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RESEARCH PAPER

Response of newly released wheat (*Triticum aestivum* L.) varieties to different sowing dates under changing climate condition in eastern Uttar Pradesh

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Abstract : A field experiment was conducted at Instructional Farm of KVK, Crop Research Station, Masodha of NDUA and T, Faizabad to assess the performance of new wheat varieties under timely sown condition in changing climatic condition. The experiment was laid out in Split Plot Design replicated three times. The treatment comprised of 2 dates of sowing *i.e.,* 15th November and 25th November in main plots and four wheat varieties HD 2967, DBW 39, HD 2733 and PBW 502 in sub plots. The soil of experimental plot was sandy clay loam in texture having low nitrogen (211.6 kg /ha) and phosphorus (11.49 kg/ha) and medium in potassium (244.6 kg/ha) with soil pH 7.5. The early sowing of wheat (15th November) produced significantly higher grains yield (54.61 q/ha) than delayed sowing (51.38 q/ha). Earliness in 10 days of sowing of wheat crop in such climatic change conditions influences wheat yield upto 6.29 per cent. The higher yield was due to higher growth and yield attributes influences the growth and development of crops. Among the varieties significantly higher grain yield (53.20 q/ha), straw yield (61.71 q/ha) net return (Rs. 22556.00) and benefit cost ratio (1.86) were obtained with wheat variety DBW 39 over the rest of the three varieties *i.e.*, HD 2967, HD 2733 and PBW 502.

Key Words : Wheat, Effective tillers, Ear, 1000 grain weight, Harvest index, B:C ratio

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INTRODUCTION

Wheat (*Triticum aestivum* L.) is the world's most widely cultivated cereal crop. In India, wheat is the second most important cereal crop next to rice contributing nearly 35 per cent to the national food basket and plays an important role in food and nutritional security. It finds a major place in meals of common population in major wheat growing states. India ranks second among wheat producing country in the world. This phenomenal increase in production is by and large attributed to adoption of high yielding varieties. The contribution of wheat is maximum as a result of its wide adaptability occupying nontraditional rice growing areas of eastern India as well as late sown and problematic areas from the amenability to technological innovation. Wheat maintains superiority in area, production and versatility in adopting a wide range of agro climates. As

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population is increasing leads to an increase demand of food grains of rice and wheat with no possibility in further increase in area due to growing urbanization. In eastern plain zone of Uttar Pradesh, wheat is grown as a second crop in sequence after *Kharif* crops. At present, the productivity of wheat at national level is around 27.0 q/ha as against 40.0 q/ha in Punjab and 25.97 q/ha in eastern UP (Department of Agriculture). The yield of wheat is continuously declining due to climate variability in recent years. Lower cooling days drastically reducing the wheat productivity in these regions. The yield reduction is much more in the late sown wheat fields. Late sowing wheat seedlings face low temperature in the earlier part and high temperature stress in the later part of the growing season. Late planting of wheat expressed to high temperature at reproductive stage causes reduced grain yield. About 80 per cent of the wheat crop cultivated at late sowing condition after harvesting the transplanted rice and this problem will be further increased due to global warming. Among various factors, sowing time and varieties are the most crucial factors which can counter the vulnerability of changing climate. Therefore, efforts ought to be made to minimize the effect of temperature variation caused due to changed sowing date by choosing appropriate wheat varieties which can synchronize its temperature requirement for onset of various phenophases with that prevailing at that time.

MATERIAL AND METHODS

The field experiment was conducted during the *Rabi* season of 2009-10 and 2010-11 at KVK Instructional Farm, Crop Research Station of N.D. University of Agriculture and Technology, Kumarganj, Faizabad to assess the performance of new wheat varieties under timely sown condition. The experiment was laid out in split plot design replicated three times. The treatment comprised of 2 dates of sowing *i.e.,* 15th and 25th November in main plots and four wheat varieties HD 2967, DBW 39, HD 2733 and PBW 502 in sub plots. The soil of plot was sandy clay loam in texture having low nitrogen (211.6 kg /ha) and phosphorous (11.4 kg/ha) and medium in potassium (244.6 kg/ha) with 7.5 soil pH. The wheat crop varieties were sown in rows at 22.5cm as per treatment scheduled. The crop received full dose of P_2O_5 (60 kg/ha) and K_2O (50 kg/ha) and N (60 kg/ha) as basal and remaining half nitrogen (60 kg/ha) was applied in equal doses, half at tillering and rest half at flowering stage. The sources of nutrient were urea, single super phosphate and muriate of potash for N, P and K, respectively. Post emergence application of sulfosulfuron and metsulfuron was given at 25-30 days after sowing for management of weeds at critical period of crop-weed competition. Other management practices were applied as per recommended of the crop under irrigated condition. The crop was harvested on first fortnight of April during both the years. Data on growth, yield component and yield were recorded as per normal procedure. In calculation of economics, the purchase rates of input and the selling rates of outputs were assumed as per the prevailing local market rates.

RESULTS AND DISCUSSION

The results obtained from the present investigation as well as relevant discussion have been summarized under following heads :

Growth characters :

Perusal of data shown in Table 1 revealed that

Table 1 : Effect of date of sowing and varieties on growth and yield attributing characters of wheat (pooled data of two years)

Treatments	Plant height (cm)	Dry matter (g/m^2)	Effective tillers/m^2 (no.)	Grains/ear (no.)	Ear length (cm)	1000-grain weight (g)
Date of sowing						
November 15	97.46	1254.27	418	41	11.8	42.41
November 25	95.64	1091.84	394	38	10.9	41.20
C.D. (P=0.05)	NS	107.25	6.9	2.1	0.06	1.07
Varieties						
HD 2967	94.73	1051.7	379	36	9.49	42.50
DBW 39	92.54	1086.6	381	38	9.65	43.25
HD 2733	93.66	1013.2	374	35	9.54	41.35
PBW 502	91.05	1007.2	356	33	8.90	40.15
C.D. (P=0.05)	NS	32.42	13.4	2.21	NS	1.43

NS=Non-significant

significant differences were observed with date of sowing and varieties on growth characters. Date of sowing significantly influenced the dry matter accumulation at harvest stage but did not influence plant height. Plant height was more with 15th November than that of 25th November, though the difference was not statistically at par. Maximum dry matter was recorded with November 15 sown wheat crop and was significantly superior to the 25th sown crop. Dry matter accumulation was 14.88 per cent more over November 25th sowing crop. Decrease in plant height and dry matter in late sowing was due to shorter growing period and climate change. These results are in the line with those reported by Shahzad *et al.* (2002) and Kumar *et al.* (2013). Different wheat varieties were also did not showed significant difference for plant height. But both, the date of sowing and varieties had showed its impact on total biomass production varied significantly. Higher plant dry matter accumulation was recorded with DBW 39 which was significantly superior to rest of the varieties followed by HD 2967. These results are similar to those of Mishra (2006).

Yield attributes and yield :

All yields attributes were significantly affected by the date of sowing (Table 1). Delayed sowing decreased grains per ear, number of effective tillers per m^2, ear length and 1000 grain weight. The number of effective tillers per m^2 and grains per ear was considered as the most important yield contributing characters varied significantly under different date of sowing. Sowing at 15th November, significantly influenced the entire yield attributing characters and significantly superior than the delayed sowing. Analysis revealed that the 10 days early sowing brought about 6.09 per cent higher number of effective tillers per m^2 and 7.89 per cent higher grains per ear as compared to delayed sowing. This might be due to favourable temperature requirement as per crop need boosting crop growth in the form of higher photosynthate accumulation and resulting higher yield parameters in early sown crop. These results are also in conformity to that of Kaur *et al.* (2010); Pandey *et al.* (2010) and Mukherjee (2012). Further, data revealed that ear length and 1000 grain weight were significantly higher at early sown crop as compared to late sown condition. Decrease in test weight due to delay sowing was mainly due reduction in growth period and shriveling of grains due to high temperature prevailed during milking and grain filling stage. Sharma and Chakor (1993) recorded similar results. The wheat genotype showed significant difference with all the yield attributes except the ear length. Variety DBW 39 recorded higher effective tillers ($381/m^2$), ear length (9.65 cm), grains/ear (38) and 1000 grain weight (43.25g) than that of recorded with other varieties.

Different date of sowing significantly influenced the grains and straw yields (Table 2). The wheat sown in early condition produced significantly higher grain yield (54.61 q/ha) than delayed sowing (51.38 q/ha). Earliness in 10 days of sowing of wheat crop in such climatic change conditions influences wheat yield upto 6.29 per cent. Similar findings were also obtained by Kumar *et al.* (2005) and Kumar *et al.* (2013). Among varieties DBW 39 was significantly superior over HD 2733 and PBW 502 but remained at par with HD 2967. However, HD 2733 was significantly superior over PBW 502 but remained at par with HD 2967. The straw yield of wheat also showed similar trends. Normal date of sowing produced significantly higher straw yield (71.23 q/ha) than late sown condition (64.83 q/ha).The different

Table 2 : Effect of date of sowing and varieties on wheat yield, straw yield, harvest index and economics (pooled data of two years)

Treatments	Grain yield (q/ha)	Straw yield (q/ha)	Harvest index (%)	Net return (Rs.)	B:C ratio
Date of sowing					
November 15	54.61	71.23	43.40	24636.0	1.94
November 25	51.38	64.83	44.21	21412.0	1.82
C.D. (P=0.05)	2.73	3.23	NS	–	–
Varieties					
HD 2967	52.30	59.55	46.76	21620.0	1.83
DBW 39	53.20	61.71	46.30	22556.0	1.86
HD 2733	51.44	62.44	45.17	21221.0	1.81
PBW 502	46.27	61.57	42.91	16998.0	1.65
C.D. (P=0.05)	1.36	NS	NS	–	–

NS=Non-significant

varieties failed to cause significant effect on straw yield. In general the highest straw yield was recorded with HD 2733 while the lowest straw yield was observed with HD 2967. The harvest index of wheat was not affected significantly by date of sowing and various genotypes.

Economics :

Net returns of Rs. 24636.0 were maximum with early sown crops and minimum was in delayed sown crops (Table 2). This treatment also recorded higher benefit:cost ratio (1.94). Among all varietal treatment, maximum net return (22556.0) and benefit:cost ratio (1.86) was recorded with cultivar DBW 39 followed by HD 2967 and HD 2733. The least net returns and benefit cost ratio was observed with the cultivar PBW 502. These findings showed that recent released varieties have better ability to cope vulnerability of climate change and global warming as compared to older ones.

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