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Shashank Srivastav
Department of Crop Physiology, C. S. Azad University of Agriculture & Technology, Kanpur, Uttar Pradesh, India

Arun Srivastava
Department of Crop Physiology, C. S. Azad University of Agriculture & Technology, Kanpur, Uttar Pradesh, India

Vikas Yadav
Department of Crop Physiology, C. S. Azad University of Agriculture & Technology, Kanpur, Uttar Pradesh, India

Ashish Srivastava
Department of Agronomy, C. S. Azad University of Agriculture & Technology, Kanpur, Uttar Pradesh, India

Correspondence
Shashank Srivastav
Department of Crop Physiology, C. S. Azad University of Agriculture & Technology, Kanpur, Uttar Pradesh, India

Physiological changibility and production enfluency in wheat with dry matter accumulation under late sown climatic condition

Shashank Srivastav, Arun Srivastava, Vikas Yadav and Ashish Srivastava

Abstract
The present study appraised under the heads of "Physiological variability and production efficiency in promising wheat genotypes under late sown condition, In rabi season 2013-14 ten wheat genotypes were taken and sowing in a micro plot. Wheat varieties namely as such NW 1014, HD 2733, K 9465, NW 2036, K 9703, K 424, K 9533, K 9423, HUW 234 and K 9162. Among the different growth observation were recorded as number of leaves, leaf area, relative growth rate, length of ear, length of main ear and yield factor effective of dry matter of plants number of grain per plant, straw weight per plant, weight of grain per plant, dry weight of stem, dry weight of leaves, dry weight of ear and total grain yield per plot.
Ten promising wheat genotypes they are variability and production efficiency along with recommended dose of fertilizer increased the plant growth parameter, dry matter production and its partitioning in different plant. The dose of fertilizer as basal application of 60 Kg N, 60 Kg P_2O_5 and 60 Kg K_2O was applied uniformly in the form of urea, DAP and MOP. Another dose of 40Kg N ha^{-1} in the form of urea was applied after first irrigation i.e. one month after sowing.
The observations were recorded at different growth stages and after harvesting. The result further also all genotype in growing factor HUW 234 had maximum and HD 2733 minimum production.

Keywords: physiological variability, production efficiency, wheat genotypes, late sown condition, dry matter

Introduction
Late sowing threatens the wheat through chilling injury to developing seedlings, accumulation of less solar radiations, incident of high temperature along with limited moisture availability at reproductive development (Cao and Moss, 1994) [6]. Plant metabolites in complex biosynthetic pathways are believed to be affected by terminal heat stress. It showed the changes in cell membrane structure and antioxidants including proline accumulation and chlorophyll contents and thereby plant senescence which leads to shortening of the period of photosynthetic activity.
Wheat is a very adoptable crop and is grown under a wide range of soil and climatic condition. The production of wheat in Uttar Pradesh, one of India's largest producing state had reached high producing state almost 6.38 million hectares till 2014. But there is a lack of precise information on response of new wheat genotypes to high temperature stress with respect growth and yield determining attributes under changing climatic variations.
Delayed sowing of wheat after paddy and cotton are known to reduce grain yield mainly due to exposure of crop to high temperature during grain development period (Asana and Williams 1965). Germination and early seedling growth have much effect on ultimate yield of a crop. Soil moisture and temperature play very important role in initiating germination wheat seeds. Each crop species has definite minimal, optimal and maximal temperature for germination. Above and below the optimal temperature, the metabolic activity preceding germination is reduced.
A field experiment was conducted in India during the rabi season of 1997-98 and 1998-99 to study the production efficiency of wheat varieties. Wheat varieties DL 803-3 (45.8 q/ha), GW 542 (44.2 q/ha) and HI 83-81 (44 q/ha) were statistically on a par for yield and gave significantly higher yields than the other varieties. Varieties Lok-1, HD 2285, GW 190 and GW 173 were also on a par and had higher yields than GW 170 and HD 1553. The lowest yield was recorded in HD 1553 (control). Lok-1, HD 2285, GW 173 and HI 1077 were early

maturing and were fit for late-sown conditions Rajput (2001). To study the effect of germination percentage, seedling emergence and tillering on yield of different varieties of wheat significant difference was recorded among dates of sowing from 1st November to 16th January with highest mean grain yield of 6292 kg ha-1 followed by 16th November sowing (6059 kg ha-1). After November, yield of all varieties decreased significantly. Lowest grain yield of 2020 kg ha-1 was recorded on 16th January sown.

Muhammad *et al.* (2012) [11]. Comparative physiological changes in wheat genotypes viz., DBW-140, Raj-3765, PBW-574, K-0-307 and HS-240 were evaluated under timely and late sown conditions in rabi season. We observed that heat stress dramatically affects chlorophyll content and leaf area index (LAI) in sensitive genotypes whereas proline and malondialdehyde (MDA) content were higher in tolerant genotypes under late sown conditions.

Mishra *et al.* (2015) [8, 9]. According to the main objectives of present study were to access, the effect of reduced irrigation on yield attributes, root development, dry matter accumulation and partitioning of wheat (*Triticum aestivum* L.) crop under reduced irrigation in Delhi (India) during winter (*rabi*) weather conditions

Singh and Dwivedi (2015) [17, 20]. Stated that the late sowing of wheat results in exposure to high temperature during reproductive phase (seed filling). The present paper studies the effects of late sown condition on various morph physiological parameters at different stages of growth

Materials and Method

The experiment was conducted in the field during Rabi season 2013-2014 in the Department of Crop Physiology, College of Agriculture, C. S. Azad University of Agriculture and Technology, Kanpur. It was conducted in Randomized Block Design with ten genotypes and three replications. Seed of ten promising wheat genotype of comparatively wider adaptability *viz*., NW 1014, HD 2733, K 9465, NW 2036, K 9703, K 424, K 9533, K 9423, HUW 234 and K 9162 were used in this experiment. The experimental field was fertilized with recommended dose of NPK @ 120 Kg N, 60 Kg P_20_5 and 60 KgK_2O. The sowing was done in plot with row to row 22.50cm and depth 5cm below. Based on the experiments rabi season for one year metrological data as analysis indicate the temperature of this year during the growing season was minimum temperature 8.7 ^{0}C and maximum temperature 26.7 ^{0}C at harvesting time minimum temperature 15.3 ^{0}C and maximum temperature 34^{0}C. Apart from these, there existed variation for temperature during different phase of crop growth. Result indicates that high temperature caused hastening of flowering and maturity of wheat.

Results and Discussion

The data shown in table one under the heads of number of leaves per plant a key role in augmenting the biomass potential of wheat crop. It was also observed that leaves production ability of the genotypes were greatly influenced by the environment factor under field condition at the anthesis stage number of leaves higher in the genotypes HUW234 followed by K9423 and lowest number of leaves in HD2733. In case of leaf area per plant data may be indicated there was general increase in the leaf area ranging increase in as the stages. The mean were recorded under active tillering, jointing, anthesis and harvesting stage respectively. It was found statistically significant at the stage. The maximum leaf area at harvesting time shown in HUW234 followed by NW1014 and the minimum in variety HD2733. In the data of length of main ear the analysis data regarding length of main ear (cm) given in result reveled that there was significant difference in the length of main ear in the various genotype. The maximum length of main ear HUW234 followed by NW1014 the genotype which was significantly higher than the length of main ear recorded under all the other genotype and minimum ear length was recorded in genotype HD2733. The observation recorded of weight of grain per plant at harvest stage significantly differs between tested varieties. Weight of grain per plant which has significantly highest in HUW234 and lowest is HD2733 in rang to number of grain per plant. The genotype HD2733 through being lowest weight of grain per plant comparison to all rest varieties. The genotype HUW234 was effective response among all other genotypes. In this table total grain yield per plot (kg/ha) recorded at harvest time it presented the average grain yield of different genotypes. The grain yield per plot influenced significantly under various genotype. The maximum grain yield per plot in (kg/ha) was recorded the genotype HUW234 which was significantly higher than the grain yield recorded all other genotypes. The minimum grain yield was found in genotypes HD 2733. Plant growth in terms of rate dry matter accumulation per unit time varied to a great extent and various observation dates in table. The RGR was highest between tillering and jointing stage and declined up to between anthesis to harvest stage. Significant genotypic difference were also observed RGR value at the initial growth stage (between tillering and jointing) and also between jointing and anthesis stage. Between tillering and jointing NW 2036, HUW 234, K9162 established the superiority over rest genotype.

Table 1

Genotype	No. of leaves/ plant	Leaf area/ plant	Length of main ear (cm)	weight of grains / plant	Total Grain yield/ plot (kg/ha)	Relative growth rate
	Anthesis stage	At harvest	At harvest	At harvest	At harvest	Tillering to Harvest
NW 1014	17.33	741.46	11.06	9.53	0.54	6.46
HD 2733	12.00	430.79	9.16	5.30	0.39	4.35
K 9465	13.33	485.29	10.73	5.60	0.42	4.72
NW 2036	16.00	685.10	10.90	8.66	0.51	6.01
K 9703	11.66	502.78	10.70	5.64	0.44	5.78
K 424	12.66	574.34	10.50	7.69	0.46	4.69
K 9533	14.00	595.52	10.73	7.70	0.49	4.60
K 9423	18.33	582.86	10.30	8.18	0.47	4.76
HUW 234	19.00	751.38	12.53	10.50	0.58	6.53
K 9162	14.66	665.38	10.80	8.18	0.50	5.92
SE (m)±	0.8060	12.8446	0.1125	0.4705	0.0316	0.2763
CD at 5%	2.3952	38.1705	0.3348	1.3985	0.0931	0.8203

Table 2

Genotype	Dry weight of stem	Dry weight of leaves/ plant	Dry weight of ear	Dry matter production / plant	Test wt.	Harvest Index
	At harvest	At harvest	At harvest	At harvest	At harvest	At harvest
NW 1014	5.77	1.35	14.98	22.10	38.57	33.75
HD 2733	4.08	0.92	12.25	17.25	34.58	33.33
K 9465	4.77	1.01	12.92	18.70	35.99	35.59
NW 2036	5.75	1.28	14.17	21.20	37.74	34.45
K 9703	4.93	1.08	13.00	19.01	36.34	37.60
K 424	5.58	1.12	12.60	19.30	29.43	34.07
K 9533	5.68	1.19	13.47	20.34	36.66	36.56
K 9423	5.60	1.13	12.88	19.61	36.55	33.55
HUW 234	5.78	1.40	15.20	22.38	41.22	37.90
K 9162	5.74	1.24	13.78	20.76	37.52	36.44
SE (m)±	0.3601	0.0447	0.4993	0.8818	0.7624	0.5069
CD at 5%	1.0700	0.7150	1.4839	2.6205	2.2659	1.5062

In this table number two dry weight of stem/ plant revealed that genotype HUW 234 was characterized by highest dry weight of stem at all the stages i.e. tillering, jointing, anthesis and harvest stage. At harvesting stage the maximum dry weight of stem production/plant noted the HUW 234 and the minimum dry weight of stem/plant the genotype HD 2733 at this stage. Dry weight of leaves/plant wheat genotypes were recorded at different growth stages.

The data presented here by indicated that was a general increases in the dry weight of the leaves as the increased in the stages the mean dry weight of leaves was recorded under tillering, jointing, anthesis, and harvest stage, respectively. Dry weight varied significantly among the genotypes of wheat taken for the present stage it being maximum in HUW 234 and the minimum in HD 2733.

A presented data in the table depicting the observation of dry weight of ear reveals a significantly difference between the genotype at jointing, an thesis and harvesting. It found to be statistically significant obtained under the genotype. The lowest dry weight of ear was recorded under the genotype HD 2733 (12.25g) and the highest weighted genotype is HUW 234 (15.20g) at harvest stage. The genotype HUW 234 showed best response among all, in dry weight of ear.

Data noted on dry matter production/plant table number two revealed that genotype HUW 234 was characterized by highest dry matter production at all the stages i.e. tillering, jointing, anthesis and harvest stage. The mean dry matter/plant was recorded under tillering, jointing, anthesis, and harvest stage, respectively. However the data were significantly at all the stage. At harvest stage however minimum dry matter/plant was recorded in HD 2733 genotypes. From the result it appears that both genotypes HUW 234 and NW 1014 were given best response and statically at 5.0 percent level of significance.

Data shown in this table the size of the grains as judged by their test weight of wheat. It varied considerably due to the genotype. The highest value was found in HUW 234 and the lowest value of test weight HD 2733 at harvest stage. Remaining genotypes occupied between 34.58 to 41.22 (g) of test weight**.** The genotype HUW 234 was found statically superior among all other genotype.

Given table data on harvest index have been equally important as the rate of photosynthetic build up is the pre portion at partitioning photosynthates between the organ of economic yield and other accessory plant parts. This depends on the efficiency with which the photosynthates are translocated from the sight of their production to the organs of economic yield i.e. the grain yield in wheat. Among index of this as provided by the value of harvest index which was significantly highest is HUW 234 and lowest is HD 2733 respectively.

Table 3: Coefficient of Correlation analysis between grain yield and yield attributes

	Grain yield	1000 grain weight	No. of grain on main shoot	Length of main ear	No. of ear/plant	Harvest Index	Grain weight/plant
Grain yield	1.000						
1000 grain weight	0.6503*	1.0000					
No.of grain on main shoot	0.8328**	0.7459*	1.0000				
Length of main ear	0.8545**	0.6265	0.8018**	1.0000			
No. of ear/plant	0.8369**	0.7102*	0.8305**	0.6230	1.0000		
Harvest Index	-0.6299	-0.1917	-0.6606	-0.5519	-0.7399	1.0000	
Grain weight/plant	0.9621**	0.5243	0.6918*	0.7404*	0.8275**	-0.6294	1.0000

(* significant at 5% and ** significant at 1%)

The perusal of coefficient of Correlation analysis between grain yield and yield attributes revels that correlation coefficient between grain yield and its attributes, grain yield was found to be significantly correlation with 1000 grain weight, number of grain on main shoot, length of main ear, number of ear/plant, grain weight/plant at 5.0 percent level of significance. 1000 grain weight, number of grain on main shoot, length of ear and grain weight/plant were enhancing grain yield of wheat at late sown condition. Grain yield was naturally correlated with harvest index at 5.0 percent level. 1000 grain weight was positively significantly correlated with number of grain on main shoot and number of ear/plant.

Number of grain on main shoot was significantly correlated with length of main ear and number of ear/plant. Length of main ear was significantly correlated with grain weight/plant.

References

1. Akhtar M, Ahmad N, Nasrullah M, Ali B, Zahid AR, Shahid MI. Effect of late planting on emergence, tillering and yield of various varieties of wheat. Journal of Animal and Plant Sciences. 2012; 22(4):1163-1166.

2. Anil Prashar, Sudhir Thaman. Wheat Section, Department of Plant Breeding, Punjab Agriculture University, Ludhiana 141 004, India. Progressive Agriculture. 2005; 5(1/2):10-12
3. Asana RD, Williams RF. The effect of temperature stress on grain development in wheat. Aust. J Agri. Res. 1965; 16:1-13.
4. Asana RD, Mani VS. Studies in physiological analysis of yield, varietals differences in photosynthesis in the leaf stem and ear of wheat. Physol. Plant. 1950; 3:22-39.
5. Asana RD, Saini AD. Studies in physiological analysis of yield. Grain development in wheat in relation to temperature, soil moisture and changes with age in sugar content of the stem and in the photosynthetic surface. Indian J Plant Physiol. 1962; 5:128-171.
6. Cao W, Moss DN. Sensitivity of winter wheat phyllochron to environmental changes. Agron J. 1994; 86:63-66.
7. Cheema MA, Muhammad Farooq Wahid MA, Abdul Wahid Babar BH. Evaluating the performance of wheat cultivars under late sown conditions. International Journal of Agriculture and Biology. 2010; 12(4):561-565.
8. Mishra AK, Parihar SS, Kumari VV, Srivastava TK, Khan Chand. Root morphology and yield of wheat (*Triticum aestivum* L.) crop under reduced irrigation in Delhi (India) weather conditions. American Journal of Experimental Agriculture. 2015; 8(1):12-39.
9. Mishra AK, Parihar SS, Kumari VV, Srivastava TK, Khan Chand. Root morphology and yield of wheat (*Triticum aestivum* L.) crop under reduced irrigation in Delhi (India) weather conditions. American Journal of Experimental Agriculture. 2015; 8(1):12-39, 88.
10. Muduli KC, Kar AK, Sahu KC, Mishra BK, Swain SK, Nayak RN. Influence of sowing dates of seed crops on seed yield and quality parameters in wheat cv Sonalika. Environment and Ecology. 2010; 28(1A):284-287.
11. Muhammad Akhtar, Iqbal RM, Moazzam Jamil, Akhtar LH. Effect of sowing date on emergence, tillering and grain yield of different wheat varieties under Bahawalpur conditions. Pakistan Journal of Agricultural Sciences. 2012; 49(3):255-259.
12. Nasri R, Kashani A, Paknejad F, Vazan S, Barary M. Correlation, path analysis and stepwise regression in yield and yield component in wheat (*Triticum aestivum* L.) under the temperate climate. Indian Journal of Fundamental and Applied Life Sciences (2014; 4(4):188-198.
13. Prasad SVS, Saxena DC, Ravish Chatrath Mishra, Watt SC, Wasson M, Renu Parashar A *et al*. Banaras Hindu University Progressive Research. 2013; 8(2):190-194, 4 ref.
14. Rajput RL, Pandey RN. Krishi Vigyan Kendra, Kothi Baag, Rajgarh (Biaora) - 465 661 (M.P.), India. Advances in Plant Sciences. 2004; 17(1):213-217.
15. Sarlach RS, Sohu VS, Mavi GS. Effect of sowing time on yield, yield contributing characters and seed quality parameters in wheat genotypes. Environment and Ecology. 2008; 26(3A):1342-1345.
16. Saxena DC, Prasad SVS, Ravish Chatrath Mishra SC, Watt M, Renu Prashar, Anton Wason Amit Gautam *et al*. Banaras Hindu University Journal of Plant Physiology. 2014; 19(1):43-47. 11 ref.
17. Singh Pratap, Dwivedi Padmanabh. Morpho-physiological responses of wheat (*Triticum aestivum* L.) genotypes under late sown condition. Vegetos. 2015; 28(1):16-25.
18. Sarlach RS, Sohu VS, Mavi GS. Effect of sowing time on yield, yield contributing characters and seed quality parameters in wheat genotypes. Environment and Ecology. 2008; 26(3A):1342-1345.
19. Saxena DC, Prasad SVS, Ravish Chatrath, Mishra SC, Watt M, Renu Prashar, *et al*. Banaras Hindu University Journal of Plant Physiology. 2014; 19(1):43-47, 11 ref.
20. Singh Pratap, Dwivedi Padmanabh. Morpho-physiological responses of wheat (*Triticum aestivum* L.) genotypes under late sown condition. Vegetos. 2015; 28(1):16-25.