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Influence of Fertility Levels on the Performance of Wheat Cultivars under new Alluvial Zone of West Bengal

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Abstract—*A field experiment was conducted at District Seed Farm (AB Block), Kalyani under Bidhan Chandra Krishi Viswavidyalaya during winter season of 2014-16 to study the effect of fertility levels on the growth and yield of different wheat cultivars. The experiment was carried out in a split plot design with three wheat cultivars (viz. PBW 343, HD 2733 and K 0307) in main plot and five fertility levels (viz. 50, 75, 100, 125 and 150 % RDF) in sub plot. Recommended dose of fertilizer (RDF) under this zone was 120 : 60 : 40 kg/ha (N: P_2O_5: K_2O). HD 2733 recorded higher value of number of earhead/m^2 and better to rest of the cultivars. With subplot treatments, maximum earhead/m^2 was observed with the 125 % RDF, and was at par with the 150 and 100 % RDF application. Grains / earhead was more registered with the HD 2733 (42.17), and was at par with K0307, and significantly better to other treatments. Higher number of grains / earhead was noted with 125 % RDF and was followed by 150 and 100 % RDF, these treatments were statistically superior to rest of the treatment. More grain yield found with HD 2733 and was followed by K0307, and statistically superior to other cultivar. Amongst various subplot treatments, maximum grain yield was registered with the 150 % RDF and was at par with the 125 and 100 % RDF. Fertilizer levels with 150 % RDF recorded about 38.5% higher yield than the lowest level of fertilizer application (i.e. 50 % RDF). With various cultivars, highest straw yield was observed with the HD 2733, and was at par with the K0307 and significantly better to other tested genotype. Among the cultivars, HD 2733 recorded the highest value of (38.01%) of harvest index and was at par with the PBW 343, while K0307 recorded the least (35.98 %). Application of 100 % RDF registered significantly more harvest index and was notably superior to all other subplot treatments except 150 % RDF application. With above work, it can be concluded that cultivation of HD 2733 and K 0307 gave high yields with 100 to 150 % RDF application. This combination produced higher growth and yield attributes along with more yield potential under new alluvial zone of West Bengal.*

Keywords*: Cultivar, fertility levels, wheat, yield.*

Wheat (*Triticum aestivum* L) is the second most important staple food crop of the world accounting nearly 30% of global cereal production covering an area of 218.5 million hectare with an average productivity of 3.26 tonnes ha^{-1}. In India , in the year 2013-14 the wheat production was recorded as 95.91 million tones from an area of 30 million hectare (FAO, 2014). But with an ever growing population, the country needs to produce 100 million tones of wheat by 2030 which is a major challenge under changing climatic scenario. West Bengal is not a traditional wheat growing state in India. However, at present, wheat has become a staple food crop next to rice and its consumption is gradually increasing because of change in food habit and economic prosperity, and in near future this become one of the major contributor in food grain basket. In spite of a wide range of adoptability, little attention has been paid towards wheat production and maximization of yield potential of this crop in West Bengal and its share to national production is less than 1%. Productivity of 2.8tha^{-1} is also far below the national average of 3.14 t ha^{-1} (Anon.20013-14). This is due to poor agronomic practices particularly suitable fertilizer doses and right kind of cultivars for this zone. Since wheat is a major cereal crop and population is gradually increasing, increase in its production and acreage should be given top priority in order to achieve food and nutritional security in the state. However, success of any crop production depends on use of appropriate genotype/variety of high yield potential and improved cultural practices. For identification of variety of greater suitability in existing climatic conditions, the study of growth and yield attributes would certainly has great significance to stabilize and sustain the productivity of wheat in the state. Efficient fertilizer management, especially nitrogen is an essential macronutrient and one of the main factors to be considered for realizing the potential of wheat cultivars. Proper nutrient management play crucial role in enhancing wheat productivity not only in West Bengal, but throughout states of India (Ramesh *et al*. 2005, Mukherjee, 2012). Hence, present investigation was undertaken to find out suitability of genotype under the optimum rate of fertilizes application under new alluvial zone of West Bengal.

1. MATERIALS AND METHODS

The field experiment was conducted at District Seed Farm (AB Block), Kalyani under Bidhan Chandra Krishi Viswavidyalaya during winter season of 2014-16. The farm is

situated at approximately 22° 56´ N latitude and 88° 32´ E longitude with an average altitude of 9.75 m above mean sea level (MSL). The soil of the experimental field was loamy in texture and almost neutral in reaction having pH 7.1, organic carbon 0.36%, available nitrogen 232.65 kg, available phosphorus 23.52 kg and available potassium 238.12 kg/ha. The experiment was carried out in a split plot design with three replications. For this experiment, three wheat genotypes (viz. PBW 343, HD 2733 and K 0307) were sown in main plot, and five fertility levels (viz. RDF, 50% RDF, 75% RDF, 125% RDF and 150 % RDF cm) in sub plot. Recommended dose of fertilizer (RDF) under this zone was 120: 60: 40 kg/ha (N: P_2O_5: K_2O). Crop was shown on third week of November during both the year of experiment with recommended seed rate of 100 kg ha^{-1}.

2. RESULTS AND DISCUSSION

Growth attributes

Amongst various growth parameters, plant height and dry matter accumulation failed to produce any significant response with various cultivars, however maximum plant height was observed with the HD 2733 and was followed by K0307 and PBW 343. More dry weight of plant was found with the K0307. Levels of fertilizers influenced the growth characters viz. plant height and dry matter accumulation significantly and more was observed with the 125 % RDF application and notably better to rest of the subplot treatments. More number of tiller/m^2 was observed with the HD 2733 and was followed by K0307. These treatments were notably better to other treatment in main plot. The results indicated that inherent tillering potential per unit area of HD 2733 was relatively higher than that of K 0307 and PBW 343. With subplot treatments, more number of tiller/m2 was registered with the 150 % RDF and was at par with the 100 and 125 % RDF. Ear length was more found with the cultivar HD 2733 and significantly superior to other cultivars. Amongst fertility levels, maximum ear length was found with the 125 % RDF and was at par with the all other levels except 50 % RDF. Similar trend was observed with the grain weight /spike. Significant differences were exhibited with cultivars and levels of fertility on physiological maturity of the plant. Days to 50 % heading was significantly earlier with K0307. More time to days to 50 % heading was found with the PBW 343. Varietal character of genotypes might be the reason for difference in crop duration for attaining 50% heading (Tewari and Singh, 1995). With different fertility levels, days to 50 % heading was earlier with 100 % RDF, and was at par with the 125 and 150 % RDF. The variation of genotypes was statistically significant with regard to the days required for attaining physiological maturity. Observation revealed that, days to physiological maturity took minimum time with the K 0307 and was significantly better to other main plot cultivars. Genetic character of genotypes might be the reason for difference in duration for attaining physiological maturity. Amongst various subplot treatments, least time for physiological maturity was observed with the 125 % RDF, and was followed by 150 % RDF and significantly better to other set of treatments.

Table 1: Effect of fertility levels on growth parameters and physiological maturity of different wheat cultivars (Pooled data of two years).

Treatment	Plant height (c.m)	Dry matter (g/plant)	Number of tiller/m^2	Ear length (c.m)	Grain weight/spike (g)	Days to 50% heading	Days to physiological maturity
Cultivars							
PBW 343	79.12	4.16	309.71	7.89	1.79	73.64	114.66
HD 2733	83.65	4.26	375.19	9.02	1.92	72.15	116.33
K 0307	82.33	5.01	365.07	8.32	1.82	61.93	108.66
S.Em (±)	0.99	0.59	5.39	0.36	0.11	0.24	0.39
LSD (0.05)	NS	NS	16.04	NS	NS	0.75	1.21
Fertility levels							
50 % RDF	71.35	3.79	304.06	7.14	1.39	71.36	116.74
75 % RDF	72.92	4.68	343.68	7.91	1.41	71.44	117.81
100 % RDF	82.62	4.61	365.79	8.07	1.68	65.73	116.23
125 % RDF	89.65	5.04	360.63	8.31	1.72	67.19	111.37
150 % RDF	87.21	4.30	371.58	8.21	1.66	66.28	113.69
S.Em (±)	0.73	0.08	5.36	0.18	0.02	0.71	1.36
LSD (0.05)	2.31	0.29	16.98	0.51	0.06	2.16	4.06

NS = Non significant

Table 2: Effect of fertility levels on yield attribute and yield of different wheat cultivars (Pooled data of two years).

Treatment	No. of earhead/m^2	Grains/ Earhead	1000-grain weight (g)	Grain yield (t /ha)	Straw yield (t / ha)	Harvest Index (%)
Cultivars						
PBW 343	253.13	37.31	40.11	2.79	5.34	36.07
HD 2733	286.07	42.17	42.29	3.72	6.27	38.01
K 0307	251.49	39.98	41.07	3.26	5.89	35.98
S.Em (±)	2.63	0.94	0.61	0.22	0.13	0.73
LSD (0.05)	7.89	2.81	NS	0.78	0.53	2.01
Fertility levels						
50 % RDF	201.36	31.95	39.68	1.96	3.91	33.39
75 % RDF	233.65	34.39	40.70	2.13	4.13	34.02

100 % RDF	258.36	38.19	41.83	3.07	5.11	37.53
125 % RDF	269.18	39.12	41.44	3.03	5.91	33.89
150 % RDF	265.31	39.33	40.66	3.19	5.68	35.96
S.Em (±)	4.33	0.61	0.63	0.06	0.31	0.71
LSD (0.05)	12.71	1.86	NS	0.21	1.11	2.21

NS= Non Significant

3. YIELD ATTRIBUTES AND YIELD

The data presented in the Table 2 show that the cultivars differ significantly among themselves and HD 2733 recorded higher value of number of earhead/m^2 and better to rest of the cultivars. With subplot treatments, maximum of this parameter was observed with the 125 % RDF, and was at par with the 150 and 100 % RDF application. Grains / earhead was more registered with the HD 2733 (42.17) and was at par with K0307, and significantly better to other treatments. However, number of grains per earhead under various fertility levels varied significantly. Higher number of grains / earhead was noted with 125 % RDF and was followed by 150 and 100 % RDF, these treatments were statistically superior to rest of the treatment. HD 2733 recorded higher 1000 grain weight (42.29 g) followed by K0307 and PBW 343. However, the difference amongst the genotypes was not-significant. Higher 1000 grain weight in HD 2733 was attributed to their comparatively well-developed bold grains compared to others. No significant difference among the sub plot treatments had been found, but a higher test weight was evident in case of 100 % RDF application. More grain yield was observed with the HD 2733 and was followed by K0307, and statistically superior to other cultivar. Higher values in earhead /m^2 and number of grain/ earhead might have resulted in higher grain yield in HD 2733 (3.72 t/ha) and K 0307 (3.26 t/ha). The lowest yield was recorded from PBW 343 (2.79 t /ha). Various fertility levels under subplot, showed significant differences among themselves. The grain yield varied from 1.96 to 3.19 t / ha with various fertility levels. Amongst various subplot treatments, maximum grain yield was registered with the 150 % RDF and was at par with the 125 and 100 % RDF. Lowest of grain yield was observed with lowest level of fertility levels. Fertilizer levels with 150 % recorded about 38.5% higher yield than the lowest level of fertility (50 % RDF). The grain yield depends upon many factors such as effective tillers / m^2, grains/ earhead and test weight etc. The greater value of these yield attributes was quite distinct with various fertilizers levels. The effect of genotypes on straw yield was statistically significant and its show distinct response with cultivar and fertility levels. With various cultivars, highest straw yield was observed with the HD 2733 and was at par with the K0307 and significantly better to other cultivar. Straw yield varied significantly as a result of different fertility levels, and more yields was registered with the 125 % RDF and showed parity with the all other levels of fertility except 50 % RDF. More number of tillers /m^2 might be responsible for influencing higher straw yield. Among the cultivars, HD 2733 recorded the highest value of (38.01%) of harvest index and was at par with the PBW 343, while K0307 recorded the least (35.98 %). Further observation revealed that, 100 % RDF registered significantly more harvest index and was significantly superior to all other subplot treatments except 150 % RDF application (Table 2).

From the study, it may be concluded that cultivation of HD 2733 and K 0307 gave high yields with 100 to 150 % RDF application. This combination produced higher growth and yield attributes along with more yield potential under new alluvial zone of West Bengal.

REFERENCES

[1] Anonymous 2013-14 *Annual Report*, All India Coordinated Wheat and Barley Project, BCKV, Kalyani, West Bengal.

[2] FAO. 2014 The State of Food and Agriculture 2014. Investing in agriculture for a better future. Rome. (http://www.fao.org/3/a-i4040e.pdf).

[3] Mukherjee Dhiman. 2012. Effect of different sowing dates on growth and yield of wheat cultivars under mid hill situation of West Bengal. *Indian journal of Agronomy* **57**(2):152-156.

[4] Ramesh P, Singh Mohan and Subba Rao A. 2005. Organic farming; its relevance to the Indian context. *Current Sciences* **88**(4): 561–

[5] Tiwari, S.K. and Singh, Mahendra 1995. Influence of sowing dates on phase duration and accumulation of dry matter in spikes of wheat *(Triticum aestivum*). *Indian Journal of Agronomy.* **40**(1): 43-46.