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Performance of different Wheat Genotypes under Various Levels of Nitrogen in Rainfed Condition of New Alluvial Region 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 2015-17 to study the performance of different genotypes under various doses of nitrogen in rainfed condition of West Bengal. The experiment was carried out in a split plot design with three nitrogen levels (viz. 40, 60 and 80 kg N /ha) in main plot and five wheat genotypes (viz. K 8027, C-306, K 1317, HD 3171 and HD 2888) were sown in the sub plot. Grain yield more found with nitrogen @ 80 kg/ha (2.98 t/ha) and was at par with the 60 kg N/ha (2.48 t/ha). These treatments resulted in 64.6 and 35.2 %, respectively more grain yield over the lowest dose of nitrogen. With various genotypes, higher grain yield found with the HD 3171 (2.83 t/ha) and was at par with the HD 2888 (2.46 t/ha) and significantly better to other tested cultivars. Cultivar HD 3171 and HD 2888 gave 40.7 and 22.4 % more grain yield over the K 1317, which gave lowest yield amongst various tested genotypes. Harvest index was highest noted with 80 kg N/ha and appreciably better to other core plots treatments. With various subplot treatments, highest HI was seen with HD 2888, and was at par with the HD 3171 and K 8027, and significantly better to other treatments. With above work, it can be concluded that use of 80 kg N/ha along with cultivar HD 3171and HD 2888 gave high yields. This combination produced higher growth and yield attributes along with more yield potential under new alluvial zone of West Bengal.*

Keywords*: Genotypes, nitrogen levels, wheat, yield.*

1. INTRODUCTION

Wheat is the second most important staple food after rice consumed by nearly 65% of the population in India and is likely to increase further due to changes in food habit India is one of the most important wheat growing countries and ranks second in terms of area and production only next to China. At present, India produces more than 95 million tonnes of wheat which is around thirteen times higher than recorded during 1950-51 (Mukherjee, 2017). The first green revolution which leads the nation to self-sufficiency for food is basically attributed to improved varieties, good agronomic practices, improved tools and implements developed by research institutions mainly for irrigated areas. But, the benefits of this revolution did not percolate much to the dry and marginal rural families. Rainfed area in India still accounts for 85.7 m ha which contributes 50% of cereal production in the country. During the period of 1985 to 1995, growth rate of un-irrigated agriculture was higher than the irrigated production systems. Post 1995 years witnessed deceleration of the overall growth in agriculture and was relatively of higher magnitude in the rainfed situations (FAO, 2014). This was primarily due to over exploitation of ground water resources in the dry land areas, lack of diversification in the high rainfall regions, improper sowing date etc. (Mukherjee, 2012). For these reasons, research was initiated to breed wheat varieties for rainfed areas. In agriculture, under dry conditions, relatively small changes in conditions with use of different cultivar and nitrogen levels may be important in biomass and yield production. Nitrogen is one of the most important nutrients applied as a fertilizer, responsible to a great extent for the large yields obtained from high input agriculture. The supply of nitrogen increases total biomass production and increases yield and yield components. Nitrogen affects production through different mechanisms. At a cellular level, N increases the cell number and cell volume; at the leaf level, it increases the photosynthetic rate and efficiency (Latiri-Souki*et al*., 1998). Under rainfed situation, strategy used consisted of testing segregating populations and advanced lines under limited moisture regimes either by planting in dry land sites with erratic precipitations, in residual moisture sites or with limited irrigations. Keeping these aspects in mind, the present study was initiated with the objective of testing few advance wheat genotypes under rainfed condition in alluvial region of West Bengal.

2. MATERIALS AND METHODS

The field experiment was conducted at District Seed Farm (AB Block), Kalyani under Bidhan Chandra Krishi Viswavidyalaya during winter season of 2015-16 and 2016-17. The farm is situated at approximately 22^{o} 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 7.2, organic carbon 0.41%, available nitrogen 222.13 kg, available phosphorus 24.19 kg and available potassium 243.21 kg/ha. The experiment was carried out in a split plot design with fifteen treatment combination in three replications. Levels of nitrogen were allotted randomly to three main plots; while different wheat genotypes were randomly allotted to four sub plots. The treatment details were mainly include three nitrogen levels (viz. 40, 60 and 80 kg N /ha) in main plot and five wheat genotypes (viz. K 8027, C-306, K 1317, HD 3171 and HD 2888) were sown in the sub plot. Among these genotypes HD 2888 was considered as check variety for its better and stable performances in this region. P_2O_5 and K applied @ 30 and 20 kg/ha. Crop was shown with seed rate of 125 kg /ha. The crop was sown on 15.11.2015 and 20.11.2016, and harvested on 25.03.2016 and 01.04.17.

3. RESULTS AND DISCUSSION

Growth attributes

Study revealed that, plant growth phase was significantly varies with various nitrogen levels and genotype under rainfed situation. Highest growth parameter was registered with more levels of nitrogen. Table 1, revealed that statistically better result with respect to various growth parameters obtained with the use of 80 kg N/ha, and was at par only with physiological maturity phase with 60 kg N/ha (Table 1). Lowest growth parameter found with 40 kg N/ha and was statistically poor compared with all other main plot assignments. With various genotypes, highest plant height found with the HD 2888, and was at par with HD 3171 and significantly better to other genotypes. Dry matter accumulation by plant failed to give any statistically difference, however maximum dry matter production recorded with the HD 3171 and was followed by HD 2888. Tiller number per meter square was utmost found with the HD 3171 and was at par with the HD 2888, and statistically improved to other subplot treatments. Further, table 1 exposed that ear length was maximum observed with the K 1317 and was at par with the HD 2888 and C 306, and notably better to other genotypes. Grain weight per spike was extra found with the HD 3171 and was at par with the K8027 and C 306. Least time for physiological maturity observed with the HD 3171 (126.33 days) and showed parity with the C 306 only (128.33 days), and statistically improved to other treatments. Utmost time for physiological maturity took place by K1317 (133.66 days). Genetic character of genotypes might be the reason for difference in duration for attaining physiological maturity.

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

Treatment	Plant height (c.m)	Dry matter (g/plant)	Tiller/ m^2 (No.)	Ear length (cm)	Grains weight /spike (g)	Physiological maturity (days)
Nitrogen levels (Kg/ha)						
40	66.35	2.29	203.00	6.54	1.36	127.74
60	79.92	3.68	243.66	6.91	1.43	130.81
80	83.62	4.11	275.33	7.57	1.79	132.23
S.Em (±)	0.61	0.05	3.36	0.15	0.03	0.89
LSD (0.05)	1.88	0.18	9.18	0.46	0.09	2.11
Genotypes						
K 8027	74.12	3.06	207.71	6.89	1.69	134.66
C-306	76.36	3.11	211.36	7.08	1.66	128.33
K 1317	71.25	3.24	245.66	6.35	1.45	133.66
HD 3171	79.65	4.06	272.19	7.82	1.82	126.33
HD 2888	81.33	3.71	265.07	7.12	1.62	131.66
S.Em (±)	0.99	0.61	4.09	0.38	0.04	0.91
LSD (0.05)	2.78	NS	12.11	0.95	0.16	2.81

NS = Non significant

Yield attributes and yield

Yield attributes and yield play significant retort with various levels of nitrogen application and with different cultivar tested under rainfed situation of alluvial zone of West Bengal. Perusal of table 2 revealed that, more no. of ear head per meter square observed with the 80 and 60 kg N/ha, and significantly better to 40 kg N/ha. With various subplot treatments, highest this parameter found with the K 8027 and was at par only with the C 306. With various main plot treatments, more grain per ear head found with the 80 kg N/ha and was statistically better to other levels of nitrogen application. Grains per ear head failed to produce any significant reply with various subplot treatments, moreover more number was found with the HD 2888 and least seen with the C 306. Further table revealed that, use of 80 kg N/ha gave more test weight and was statistically better to other levels of nitrogen. Various genotypes under subplot treatments failed to give any significant response. However, highest test weight with different genotypes observed with the HD 3171, and least found with the C 306. The plant root systems, which significantly affect crop growth and yield formation, play an important role in the plant-soil ecosystem. Use of high levels of nitrogen and good genotype absorbed more nutrients from soils system through better root development and help to enhance wheat growth and ultimately yield (Wang *et al.*, 2014). Grain yield was highest observed with the use of nitrogen @ 80 kg/ha (2.98 t/ha) and was at par with the 60 kg N/ha (2.48 t/ha) and notably better to other main plot treatments (Table 2). Use of high level of nitrogen i.e. 80 and

60 kg N/ha resulted in 64.6 and 35.2 %, respectively more grain yield over the 40 kg N/ha. Further, higher values in ear head /m^2 and number of grain/ ear head might have resulted in higher grain yield in the HD 3171 (2.83 t/ha) and was at par with the HD 2888 (2.46 t/ha) and significantly better to other sub plot tested genotypes. Lowest yield amongst various genotype observed with the K 1317 (2.01 t/ha) and was statistically poor to other treatment except C 306 (2.34 t/ha).Cultivar HD 3171 and HD 2888 gave 40.7 and 22.4 % more grain yield over the K 1317. The interaction between nitrogen and genotypes was found significant with regard to grain production (Table 3). Further observation revealed that, straw yield was more found with the 80 kg N /ha (5.06 t/ha) and showed parity only with the 60 kg N/ha (4.84 t/ha), and statistically higher to other main plot assignments (Table 2). Amongst various subplot treatments, more straw fabrication found with the C 306 (5.01 t/ha) and was at par with the HD 3171 (4.58 t/ha) and radically better to other main plot tested genotypes. Lowest straw yield with various cultivars observed with the HD 2888 (3.88 t/ha), and was closely followed by K 8027 (3.98 t/ha). Harvest index was highest noted with 80 kg N/ha and appreciably better to other core plots treatments. With various subplot treatments, highest HI was seen with HD 2888, and was at par with the HD 3171 and K 8027, and significantly better to other treatments.

Table 2: Effect of different nitrogen levels and genotypes on yield attributes and yields of wheat under rainfed condition

(Pooled data of two years).

Treatment	No. of ear head (No. m^2)	Grains/ ear head (No. m^2)	1000-grain weight (g)	Grain yield (t /ha)	Straw yield (t / ha)	Harvest Index (%)
Nitrogen levels (Kg/ha)						
40	188.66	26.33	36.68	1.81	2.95	38.92
60	217.66	28.93	38.8	2.40	4.84	33.33
80	228.33	35.13	40.53	2.98	5.06	36.51
S.Em (±)	3.93	2.01	0.33	0.16	0.21	0.33
LSD (0.05)	10.71	6.11	0.94	0.46	0.61	1.01
Genotypes						
K 8027	225.73	29.09	38.61	2.41	3.98	37.72
C-306	223.66	28.01	36.78	2.34	5.01	31.84
K 1317	208.08	28.57	38.11	2.01	4.04	33.22
HD 3171	210.33	31.68	40.22	2.83	4.58	38.19
HD 2888	189.54	34.10	38.22	2.46	3.88	38.81
S.Em (±)	4.63	2.11	0.61	0.13	0.19	0.41
LSD (0.05)	12.89	NS	NS	0.39	0.56	1.23

NS= Non Significant

Table 3: Interaction effect of grain yield of different wheat cultivars (t/ha) as influenced by various nitrogen levels (Pooled data of two years).

Variety	Nitrogen level (kg/ha)			Mean (t/ ha)
	40	60	80	
K 8027	1.71	2.40	3.13	2.41
C-306	1.87	2.57	2.60	2.34
K 1317	1.51	2.09	2.45	2.01
HD 3171	2.17	2.64	3.69	2.83
HD 2888	1.83	2.32	3.05	2.46
Mean	1.81	2.40	2.98	2.41
	F Test	S.Em(±)	C.D.	C.V (%)
Nitrogen (A)	**	0.06	0.26	12.31
Variety (B)	*	0.07	0.23	9.87
B within A	N.S.	0.13	0.39	-
A within B	-	0.13	0.40	-

** Significance at 1 % levels.* Significance at 0.5% levels.

REFERENCES

[1] 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).

[2] Mukherjee, D.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.

[3] Mukherjee, D. 2017. Enhancement of wheat productivity through efficient nutrient management practices. *Annals of Agricultural Research New Series***,** 38 (4): 395-398.

[4] Wang, C., Liu, W., Li, Qiuxia., Dongyun, M., Lu, H., Feng, W., Xie, Y., Zhu, Y and Guo, T. 2014. Effects of different irrigation and nitrogen regimes on root growth and its correlation with above-ground plant parts in high-yielding wheat under field conditions. *Field Crops Research*, 165: 138-149.

[5] Latiri-Souki, K., Nortcliff, S and Lawlor, D.W. 1998.Nitrogen fertilizer can increase dry matter, grain production and radiation and water use efficiencies for durum wheat under semi-arid conditions. *European Journal of Agronomy*, 9: 21-34.