14 cm) was recorded in the case of T_9 (DBW- 17). The probable reasons for the findings could have been because of varietal characteristics, all varieties recorded increased plant height by application of irrigation at all critical growth stage which might be due to the variation of genetic character among different varieties as well as with healthier plant growth with sufficient availability of nutrients having no moisture stress. These results are in line with those of Thompson and Chase (1992) who reported similar results.

Dry weight of plants (g): The dry weight of plants recorded non significant difference between the treatments in both of the observations recorded at 30 and 60 DAS. At 30 DAS, treatment T_5 (PBW-550) and T_9 (DBW-17) recorded the highest value (5.00 g) for dry weight. At 60 DAS, treatment T_2 (AAG-W-7) recorded the highest values (17.00 g) for dry weight, while lowest dry weight of plant (11.00 g) was recorded in the treatment T_9. At 90 DAS the differences were statistically significant. At 90 DAS, treatment T_1 (PBW-343) recorded the highest values (92.67 g) for dry weight, while lowest dry weight of plant (53.67 g) was recorded in the treatment T_2 (AAG-W-7). The dry weight recorded under treatment T_4, T_7, T_6 and T_3 were statistically at par to that of T_4 (AAG-W-6). The probable reasons for the findings could have been because of varietal characteristics, all varieties recorded increased dry weight of plant by application of irrigation at all critical growth stage which might be due to the variation of genetic character among different varieties as well as with healthier plant growth with sufficient availability of nutrients having no moisture stress. These results are in line with those of Sarwar et al. (2010).

Number of tillers per plants: The analysis of data recorded non significant difference in number of tillers per plant at 60 and 90 DAS. The highest number of tillers per plant (5.13) 60 DAS was recorded in the treatment T_7 (AAG-W-8). The highest number of tillers per plant (3.53) 90 DAS was recorded in the treatment T_6 (AAG-W-4) and T_7 (AAG-W-8). While lowest (3.13, 2.20) at 60, 90 DAS were recorded under treatments T_1 (PBW-343).The probable reasons for such finding might be due to varietal character.

Yield attributes and Yield

Length of spike (cm): The maximum length of spike (11.04 cm) was recorded in the treatment T_4 (AAG-W-6) whereas, the minimum length of spike (7.73 cm) was recorded in the treatment T_6 (AAG-W-4) (Table 2).The probable reasons for such findings might be due to varietal character. Timely sowing wheat crop took more days to complete its life-cycle with sufficient availability of moisture at seeding to physiological maturity. Shivani et al. (2001 and Verma et al. (1997) also reported similar findings.

Number of grains/spike: The higher number of grains spike^{-1} (48.07) was recorded in the treatment T_7 (AAG-W-8). Treatments T_2 (AAG-W-7) and T_6 (AAG-W-6) were statistically at par to that of T_7. It might be due to varietal character. Shivani et al. (2001) and Verma et al. (1997) also reported similar findings.

Test weight (g): The significantly highest test weight (41.23 g) was recorded in the treatment T_3 (AAG-W-9) whereas, the minimum test weight (33.73 g) was recorded in the treatment T_9 (DBW-17) .The test weight recorded under treatment T_1 (PBW -343) was statistically at par to that of T_3 (AAG-W-9). It was might be due to recommended NPK fertilizer dose and five irrigations provided to wheat which might have helped in more translocation of

photosynthats towards grain due to the availability of sufficient amount of water in root zone. Similar results were recorded by Wajid et al. (2002) and Ali et al. (2000).

Grain yield (t/ha): The data (Table 2) indicates that the grain yield differed none significantly due to treatments. The maximum grain yield (2.76 t/ha) was recorded in the treatment T_4 (AAG-W-6), followed by treatments T_8 (AAG-W-10) and T_7 (AAG-W-8) respectively, whereas, the minimum grain yield (1.72 t/ha) was recorded in the treatment T_1 (PBW-343). The observation clearly depict that our varieties i.e., from treatment T_2, T_4, T_6 and T_7 performed at par to that of the recommended varieties for the region.

Straw yield (t/ha): The statistical analysis of the data indicates that the straw yield differs non significantly under different treatments. A critical review of the table reveals that the straw yield was higher (6.40 t/ha) under treatment T_4 (AAG-W-6) while, the minimum straw yield (2.80 t/ha) was recorded under treatment T_1 (PBW-343) and T_9 (DBW-17).The probable reasons for such finding might be due to the different varieties performance at par with influence to the straw and grain yield.

Table 1: Effect of low fertility and two irrigations on growth attributes of different varieties of Wheat

Treatments		No. of plants /meter row length	Plant Height (cm)	Dry weight (g/plant)	Number of tillers/plant
T_1	PBW – 343	24.40	77.81	92.67	3.13
T_2	AAG-W-7	28.53	81.92	53.67	3.33
T_3	AAG-W-9	25.07	88.08	78.67	4.00
T_4	AAG-W-6	23.87	92.26	91.33	4.60
T_5	PBW-550	26.53	83.49	73.00	3.67
T_6	AAG-W-4	26.30	79.56	79.67	4.87
T_7	AAG-W-8	26.40	83.79	80.67	5.13
T_8	AAG-W-10	26.63	86.63	73.67	4.87
T_9	DBW-17	26.53	75.14	71.00	3.53
F-test		NS	NS	S	NS
S.Ed (±)		2.27	4.96	7.08	2.82
C.D (P=0.05)		-	-	15.01	-

Table 2: Effect of low fertility and two irrigations on yield attributes yield of different varieties of Wheat

Treatments		Length of spike (cm)	No. of grains/ spike	Test weight (g)	Grain yield (t/ ha)	Straw yield (t/ha)
T_1	PBW – 343	8.58	39.20	41.20	1.72	2.80
T_2	AAG-W-7	8.55	47.93	36.50	2.56	3.35
T_3	AAG-W-9	8.07	41.23	41.23	1.74	3.42
T_4	AAG-W-6	11.04	44.07	36.90	2.76	6.40
T_5	PBW-550	8.60	40.00	35.10	2.56	3.51
T_6	AAG-W-4	7.73	47.27	35.13	2.46	3.86
T_7	AAG-W-8	8.53	48.07	34.77	2.63	4.45
T_8	AAG-W-10	9.11	39.73	36.90	2.64	4.02
T_9	DBW-17	7.89	40.60	33.73	2.02	2.80
F-test		S	NS	S	NS	NS
S.Ed (±)		0.36	4.79	1.64	0.51.	1.09
C.D (P=0.05)		0.76	-	3.48	1.09	-

CONCLUSION

It may be concluded that among the varieties tried under low fertility and two irrigations accession variety AAG-W-6, was found to be the best for obtaining highest grain yield and benefit cost ratio in wheat. Since the findings are based on the research done in one season, it may be repeated for confirmation.

REFERENCES

Ali, A., Malik, M.A., Ahmad, R., & Saifullah, (2000). Effect of various doses of nitrogen on the growth and yield of two wheat (*Triticum aestivum*) cultivars. *Pakistan. J. Biol. Sci*., *3*, 1004-5.

Ali, M., Abbas, G., Sharif, M., & Rehman, A. (1997). Effect of nitrogen along and in combination with phosphorus and potash on the yield and N content of wheat. *J. Anim. Pl. Sci*., *7*, 81-3

Anonymous, (2008). Fully Revised Estimates of Principal Crops in India for the year 2007-08, *Food Corporation of India*.

Chandra, S., Varshncy, M.S., Sing, J., & Singh, S.K. (1992). Response of wheat varieties to different levels of nitrogen. *Narendra Deva. J. Agric. Res. 7*, 167–71.

Jamal, M., Nazir, M.S., Shah, S.H., & Nazir, A. (1996). Varietal response of wheat to water stress at different growth stages and effect on grain yield, straw yield, harvest index and protein contents in grains. *Rachis*. *15*(1-2), 38-45

Rai, M., & Mauria, S. (1999). Coarse cereals, not for the poor alone. The *Hindu Survey of Indian Agriculture* 55-59.

Sarwar, N., Maqsood, M., Mubeen, K., Shehzad, M., Bhullar, M.S., Qamar, R., & Akbar, N. (2010). Effect of different levels of irrigation on yield and yield components of wheat cultivars. *Pak. J. Agri. Sci. 47*(3), 371-374

Shivani, Verma, U.N., Pal, S.K., Thakur, R., & Kumar, S. (2001). Production potential and water-use efficiency of wheat cultivars under different dates of seeding and irrigation levels. *Indian J. Agron. 46*(4), 659-664

Tewari, S.K., & Singh, M. (1993). Yielding ability of wheat (*Triticum aestivum* L.) at different dates of sowing-a temperature dependent performance. *Indian J. Agron. 38*(2), 204-209.

Thompson, J.A., & Chase, D.L. (1992). Effect of limited irrigation on growth and yield of semi dwarf wheat in Southern New South Wales. (Field Crop Absts. 4721; 1994).

Verma, U.N., Pal S.K., Singh, M.K., & Thakur, R. (1997). Fertilizer requirement of late sown wheat (*Triticum aestivum* L.) under condition of Bihar plateau. *Indian J. Agric. Sci. 68*(5), 204-207.

Wajid, A., Hussain, A., Maqsood, M., Ahmad, A., & Awais, M. (2002). Influence of sowing date and irrigation levels on growth and grain yield of wheat. *Pak. J. Agri. Sci*. *39*(1), 22-24.