EFFECT OF TEMPERATURE AND DELAYED CULTIVATION ON WHEAT CROP

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ABSTRACT

At 60 DAS, under 15 days late sowing, all the varieties except K 8962 recorded non-significant increase in plant biomass over normal sowing in 2006-07 but in 2007-08, all varieties except Halna, NW 1076 and HP 1633 had significant increase. However, under 30 days late sowing all the varieties showed significant increase in plant biomass over normal sowing in both years.

In contrast to above stage, at 90 DAS, significant reduction in plant biomass was observed under late over to normal sowing and magnitude of reduction was more under 30 days late sowing in comparison to 15 days delayed sowing. In 2006-07, under 15 days late sowing, only two varieties viz., Halna and Sonalika had non-significant decrease in plant biomass as compared to normal sowing, however, rest of the varieties had significant decrease. In 2007-08, non-significant decrease was observed in Halna, HP 1744 and NW 2036 while others showed significant decrease under 30 days late sowing, all the varieties resulted in significant decrease in plant biomass over normal sowing in both years. However, maximum plant biomass was observed in Raj 3765 followed by Sonalika and UP 2425 and in 2007-08, highest biomass was found in Sonalika followed by HD2285 and Halna.

Key words: *varieties, biomass. Non-significant, late sowing.*

INTRODUCTION

Plants exposed to high temperature evolve a series of morphological and physiological adaptations, which confer tolerance to these stresses. However, the utility of a plant character as a selection criterion depends upon its rapid assessment and simplicity. Most physiological screening tests are too slow and complex to be suitable for large scale breeding programmes. The aim of the present study was to identify simple physiological traits which can be used to identify and screen wheat genotype for temperature tolerance by assessing their association with grain yield.

An understanding in this regard would provide the basis for improving the high temperature tolerance for grain growth in wheat. Therefore, identification of reliable physiological traits contributing to high temperature tolerance by utilizing the existing variability among cultivars is necessary for development of high temperature tolerant varieties. Keeping above facts in mind the present investigation entitled "Physiological characterization of wheat (*Triticum aestivum* L.) Varieties for hyper thermal tolerance" was undertaken with the following objectives: Screening and evaluation of wheat varieties for tolerance to high temperature. To identify physiological traits associated with high temperature tolerance.

REVIEW OF LITERATURE

Pandey *et al.* (1974) found that an increase in plant height of wheat when sowing was of delayed from 22nd October to 20th November.

Singh and Singh (1989) reported that among the wheat varieties, Sonalika resulted in maximum plant height during first year, while during second year HUW-234 recorded more plant height followed by HD-2285, at the late sowing (20th December).

Naik *et al.* (1991) reported that the plant height influenced significantly by sowing dates. The crop sown on 18th November produced significantly taller plants than crop sown on 31st October and 15th December.

Evans and Wardlaw (1976) observed that high temperature increases the growth rate, but decrease the growth duration. Since, the overall growth rate and growth duration is more affected by temperature therefore high temperature visually result in depressed growth, hence reduced grain yield.

Singh and Singh (1975) found that plant height was increased progressively as the sowing was delayed from 1st to 20th November. Though the differences were not significant, after 20th November plant height decreased significantly with delay in sowing.

Singh *et al.* (1978) observed that after the January-February, minimum and maximum temperature increased suddenly which resulted into forced maturity of late sown crop andresulted in the lesser number of tillers m^{-1}.

Prasad (1979) found that delayed sowing beyond 30th November add adverse effect on plant population and effective tillers.

Mishra *et al.* (2000) observed that number of tillers increased when sowing was done on 22nd November as compared to other late date of sowing.

Kumar and Sharma (2003) reported that the number of tillers m^{-1} was reduced when sowing in delayed particularly beyond 20th November.

Negi *et al.* (2003) observed more number of tillers $metre^{-1}$ when the crop sown on 28th November that the 20th October sowing.

Singh *et al.* (2001) observed that high temperature reduce number of tiller m^{-2} indifferent wheat varieties on varying extent.

MATERIAL AND METHOD

Data recorded on plant biomass as influenced by late sowing have been presented in Table 5 and 6. In general, late sowing resulted in increase in plant biomass of almost all varieties at 30 DAS and 60 DAS. However, at 90 DAS, all the varieties exhibited decrease in plant biomass under both 15 days and 30 days late sowing as compared to normal sowing. At 30 days, under 15 days late sowing significant increase in plant biomass was over normal sowing was observed in PBW 343, Sonalika and K 8962 in year 2006-07, while, in 2007-08, UP 2425 and HP 1633 had significant increase. Rest of the varieties in both years showed non-significant increase in biomass. Under 30 days delayed sowing, all the varieties exhibited significant increase in plant biomass in both years.

At 60 DAS, under 15 days late sowing, all the varieties except K 8962 recorded non- significant increase in plant biomass over normal sowing in 2006-07 but in 2007-08, all varieties except Halna, NW 1076 and HP 1633 had significant increase. However, under 30 days late sowing all the varieties showed significant increase in plant biomass over normal sowing in both years.

In contrast to above stage, at 90 DAS, significant reduction in plant biomass was observed under late over to normal sowing and magnitude of reduction was more under 30 days late sowing in comparison to 15 days delayed sowing. In 2006-07, under 15 days late sowing, only two varieties *viz*., Halna and Sonalika had non-significant decrease in plant biomass as compared to normal sowing, however, rest of the varieties had significant decrease. In 2007-08, non-significant decrease was observed in Halna, HP 1744 and NW 2036 while others showed significant decrease under 30 days late sowing, all the varieties resulted in significant decrease in plant biomass over normal sowing in both years. However, maximum plant biomass was observed in Raj 3765 followed by Sonalika and UP 2425 and in 2007-08, highest biomass was found in Sonalika followed by HD2285 and Halna.

Relative growth rate (RGR):

In general, RGR of all varieties between 30-60 DAS was higher than 60-90 DAS under normal as well as late sowing conditions in both years. Between 30-60 DAS, 15 days late sowing caused significant increase in RGR over normal sowing in variety NW 1014 in 2006-07, while in2007-08, significant increase was observed in varieties NW 1014, Raj 3765, NW 2036, HD 2285 and HD 2307. However, under 30 days late sowing, significant increase in RGR over normal sowing was found in Raj 3765, NW 1014, Sonalika and HD 2307 in 2006-07, HD 2643, HP 1744, NW 2036, Sonalika, HD 2285 and HD 2307 in 2007-08.

Table-5: Effect of late sowing on plant biomass (g/plant) in wheat varieties at different growth intervals (2006-07).

Varieties	30 DAS				60 DAS				90 DAS			
	NS	LS_1	LS_2	Mean	NS	LS_1	LS_2	Mean	NS	LS_1	LS_2	Mean
Halna	0.15	0.16	0.29	0.20	2.69	3.65	5.71	4.02	23.46	22.05	17.36	20.96
Raj 3765	0.10	0.12	0.39	0.20	2.70	3.17	5.68	3.85	27.07	22.46	18.13	22.55
NW 1014	0.11	0.12	0.21	0.15	2.16	4.77	6.38	4.44	25.17	20.13	15.10	20.13
PBW 343	0.10	0.18	0.30	0.19	2.95	3.26	6.95	4.39	22.60	16.95	13.33	17.63
HD 2643	0.13	0.17	0.30	0.20	2.96	2.52	5.33	3.60	25.88	18.90	14.23	19.67
HP 1744	0.13	0.16	0.30	0.20	2.39	3.64	4.64	3.56	22.68	16.33	13.60	17.54
NW 2036	0.11	0.13	0.20	0.15	2.99	3.66	6.55	4.40	21.14	17.96	15.22	18.11
DBW 14	0.12	0.14	0.31	0.19	2.73	3.52	6.44	4.23	18.35	15.41	12.47	15.41
NW 1076	0.14	0.15	0.30	0.20	2.40	3.77	6.50	4.22	23.91	17.15	14.58	18.55
Sonalika	0.11	0.18	0.27	0.19	2.06	3.64	9.57	5.09	23.83	21.43	18.08	21.11
HD 2285	0.18	0.18	0.27	0.21	2.86	3.74	8.06	4.89	26.36	21.08	17.39	21.61
HD 2307	0.11	0.13	0.29	0.18	2.19	3.31	7.57	4.36	22.53	17.34	13.51	17.79
K 8962	0.11	0.20	0.31	0.21	2.92	5.10	8.02	5.35	24.62	20.43	16.49	20.51
UP 2425	0.14	0.17	0.29	0.20	3.08	3.69	8.60	5.12	29.11	20.37	15.71	21.73
HP 1633	0.14	0.16	0.29	0.19	2.74	3.34	8.46	4.85	25.75	17.51	14.16	19.14
Mean	0.13	0.16	0.29		2.65	3.65	6.96		24.16	19.03	15.29	
CD at5%	V = 0.02, S=0.02,V at S = 0.05, S at V = 0.05				V = 0.83, S=0.69, V at S = 1.44, S at V = 1.51				V = 1.43, S=1.17, V at S =2.48, S at V = 2.59			

Table-6: Effect of late sowing on plant biomass (g/plant) in wheat varieties at different growth intervals (2007-08).

Varietiess	30 DAS				60 DAS				90 DAS			
	NS	LS_1	LS_2	Mean	NS	LS_1	LS_2	Mean	NS	LS_1	LS_2	Mean
Halna	0.16	0.17	0.36	0.23	2.52	3.47	5.91	3.97	23.88	23.06	18.88	21.94
Raj 3765	0.14	0.17	0.42	0.24	2.07	3.66	6.58	4.10	27.95	23.56	19.90	23.80
NW 1014	0.14	0.20	0.36	0.23	2.04	4.85	6.73	4.54	25.70	20.60	16.46	20.92
PBW 343	0.16	0.21	0.31	0.23	1.96	3.50	7.60	4.35	21.21	16.42	12.29	16.64
HD 2643	0.13	0.17	0.27	0.19	1.32	2.55	5.82	3.23	24.99	18.32	14.69	19.33
HP 1744	0.14	0.19	0.24	0.19	2.11	3.55	5.39	3.68	22.41	16.94	13.47	17.61
NW 2036	0.18	0.21	0.30	0.23	1.99	3.50	6.92	4.14	20.80	17.33	15.91	18.01
DBW 14	0.14	0.22	0.34	0.23	2.03	3.69	6.82	4.18	19.51	16.76	13.40	16.56
NW 1076	0.14	0.22	0.40	0.25	2.21	3.61	6.90	4.24	24.00	17.89	14.70	18.86
Sonalika	0.20	0.24	0.42	0.29	3.05	4.40	10.71	6.05	26.13	22.22	19.86	22.74
HD 2285	0.12	0.17	0.43	0.24	1.82	4.10	9.99	5.30	27.42	22.52	19.40	23.11
HD 2307	0.15	0.17	0.41	0.24	2.08	3.55	8.41	4.68	19.95	15.86	12.67	16.16
K 8962	0.16	0.20	0.49	0.28	2.95	5.02	8.19	5.39	26.95	22.16	18.18	22.43
UP 2425	0.14	0.21	0.36	0.23	2.44	4.06	8.60	5.03	27.32	18.74	15.12	20.39
HP 1633	0.12	0.19	0.30	0.21	2.83	3.30	8.54	4.89	27.09	19.31	13.62	20.01
Mean	0.15	0.20	0.36		2.23	3.79	7.54		24.35	19.45	15.90	
CD at 5%	V = 0.03, S=0.03, V at S = 0.06, S at V = 0.07				V = 0.79, S=0.66, V at S = 1.37, S at V = 1.44				V = 1.44, S=1.19, V at S = 1.51, S at V = 2.62			

CONCLUSION

Between 60-90 DAS, in comparison to normal sowing, the late sowing for both 15 and 30 days decreased significantly the RGR of all varieties in both years. In 2006-07, highest RGR under 15 days and 30 days, late sowing was found in Raj 3765 followed by Halna, Sonalika and HP 1744. In 2007-08, varieties Halna, Raj 3765 and HD 2643 maintained higher RGR than rest of the varieties under both late sowing conditions. Under 30 day late sowing, decrease in RGR was higher in almost all varieties was higher in 2006-07 as compared to 2007-08.

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