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Interactive effect of salinity and high temperature stress during germination stage of different wheat (*Triticum astivum* L.) genotypes

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Abstract
The experiment was carried out under laboratory condition to investigate the impact of individual as well as combined salinity and high temperature stress on germination and early seedling growth of wheat and to screen contrasting sets of wheat genotypes for combined stress. Three replications of screen forty six winter wheat (*Triticum aestivum* L.) genotypes were subjected to two levels of salinity stress i.e. 4 and 8 dSm^{-1} with salt combination of NaCl:$CaCl_2$:Na_2SO_4 in a ratio of 7:2:1 and high temperature treatment that was given by transferring the seeding in the incubator at temperature 37± 2°C. The physiological parameters i.e. seedling length, seedling fresh weight, seedling dry weight and SPAD value were measured in 10 days old seedling. The result indicated that, all parameters were found decreased under the influence of these stress but the reduction was most severe under combined second salinity level and high temperature stress when compared to ambient condition. Also genotypes KRL-1-4, KRL-19 and HD-2733 were found to be most tolerant and HI-1563, HD 2329 and HT-8 were the most susceptible in terms of physiological parameters under given treatments. It was concluded that there is a genetic variability among the wheat genotypes that can be used in breeding programs to improve wheat yield.

Keywords: Combined stress, high temperature, physiological parameters, salinity, wheat

Introduction
Wheat is the second most important staple food crop next to rice. Many abiotic stresses negatively affect wheat growth and productivity, and ultimately yield. Many studies have described the response mechanisms of plants to salinity and heat applied individually, recent studies revealed that the response of plants to a combination of two different stresses is specific and cannot be deduced from the stresses applied individually (Rivero %., 2014). Heat stress is a common problem in many wheat-growing regions worldwide. as wheat is a cool season crop in hardly tolerate the temperature increase above optimum and result in yield losses. Soil salinity is also a global eco-threat to sustainable agriculture and is also increasing over the time. To cope with environmental stresses, plants can develop adaptation strategies i.e. escape, stress avoidance and stress tolerance (it is the ability of the plant to sustain plant function with the presence of stressed conditions) (Touchette %., 2007).

Materials and Method
Experimental site: The present study was done in laboratory condition in the Department of Botany and Plant Physiology, Dr. Rajendra Prasad Central Agriculture University, Pusa, Bihar.

Experimental materials: Seeds of forty six wheat genotypes (*Triticum astivum* L.) i.e. HT-150, KRL-19, KRL-213, KRL210, KRL1-4, HD-2888, DBW-16, DBW-14, CSW 16, C-306, HW-2045, HI-1563, BRW-934, PBW-373, HD-2985, WR-544, HD-2643, K-68, HD-3059, PBW-65, KACHU#1, HT-142, HT-138, HD-2733, HD-2329, HT-140, RAJ-4120, HP-1939, HTEM, HT-20, BRW-8708, HT-147, HT-22, GS-2027, GS-2021, HT-8, GS-2008, GS-1010, GS-1001, HT-114, GS-2028, HD-2967, BAAZ, K-8027, GS-1020 and GS-2007 were collected from the department of Agronomy, Dr. Rajendra Prasad Central agricultural University, Pusa, Samastipur (Bihar), Borlaug Institute for South Asia, Samastipur (Bihar), Regional Station Indian Agricultural Research Institute, Pusa (Bihar) and from the Regional Station Indian Agricultural Research Institute Karnal (Haryana).

Experiment details: Forty six wheat genotypes were gown on Petri plates with three replications. 20 wheat seeds were sown in each sterilized petri plate lined with three layers of filter paper for germination. For salt stress treatments, saline solution of composition

Nacl:$CaCl_2$:Na_2SO_4 (7:2:1) and concentration 4 (salinity level 1, S_1) and 8 ds/m (salinity level 2, S_2) were used as irrigation solution however, distilled water was used as control. For high temperature treatment the petri dishes were kept in incubator at temperature 37 ± 2 °C and for combined salinity and high temperature stress, salinity stressed plant (induced by application of saline solution of EC 4 and 8 ds/m) was shifted to elevated temperature (37 ± 2 °C) in incubator. Control plants were grown under ambient/ unstressed temperature conditions (25 ± 2 °C).

Parameters recorded: The physiological parameters recorded were recorded on 10th day after germination. Physiological parameters taken includes Seedling length (cm), Seedling fresh weight (g), Seedling dry weight (g) and SPAD value.

Statistical analysis: Data analysis was performed using the software "DSAASTAT" statistical software (Version 1.101).

Results and Discussion

Seedling length of 10-day-old wheat seedling of 46 genotypes were recorded under different treatments *viz.* control (T_0), high temperature (T_1), salinity level-1 (4 dS m^{-1}) (T_2), combined salinity level-1 with high temperature (T_3), salinity level-2 (8 dS m^{-1}) (T_4) and combined salinity level-2 with high temperature stress (T_5), and the percentage change under stress condition over control were calculated and presented in Table 1. The growth of Seedling (measured in terms of length) was adversely affected under different stress treatments in all genotypes as compared to control. Under control condition, the genotype KRL-19 attained maximum Seedling length (39.4 cm) and minimum Seedling length was recorded in genotype GS-2008 (24.9 cm). High temperature adversely affected the Seedling length in all wheat genotypes with maximum percentage decrease in genotypes HI-1563, HT-8 and HD-2985 (21.5, 19.8 and 19.1%, respectively) and minimum percentage decrease was recorded in genotypes KRL-1-4, HD-2733 and KACHU-1 (0.3, 0.6 and 1.0%, respectively) over control. The effect of temperature on germination and seedling growth of Psyllium, Marshmallow and Fennel flower with regards to germination behavior and seedling growth characteristics (seedling length, fresh weight dry weight) is well documented by Saba %. (2014) [12]. A significant reduction in seedling length of all wheat genotypes were observed under salinity stress treatments T_2 and T_4. Under treatment T_2, maximum reduction in Seedling length was observed in genotypes HT-8, HI-1563 and HD-2985 (34.4, 29.6 and 29.2%, respectively) and minimum reduction was observed in genotypes HD-2733, KRL-1-4 and KRL-19 (1.0, 1.4 and 1.5%, respectively) over control. However, under treatment T_4, reduction in Seedling length over control was maximum in genotypes HT-8, HD-2985 and HI-1563 (45.1, 45.1 and 43.2%, respectively) and minimum in genotypes HD-2733, KRL-19 and KRL-1-4 (1.6, 2.0 and 3.8%, respectively). In a similar investigation Ehtaiwesh (2016) [5] showed that salinity stress (0.0, 4.0, 8.0 and 12.0 ds m^{-2}) on seed germination and seedling growth of four bread wheat cultivars (*Triticum aestivum* L). Under combined stress treatment Seedling length was adversely affected in all genotypes with maximum percentage decrease was recorded in genotypes HT-8, HI-1563 and HD-2985 (39.3, 38.9 and 41.3%, respectively for treatment T_3 and 50.8, 49.2 and 48.8%, respectively for treatment T_5) and minimum percent decrease was recorded in genotypes KRL-1-4, KRL-19 and HD-2733 (0.6, 0.2 and 0.5%, respectively for treatment T_3 and 5.0, 3.8 and 1.6%, respectively for treatment T_5) over control. However, adverse effect on Seedling growth (measured in terms of length) was more pronounced in treatment T_5 in comparison to other stress treatments. Effect of salinity and temperature on growth parameters of chicory, cumin and fennel was reported by Hokmalipour (2015) [8] and it was concluded that combined stress treatment resulted in a significant reduction in seedling length seedling length, shoot length, root length, germination percentage, germination rate, seedling dry and fresh weight and seed vigor index. Such reduction in growth may be attributed to the inhibitory effect of different stresses, which prevent crop plants from realizing their full genetic potentiatal due to reactive oxygen species (ROS) that are produced during different stresses that induced cell death as a consequence of membrane lipid peroxidation, protein oxidation, enzyme inhibition and DNA and RNA damage. Based on the result it was concluded that wheat genotypes KRL-19, HD-2733 and KRL-1-4 were able to tolerate to some extent, the negative effect of combined salinity and high temperature stress and was considered as tolerant however, genotypes HD-2985, HT-8 and HI-1563 as susceptible.

Seedling Fresh Weight

Seedling fresh weight of 10-day-old wheat seedling of 46 genotypes were recorded under different treatments *viz.* control (T_0), high temperature (T_1), salinity level-1 (4 dS m^{-1}) (T_2), combined salinity level-1 with high temperature (T_3), salinity level-2 (8 dS m^{-1}) (T_4) and combined salinity level-2 with high temperature stress (T_5), and the percentage change under stress condition over control were calculated and presented in Table 2. The growth of seedling (measured in terms of fresh weight) was adversely affected under different stress treatments in all genotypes as compared to control. Under control condition, the genotype KRL-19 attained maximum seedling fresh weight (0.589 g) and minimum seedling fresh weight was recorded in genotype HT-8 (0.215 g). High temperature adversely affected the seedling fresh weight in all wheat genotypes with maximum percentage decrease in genotypes HI-1563, KRL-213 and HD-2888 (17.2, 18.9 and 22.8%, respectively) and minimum percentage decrease was recorded in genotypes HD-2733, BAAZ and KRL-19 (1.8, 2.1 and 1.8%, respectively) over control. In the same way Saba %. (2014) [12] reported that high temperature significantly deduced seedling growth characteristics (seedling length, fresh weight dry weight) in psyllium, marshmallow and fennel flower. A significant reduction in seedling fresh weight of all wheat genotypes were observed under salinity stress treatments T_2 and T_4. Under treatment T_2, maximum reduction in seedling fresh weight was observed in genotypes HI-1563, HD-2985 and HT-8 (19.6, 20.8 and 20.4%, respectively) and minimum reduction was observed in genotypes HD-2888, KRL-19 and HD-2733 (0.4, 4.8 and 4.5%, respectively) over control. However, under treatment T_4, reduction in seedling fresh weight over control was maximum in genotypes HI-1563, HT-150 and HD-2967 (36.5, 35.5 and 35.6%, respectively) and minimum in genotypes HD-2733, KRL-1-4 and KRL-19 (11.5, 10.1 and 9.5%, respectively). Azooz *%.*, (2013) [1] also showed that broad bean plant exhibited a significant reduction in their seedling fresh weights in response to 150 mM NaCl. Similarly, Mohamed *%.*, (2010) [11] showed that NaCl stress treatments in potato clones gradually decreased the seedling fresh weight when compared to those plantlets grown under control

condition. Such reduction in seedling fresh weight might be attributed to the toxic effect of salinity or increased crucial osmotic pressure, at which the plants would not be able to absorb water. Under combined stress treatment seedling fresh weight was adversely affected in all genotypes with maximum percentage decrease was recorded in genotypes HI-1563, HT-8 and HD-2985 (27.1, 26.0 and 28.1%, respectively for treatment T_3 and 47.3, 47.6 and 44.0%, respectively for treatment T_5) and minimum percent decrease was recorded in genotypes KRL-1-4, KRL-19 and HD-2733 (8.1, 7.2 and 9.6%, respectively for treatment T_3 and 18.9, 18.3 and 13.6%, respectively for treatment T_5) over control. However, adverse effect on seedling growth (measured in terms of fresh weight) was more pronounced in treatment T_5 in comparison to other stress treatments. For example Bybordi and Tabatabaei, (2009) [4] studied the germination and seedling responses of five rape seed cultivars to different salinity levels (0, 5, 10, 15 and 20 ds m^{-1}) and high temperature (37 ^{0}C). It was observed that increasing salinity, high temperature and combined stress decreased significantly radicle and plumule length and seedling fresh and dry weights. Bai %., (2016) also observed that moderate salt stress combined with high temperature significantly reduced seedling biomass (fresh weight) by 39–53% in rice. Under salt stress, osmotic stress is created by excess of salt in the soil, and ionic toxicity is caused by the over accumulation of salt in the cells. Also salinity and heat stress individually and together adversely affect the physiological activities of plant cell due to osmotic imbalance, ROS toxicity, and enzymatic damage etc. thus adversely affecting plant growth. Based on the result it was concluded that wheat genotypes KRL-19, HD-2733 and KRL-1-4 were able to tolerate to some extent, the negative effect of combined salinity and high temperature stress and was considered as tolerant however, genotypes HD-2985, HT-8 and HI-1563 as susceptible

Seedling Dry Weight

Seedling dry weight of 10-day-old wheat seedling of 46 genotypes were recorded under different treatments *viz.* control (T_0), high temperature (T_1), salinity level-1 (4 dS m^{-1}) (T_2), combined salinity level-1 with high temperature (T_3), salinity level-2 (8 dS m^{-1}) (T_4) and combined salinity level-2 with high temperature stress (T_5), and the percentage change under stress condition over control were calculated and presented in Table 3. The growth of seedling (measured in terms of dry weight) was adversely affected under different stress treatments in all genotypes as compared to control. Under control condition, the genotype KRL-19 attained maximum seedling dry weight (0.060 g) and minimum seedling dry weight was recorded in genotype HT-8 (0.022 g). High temperature adversely affected the seedling dry weight in all wheat genotypes with maximum percentage decrease in genotypes HI-1563, HD-2888 and HT-8 (25.9, 24.4 and 23.6%, respectively) and minimum percentage decrease was recorded in genotypes KRL-1-4, KRL-19 and HD-2733 (3.2, 2.9 and 2.4%, respectively) over control. Vollenweider and Goerg, (2005) [14] reported that elevated temperature resulted in seedling growth inhibition (seedling dry weight). A significant reduction in seedling dry weight of all wheat genotypes were observed under salinity stress treatments T_2 and T_4. Under treatment T_2, maximum reduction in seedling dry weight was observed in genotypes HI-1563, HT-8 and HD-2985 (34.2, 33.6 and 33.9%, respectively) and minimum reduction was observed in genotypes HD-2888, HD-2733 and KRL-19 (2.5, 5.3 and 6.0%, respectively) over control. However, under treatment T_4, reduction in seedling dry weight over control was maximum in genotypes HI-1563, HT-150 and HD-2967 (41.6, 38.2 and 36.4%, respectively) and minimum in genotypes HD-2733, KRL-1-4 and KRL-19 (11.6, 10.9 and 10.5%, respectively). Mohamed %., (2010) [11] in his study showed the effect of salt stress on transgenic and wild potato clones and concluded that on exposure to NaCl for one month, the shoot height, fresh and dry weights of transformed clone showed significant decrease than those of non-transformed clone under salinity. Similar decrease in seedling dry weight was reported by Kapoor (2011) [9] on *Oryza sativa* exposed to different concentrations of salt solution i.e., 50 and 100 mM. Under combined stress treatment seedling dry weight was adversely affected in all genotypes with maximum percentage decrease was recorded in genotypes HI-1563, HD-2985 and H-8 (34.2, 33.9 and 33.6%, respectively), respectively for treatment T_3 and 51.6, 47.3 and 49.9%, respectively for treatment T_5) and minimum percent decrease was recorded in genotypes HD-2733, KRL-1-4 and KRL-19 (10.1, 8.9 and 8.3%, respectively for treatment T_3 and 13.9, 19.6 and 18.5%, respectively for treatment T_5) over control. However, adverse effect on seedling growth (measured in terms of dry weight) was more pronounced in treatment T_5 in comparison to other stress treatments. For example Bybordi and Tabatabaei, (2009) [4] studied the germination and seedling responses of five rape seed cultivars to different salinity levels (0, 5, 10, 15 and 20 ds m^{-1}) and high temperature (37 ^{0}C) in glasshouse. It was observed that increasing salinity, high temperature and combined stress decreased significantly the radicle and plumule length and seedling fresh and dry weights. In a similar experiment by Bai %., (2016) it was reported that moderate salt stress (1.8 g NaCl kg^{-1} soil) combined with high temperature (36°C) significantly reduced root and shoot biomass (fresh and dry weight) by 39–53% in rice. It may be possible that different stress induces many physiological, biochemical and molecular response on plants; so that plants are able to develop tolerance mechanisms which will provide them adaption under limited environmental conditions (Khayatnezhad, M., and Gholamin %., 2011) [10]. The genotypes KRL-19, HD-2733 and KRL-1-4 were considered as tolerant to some extent the adverse effect of combined stress as reflected by the data however, genotypes HD-2985, HT-8 and HI-1563 are susceptible ones.

SPAD Value

SPAD value of 10-day-old wheat seedling of 46 genotypes were recorded under different treatments *viz.* control (T_0), high temperature (T_1), salinity level-1 (4 dS m^{-1}) (T_2), combined salinity level-1 with high temperature (T_3), salinity level-2 (8 dS m^{-1}) (T_4) and combined salinity level-2 with high temperature stress (T_5), and the percentage change under stress condition over control were calculated and presented in Table 4. The SPAD value was adversely affected under different stress treatments in all genotypes as compared to control. Under control condition, the genotype KRL-1-4 attained maximum SPAD value (47.0) and minimum SPAD value was recorded in genotype HD-2329 (22.4). High temperature adversely affected the SPAD value in all wheat genotypes with maximum percentage decrease in genotypes HD-2985, HT-8 and HI-1563 (12.9, 12.6 and 10.6%, respectively) and minimum percentage decrease was recorded in genotypes CSW-16, K-8027 and BRW-934 (1.6, 1.4 and 0.2%, respectively) over control. Similarly, Feng %., (2014) [7] showed that heat stress caused a loss of pigment content in

flag leaves. Heat stress reduces plant photosynthetic capacity through metabolic limitations and oxidative damage to chloroplasts and chlorophyll pigments (Farooq %., 2011) [6]. A significant reduction in SPAD value of all wheat genotypes were observed under salinity stress treatments T_2 and T_4. Under treatment T_2, maximum reduction in SPAD value was observed in genotypes HD-2985, HT-8 and HI-1563 (20.6, 20.3 and 19.5%, respectively) and minimum reduction was observed in genotypes KACHU-1, KRL-213 and C-306 (1.6, 1.4 and 0.7%, respectively) over control. However, under treatment T_4, reduction in SPAD value over control was maximum in genotypes, HD-2985, HI-1563 and HT-8 (32.9, 31.8 and 28.5%, respectively) and minimum in genotypes KRL-1-4, HD-2733 and KRL-19 (11.1, 10.6 and 10.0%, respectively). Similarly, Turkyilmaz (2012) [13] revealed that salinity decreased chlorophyll and carotenoids contents of wheat under salinity stress condition. Under combined stress treatment SPAD value was adversely affected in all genotypes with maximum percentage decrease was recorded in genotypes HI-1563, HD-2985 and H-8 (27.9, 23.7 and 23.1%, respectively), respectively for treatment T_3 and 41.8, 41.6 and 39.0%, respectively for treatment T_5) and minimum percent decrease was recorded in genotypes HD-2733, KRL-1-4 and KRL-19 (8.7, 7.1 and 6.1%, respectively for treatment T_3 and 14.5, 13.0 and 12.6%, respectively for treatment T_5) over control. However, adverse effect on SPAD value was more pronounced in treatment T_5 in comparison to other stress treatments. Becker al., 2017 also studied the effects of combined soil salinity and high temperature on photosynthesis and growth of quinoa plants (*Chenopodium quinoa*). It was observed that plant photosynthetic pigment was reduced significantly under combined high temperature and saltwater treatment. Combined effects of high temperature and saltwater were significantly more than the individual effect on the given parameter. Thus wheat genotypes KRL-19, HD-2733 and KRL-1-4 were considered as tolerant as they were able to tolerate the combined stress treatments and genotypes HD-2985, HT-8 and HI-1563 were considered as susceptible. Such result may be due to the increased activity of chlorophyllase enzyme and reduced activity of Rubisco enzyme.

Table 1: Effect of salinity, high temperature, and combined stress on seedling length (cm) of 10-day-old wheat seedlings

Genotypes (G)	Treatments (T)											
	Control (T_0)	High Temperature (37 ± 2°C) (T_1)	% Change	Salinity (4 dS m^{-1}) (T_2)	% Change	Salinity (4 dS m^{-1}) + High Temperature (37 ± 2°C)(T_3)	% Change	Salinity (8 dS m^{-1}) (T_4)	% Change	Salinity (8 dS m^{-1}) + High Temperature (37 ± 2°C)(T_5)	% Change	Mean
HT-150	30.2	28.4	-6.1	27.8	-7.9	27.3	-9.7	25.8	-14.6	25.2	-16.6	27.5
KRL-19	39.4	38.6	-2.0	38.8	-1.5	39.3	-0.2	38.6	-2.0	37.9	-3.8	39.1
KRL-213	31.2	29.3	-6.1	30.0	-3.8	29.2	-6.4	28.7	-8.0	27.4	-12.2	27.0
KRL-210	35.0	34.1	-2.5	34.2	-2.1	33.2	-5.0	32.0	-8.5	30.6	-12.5	27.8
KRL-1-4	36.5	36.6	0.2	36.0	-1.4	36.3	-0.6	35.1	-3.8	34.7	-5.0	39.8
HD-2888	37.0	34.1	-7.9	36.0	-2.6	30.8	-16.8	31.1	-16.0	27.7	-25.1	32.3
DBW-16	27.8	26.4	-4.7	25.5	-8.2	24.7	-11.1	20.5	-26.2	18.4	-33.7	23.0
DBW-14	27.4	26.6	-2.9	26.0	-4.9	24.9	-8.9	21.3	-22.0	19.8	-27.5	24.4
CSW-16	26.0	23.7	-8.8	21.0	-19.1	20.2	-22.1	19.1	-26.6	18.0	-30.7	24.7
C-306	28.0	27.3	-2.4	26.6	-5.0	25.9	-7.4	25.2	-10.0	24.2	-13.6	26.1
HW-2045	29.6	27.0	-8.9	26.2	-11.6	25.6	-13.7	21.2	-28.6	18.6	-37.2	24.9
HI-1563	31.3	24.6	-21.5	22.0	-29.6	19.1	-38.9	17.8	-43.2	15.9	-49.2	22.6
BRW-934	26.9	26.6	-1.3	25.5	-5.3	24.1	-10.6	23.5	-12.8	22.0	-18.2	23.4
PBW-373	31.0	26.9	-13.3	26.5	-14.7	23.6	-23.9	17.7	-42.9	17.0	-45.3	22.1
HD-2643	34.7	32.6	-6.0	31.7	-8.6	31.2	-10.1	29.6	-14.7	28.3	-18.4	31.5
WR-544	31.2	29.0	-7.1	28.9	-7.3	28.1	-9.9	23.4	-25.0	20.5	-34.2	27.3
HD-2985	29.2	23.7	-19.1	20.7	-29.2	17.2	-41.3	16.1	-45.1	15.0	-48.8	21.5
K-68	27.2	26.0	-4.4	24.8	-8.9	22.7	-16.7	20.9	-23.4	20.4	-25.3	24.9
HD-3059	28.8	28.1	-2.4	24.8	-13.9	23.9	-17.0	22.2	-22.9	18.9	-34.4	23.9
PBW-65	29.2	27.1	-7.4	24.9	-14.8	24.4	-16.6	21.2	-27.6	19.9	-31.8	24.7
KACHU-1	30.2	29.9	-1.0	27.6	-8.5	26.6	-11.9	24.0	-20.5	23.0	-23.9	25.2
HT-142	30.3	27.7	-8.6	25.9	-14.7	24.9	-17.8	20.4	-32.6	18.6	-38.7	24.0
HT-138	30.3	27.8	-8.1	27.1	-10.6	25.6	-15.5	19.8	-34.5	19.2	-36.6	23.8
HD-2733	37.2	37.0	-0.6	36.8	-1.0	37.0	-0.5	36.6	-1.6	36.6	-1.6	40.1
HD-2329	28.5	26.9	-5.7	24.2	-15.1	23.2	-18.4	21.8	-23.5	19.8	-30.6	25.3
HT-140	25.8	23.1	-10.7	21.9	-15.2	21.0	-18.8	20.7	-20.0	19.1	-25.9	23.5
RAJ-4120	27.5	25.7	-6.7	24.2	-12.1	23.2	-15.6	22.6	-17.9	20.3	-26.3	26.8
HP-1939	28.7	27.0	-5.8	26.8	-6.6	25.2	-12.0	25.0	-12.7	21.9	-23.6	27.4
HTEM	28.4	26.1	-7.8	23.9	-15.6	22.8	-19.5	17.7	-37.4	16.3	-42.3	21.7
HT-20	29.0	25.8	-11.2	24.1	-17.1	23.4	-19.4	19.8	-31.8	18.4	-36.7	23.4
BRW-8708	31.0	28.1	-9.3	26.5	-14.5	25.9	-16.6	22.2	-28.3	19.3	-37.7	24.7
HT-147	31.1	29.3	-5.8	25.8	-17.0	24.2	-22.2	21.3	-31.6	20.3	-34.9	25.6
HT-22	27.5	25.7	-6.6	23.0	-16.3	21.8	-20.9	20.7	-24.6	19.6	-28.8	23.8
GS-2027	30.7	27.9	-9.0	26.5	-13.9	23.1	-24.9	20.8	-32.4	19.3	-37.1	25.1
GS-2021	29.4	26.8	-8.8	25.0	-15.1	23.5	-20.0	20.7	-29.5	17.7	-39.7	24.2
HT-8	30.0	24.1	-19.8	19.7	-34.4	18.2	-39.3	16.5	-45.1	14.8	-50.8	23.2
GS-2008	24.9	20.4	-18.0	20.1	-19.1	20.1	-19.2	18.9	-24.2	17.1	-31.4	20.8
GS-1010	30.5	27.6	-9.6	25.7	-15.5	25.1	-17.7	22.3	-26.7	21.0	-31.0	25.8
GS-1001	29.2	26.3	-10.2	23.6	-19.2	22.3	-23.7	19.4	-33.6	17.8	-39.3	23.7
HT-114	30.2	28.4	-6.1	24.8	-18.1	24.6	-18.5	21.4	-29.2	18.9	-37.4	24.4
GS-2028	29.4	24.9	-15.3	21.9	-25.7	21.6	-26.5	20.2	-31.3	19.1	-35.0	24.1

HD-2967	30.7	28.5	-7.2	27.5	-10.5	27.1	-11.9	24.9	-19.1	24.7	-19.7	26.8
BAAZ	37.4	35.9	-4.0	32.5	-13.2	31.1	-16.8	28.2	-24.6	25.0	-33.2	28.2
K-8027	30.6	26.2	-14.4	23.7	-22.6	21.2	-30.9	19.3	-37.0	16.8	-45.1	22.3
GS-1020	30.5	25.5	-16.2	22.6	-25.8	22.4	-26.6	18.6	-39.0	17.4	-42.9	23.0
GS-2007	29.4	24.9	-15.4	22.1	-25.1	21.2	-27.8	17.3	-41.2	16.1	-45.2	21.3
Mean	30.9	27.6		24.9		24.1		21.3		19.6		24.4
Factor	CD at 5%	CD at 1%	SEM	Significance	% Change indicates decrease over control							
Treatments	0.59	0.78	0.21	**								
Genotypes	1.64	2.16	0.59	**								
T x G	4.03	5.30	1.45	NS	** indicates significant at 1%, NS=Non-significant							

Table 2: Effect of salinity, high temperature, and combined stress on seedling fresh weight plant^{-1} (g) of 10-day-old wheat seedlings.

Genotypes (G)	Treatments (T)											
	Control (T_0)	High Temperature (37 ± 2°C) (T_1)	% Change	Salinity (4 dS m^{-1}) (T_2)	% Change	Salinity (4 dS m^{-1}) + High Temperature (37 ± 2°C) (T_3)	% Change	Salinity (8 dS m^{-1}) (T_4)	% Change	Salinity (8 dS m^{-1}) + High Temperature (37 ± 2°C) (T_5)	% Change	Mean
HT-150	0.390	0.377	-3.1	0.320	-17.9	0.298	-23.6	0.251	-35.5	0.233	-40.3	0.311
KRL-19	0.589	0.579	-1.8	0.560	-4.8	0.546	-7.2	0.533	-9.5	0.481	-18.3	0.548
KRL-213	0.456	0.370	-18.9	0.430	-5.8	0.376	-17.6	0.367	-19.6	0.339	-25.6	0.390
KRL-210	0.304	0.289	-5.1	0.282	-7.3	0.245	-19.5	0.244	-19.7	0.233	-23.4	0.266
KRL-1-4	0.515	0.503	-2.3	0.488	-5.3	0.474	-8.1	0.463	-10.1	0.418	-18.9	0.477
HD-2888	0.368	0.284	-22.8	0.367	-0.4	0.289	-21.6	0.321	-12.7	0.252	-31.6	0.313
DBW-16	0.419	0.399	-4.7	0.346	-17.6	0.334	-20.4	0.319	-23.8	0.278	-33.7	0.349
DBW-14	0.359	0.345	-3.7	0.300	-16.2	0.286	-20.2	0.273	-23.8	0.226	-37.1	0.298
CSW-16	0.369	0.357	-3.2	0.344	-6.7	0.304	-17.7	0.266	-28.0	0.252	-31.8	0.315
C-306	0.355	0.333	-6.3	0.308	-13.4	0.296	-16.7	0.309	-13.0	0.245	-31.1	0.307
HW-2045	0.327	0.317	-2.9	0.302	-7.6	0.286	-12.4	0.266	-18.5	0.240	-26.5	0.290
HI-1563	0.232	0.193	-17.2	0.187	-19.6	0.169	-27.1	0.148	-36.5	0.122	-47.3	0.175
BRW-934	0.312	0.292	-6.4	0.265	-15.2	0.253	-19.0	0.245	-21.7	0.224	-28.1	0.265
PBW-373	0.348	0.323	-7.2	0.315	-9.6	0.285	-18.1	0.264	-24.2	0.223	-35.8	0.293
HD-2643	0.248	0.232	-6.6	0.215	-13.4	0.213	-14.4	0.184	-25.7	0.165	-33.5	0.209
WR-544	0.357	0.342	-4.3	0.315	-12.0	0.303	-15.3	0.261	-26.9	0.245	-31.5	0.304
HD-2985	0.297	0.254	-14.4	0.235	-20.8	0.213	-28.1	0.201	-32.4	0.166	-44.0	0.228
K-68	0.451	0.426	-5.5	0.399	-11.6	0.371	-17.9	0.362	-19.8	0.287	-36.3	0.383
HD-3059	0.331	0.306	-7.5	0.293	-11.5	0.278	-16.1	0.238	-28.3	0.222	-33.0	0.278
PBW-65	0.406	0.373	-8.2	0.329	-19.0	0.318	-21.6	0.302	-25.7	0.274	-32.5	0.334
KACHU-1	0.238	0.226	-5.0	0.211	-11.0	0.195	-18.0	0.183	-23.0	0.164	-31.0	0.203
HT-142	0.369	0.355	-3.9	0.314	-15.1	0.293	-20.6	0.276	-25.4	0.233	-37.0	0.307
HT-138	0.349	0.330	-5.4	0.283	-19.0	0.278	-20.4	0.260	-25.5	0.235	-32.7	0.289
HD-2733	0.553	0.543	-1.8	0.528	-4.5	0.500	-9.6	0.490	-11.5	0.478	-13.6	0.515
HD-2329	0.354	0.305	-13.8	0.291	-17.8	0.286	-19.1	0.262	-25.9	0.236	-33.2	0.289
HT-140	0.341	0.316	-7.3	0.285	-16.4	0.267	-21.6	0.260	-23.7	0.221	-35.2	0.282
RAJ-4120	0.350	0.304	-13.2	0.289	-17.6	0.284	-19.0	0.262	-25.1	0.222	-36.6	0.285
HP-1939	0.344	0.317	-7.9	0.291	-15.5	0.284	-17.6	0.253	-26.6	0.229	-33.5	0.286
HTEM	0.355	0.304	-14.4	0.291	-18.1	0.277	-22.1	0.261	-26.4	0.234	-34.1	0.287
HT-20	0.302	0.279	-7.5	0.252	-16.5	0.238	-21.3	0.235	-22.0	0.223	-26.0	0.255
BRW-8708	0.372	0.325	-12.4	0.314	-15.6	0.285	-23.3	0.260	-30.0	0.253	-32.0	0.301
HT-147	0.359	0.341	-5.0	0.317	-11.6	0.289	-19.6	0.260	-27.5	0.238	-33.8	0.300
HT-22	0.265	0.245	-7.6	0.238	-10.3	0.220	-17.0	0.207	-22.0	0.177	-33.2	0.225
GS-2027	0.284	0.274	-3.3	0.258	-9.2	0.240	-15.4	0.235	-17.1	0.208	-26.8	0.250
GS-2021	0.354	0.329	-7.1	0.304	-14.1	0.290	-18.1	0.273	-22.8	0.223	-36.9	0.295

HT-8	0.215	0.184	-14.7	0.171	-20.4	0.159	-26.0	0.149	-31.0	0.113	-47.6	0.165
GS-2008	0.304	0.284	-6.7	0.267	-12.1	0.265	-12.9	0.230	-24.2	0.198	-34.8	0.258
GS-1010	0.302	0.267	-11.4	0.254	-15.7	0.236	-21.7	0.222	-26.4	0.198	-34.3	0.247
GS-1001	0.265	0.255	-3.6	0.243	-8.1	0.215	-18.8	0.201	-24.2	0.195	-26.4	0.229
HT-114	0.285	0.252	-11.7	0.236	-17.1	0.223	-21.7	0.209	-26.7	0.197	-30.8	0.234
GS-2028	0.278	0.260	-6.4	0.248	-10.7	0.230	-17.1	0.204	-26.5	0.195	-29.9	0.236
HD-2967	0.374	0.335	-10.5	0.319	-14.5	0.299	-20.1	0.241	-35.6	0.230	-38.6	0.299
BAAZ	0.262	0.257	-2.1	0.233	-11.3	0.221	-15.8	0.209	-20.3	0.202	-23.1	0.231
K-8027	0.273	0.236	-13.5	0.227	-17.0	0.210	-23.1	0.203	-25.7	0.182	-33.5	0.222
GS-1020	0.262	0.248	-5.4	0.234	-10.9	0.212	-19.4	0.194	-26.3	0.178	-32.1	0.221
GS-2007	0.291	0.274	-5.7	0.240	-17.5	0.225	-22.6	0.217	-25.3	0.183	-37.1	0.238
Mean	0.291	0.274		0.240		0.225		0.217		0.183		0.238
Factor	CD at 5%	CD at 1%	SEM	Significance	% Change indicates decrease over control							
Treatments	0.0005	0.0007	0.0002	**								
Genotypes	0.0015	0.0019	0.0005	**								
T x G	0.0036	0.0048	0.0013	**	** indicates significant at 1%							

Table 3: Effect of salinity, high temperature, and combined stress on seedling dry weight plant^{-1} (g) of 10-day-old wheat seedlings

Genotypes (G)	Treatments (T)											
	Control (T_0)	High Temperature (37 ± 2°C) (T_1)	% Change	Salinity (4 dS m^{-1}) (T_2)	% Change	Salinity (4 dS m^{-1}) + High Temperature (37 ± 2°C) (T_3)	% Change	Salinity (8 dS m^{-1}) (T_4)	% Change	Salinity (8 dS m^{-1}) + High Temperature (37 ± 2°C) (T_5)	% Change	Mean
HT-150	0.041	0.038	-7.2	0.032	-21.3	0.030	-26.8	0.025	-38.2	0.023	-42.8	0.0314
KRL-19	0.060	0.058	-2.9	0.056	-6.0	0.055	-8.3	0.053	-10.5	0.049	-18.5	0.0550
KRL-213	0.048	0.037	-22.3	0.043	-9.7	0.038	-21.0	0.037	-23.0	0.034	-28.7	0.0393
KRL-210	0.032	0.029	-9.8	0.028	-11.9	0.024	-23.6	0.024	-23.7	0.023	-27.3	0.0269
KRL-1-4	0.052	0.050	-3.2	0.049	-6.1	0.047	-8.9	0.046	-10.9	0.042	-19.6	0.0478
HD-2888	0.038	0.028	-24.4	0.037	-2.5	0.029	-23.3	0.032	-14.6	0.025	-33.1	0.0315
DBW-16	0.044	0.040	-8.5	0.035	-20.8	0.033	-23.5	0.032	-26.8	0.028	-36.3	0.0352
DBW-14	0.038	0.035	-7.9	0.030	-19.9	0.029	-23.7	0.027	-27.2	0.023	-39.9	0.0301
CSW-16	0.038	0.036	-5.5	0.034	-9.0	0.030	-19.6	0.027	-29.7	0.025	-33.4	0.0317
C-306	0.036	0.033	-8.4	0.031	-15.3	0.030	-18.6	0.031	-14.9	0.024	-32.6	0.0309
HW-2045	0.034	0.032	-5.5	0.030	-10.1	0.029	-14.7	0.027	-20.7	0.024	-28.5	0.0291
HI-1563	0.025	0.019	-25.9	0.018	-27.3	0.017	-34.2	0.015	-41.6	0.012	-51.6	0.0177
BRW-934	0.033	0.029	-10.7	0.026	-19.1	0.025	-22.7	0.024	-25.2	0.022	-31.4	0.0268
PBW-373	0.036	0.032	-9.3	0.031	-11.6	0.029	-19.9	0.026	-25.9	0.022	-37.3	0.0294
HD-2643	0.026	0.023	-11.4	0.022	-17.8	0.021	-18.8	0.018	-29.5	0.017	-36.9	0.0212
WR-544	0.036	0.034	-5.0	0.031	-12.6	0.030	-15.9	0.026	-27.4	0.024	-32.0	0.0304
HD-2985	0.032	0.025	-21.6	0.023	-27.7	0.021	-33.9	0.020	-36.4	0.017	-47.3	0.0228
K-68	0.047	0.043	-10.0	0.040	-15.8	0.037	-21.8	0.036	-23.6	0.029	-39.3	0.0387
HD-3059	0.035	0.031	-11.9	0.029	-15.7	0.028	-20.1	0.024	-31.7	0.022	-36.2	0.0281
PBW-65	0.043	0.037	-12.8	0.033	-23.1	0.032	-25.6	0.030	-29.5	0.027	-35.9	0.0337
KACHU-1	0.024	0.023	-7.5	0.021	-13.4	0.019	-20.2	0.018	-25.1	0.016	-32.8	0.0204
HT-142	0.037	0.036	-3.9	0.031	-15.1	0.029	-20.6	0.028	-25.4	0.023	-37.0	0.0307
HT-138	0.036	0.033	-9.3	0.028	-22.4	0.028	-23.7	0.026	-28.6	0.024	-35.4	0.0292
HD-2733	0.057	0.055	-2.4	0.054	-5.3	0.051	-10.1	0.050	-11.6	0.049	-13.9	0.0525
HD-2329	0.037	0.031	-17.4	0.029	-21.3	0.029	-22.5	0.026	-29.0	0.024	-36.0	0.0292
HT-140	0.035	0.032	-8.8	0.029	-17.7	0.027	-22.9	0.026	-24.9	0.022	-36.2	0.0283
RAJ-4120	0.037	0.030	-18.2	0.029	-22.4	0.028	-23.7	0.026	-29.4	0.022	-39.7	0.0289
HP-1939	0.037	0.032	-14.4	0.029	-21.5	0.029	-22.3	0.025	-31.7	0.023	-38.1	0.0291
HTEM	0.037	0.030	-16.9	0.029	-20.5	0.028	-24.4	0.026	-28.6	0.023	-36.1	0.0289
HT-20	0.031	0.028	-11.0	0.025	-19.7	0.024	-24.3	0.024	-25.0	0.022	-28.8	0.0257

BRW-8708	0.039	0.033	-16.7	0.031	-19.7	0.029	-25.8	0.026	-33.4	0.026	-33.5	0.0307
HT-147	0.038	0.034	-11.4	0.032	-17.6	0.029	-25.0	0.026	-32.4	0.024	-38.3	0.0305
HT-22	0.028	0.024	-13.2	0.024	-15.7	0.022	-22.0	0.021	-26.7	0.018	-37.2	0.0228
GS-2027	0.031	0.027	-10.2	0.026	-15.6	0.024	-21.3	0.024	-23.0	0.021	-31.9	0.0253
GS-2021	0.038	0.033	-13.3	0.030	-19.9	0.029	-23.6	0.027	-28.0	0.022	-41.2	0.0300
HT-8	0.022	0.017	-23.6	0.016	-27.3	0.015	-33.6	0.014	-35.7	0.011	-49.9	0.0161
GS-2008	0.032	0.028	-10.2	0.027	-15.5	0.026	-16.2	0.023	-27.1	0.020	-37.3	0.0260
GS-1010	0.031	0.027	-14.3	0.025	-18.5	0.024	-24.2	0.022	-28.8	0.020	-36.4	0.0248
GS-1001	0.027	0.026	-6.1	0.024	-10.4	0.021	-20.9	0.020	-26.2	0.019	-28.3	0.0230
HT-114	0.029	0.025	-13.6	0.024	-19.0	0.022	-23.4	0.021	-28.3	0.020	-32.4	0.0235
GS-2028	0.028	0.026	-7.3	0.025	-11.5	0.023	-18.7	0.020	-27.6	0.019	-31.5	0.0234
HD-2967	0.037	0.032	-13.5	0.031	-17.1	0.029	-22.9	0.023	-38.8	0.021	-42.1	0.0287
BAAZ	0.027	0.025	-6.9	0.022	-16.9	0.021	-22.5	0.020	-24.8	0.019	-28.4	0.0223
K-8027	0.029	0.024	-17.2	0.023	-20.0	0.021	-25.9	0.021	-28.5	0.019	-34.8	0.0227
GS-1020	0.025	0.023	-6.0	0.022	-10.8	0.020	-21.3	0.018	-25.9	0.017	-32.6	0.0209
GS-2007	0.029	0.027	-7.0	0.024	-18.7	0.022	-24.6	0.021	-26.8	0.018	-37.9	0.0237
MEAN	0.035	0.031		0.030		0.028		0.026		0.023		0.0290
Factor	CD at 5%	CD at 1%	SEM	Significance	**% Change indicates decrease over control**							
Treatments	0.0005	0.0007	0.0002	**								
Genotypes	0.0015	0.0020	0.0005	**								
T x G	0.0037	0.0049	0.0013	NS	**** indicates significant at 1%, NS=Non-significant**							

Table 4: Effect of salinity, high temperature, and combined stress on SPAD unit of 10-day-old wheat seedlings

Genotypes (G)	Treatments (T)											
	Control (T_0)	High Temperature (37 ± 2°C) (T_1)	% Change	Salinity (4 dS m^{-1}) (T_2)	% Change	Salinity (4 dS m^{-1}) + High Temperature (37 ± 2°C) (T_3)	% Change	Salinity (8 dS m^{-1}) (T_4)	% Change	Salinity (8 dS m^{-1}) + High Temperature (37 ± 2°C) (T_5)	% Change	Mean
HT-150	31.0	29.2	-5.8	27.0	-12.9	25.0	-19.4	24.1	-22.3	23.8	-23.2	26.7
KRL-19	40.8	39.8	-2.5	39.5	-3.2	37.9	-7.1	36.7	-10.0	35.5	-13.0	38.4
KRL-213	30.5	29.0	-4.9	30.1	-1.4	24.7	-19.0	25.7	-15.8	21.8	-28.5	27.0
KRL-210	27.5	26.4	-4.0	25.4	-7.6	23.5	-14.5	23.8	-13.3	21.5	-21.8	24.7
KRL1-4	47.0	46.0	-2.1	45.6	-3.0	42.9	-8.7	41.8	-11.1	40.2	-14.5	43.9
HD-2888	33.6	30.3	-9.8	30.0	-10.7	29.2	-13.1	25.0	-25.6	22.2	-33.9	28.4
DBW-16	27.3	24.8	-9.2	23.0	-15.8	22.0	-19.4	21.8	-20.1	20.1	-26.4	23.2
DBW-14	27.8	27.0	-2.8	24.7	-11.2	23.8	-14.4	22.9	-17.6	21.5	-22.7	24.6
CSW-16	33.0	32.5	-1.6	30.0	-9.1	28.1	-14.8	23.9	-27.6	22.6	-31.5	28.3
C-306	37.2	36.0	-3.2	36.9	-0.7	32.2	-13.4	29.0	-22.0	24.6	-33.9	32.7
HW-2045	30.0	28.4	-5.3	27.0	-10.0	24.2	-19.3	21.9	-27.0	20.9	-30.3	25.4
HI-1563	35.9	32.1	-10.6	28.9	-19.5	25.9	-27.9	24.5	-31.8	20.9	-41.8	28.0
BRW-934	27.0	26.9	-0.2	25.9	-4.1	23.8	-11.9	23.0	-14.8	21.0	-22.2	24.6
PBW-373	33.0	32.0	-3.0	30.1	-8.8	25.5	-22.7	25.0	-24.2	22.8	-30.9	28.1
HD-2643	26.9	26.0	-3.3	25.3	-5.9	22.3	-17.1	21.8	-19.0	20.2	-24.9	23.8
WR-544	26.4	24.9	-5.7	23.9	-9.5	22.1	-16.3	21.1	-20.1	20.1	-23.9	23.1
HD-2985	38.9	33.9	-12.9	30.9	-20.6	29.7	-23.7	26.1	-32.9	22.7	-41.6	30.4
K-68	24.0	22.3	-7.1	21.7	-9.6	20.7	-13.8	20.0	-16.7	19.1	-20.4	21.3
HD-3059	24.0	22.8	-5.0	21.7	-9.6	21.0	-12.5	20.9	-12.9	19.2	-20.0	21.6
PBW-65	31.1	29.7	-4.5	29.0	-6.7	27.9	-10.3	26.3	-15.4	23.4	-24.7	27.9
KACHU-1	27.0	26.1	-3.3	26.6	-1.6	23.3	-13.7	22.7	-15.9	21.0	-22.2	24.4
HT-142	27.7	25.3	-8.7	24.0	-13.4	23.7	-14.4	23.0	-17.0	22.0	-20.6	24.3
HT-138	27.2	25.8	-5.1	23.9	-12.1	21.6	-20.6	21.2	-22.1	21.1	-22.4	23.5
HD-2733	44.4	43.2	-2.7	42.7	-3.8	41.7	-6.1	39.7	-10.6	38.8	-12.6	41.8
HD-2329	22.4	20.3	-9.4	20.1	-10.3	19.7	-12.1	19.1	-14.7	18.8	-16.1	20.1

HT-140	32.4	31.2	-3.7	30.0	-7.4	26.7	-17.6	24.0	-25.9	23.0	-29.0	27.9
RAJ-4120	31.0	29.2	-5.8	28.9	-6.8	24.2	-21.9	23.0	-25.8	22.1	-28.7	26.4
HP-1939	31.0	29.0	-6.5	25.9	-16.5	24.8	-20.0	23.9	-22.9	23.0	-25.8	26.3
HTEM	24.1	22.0	-8.7	21.9	-9.1	21.5	-10.8	21.0	-12.9	20.0	-17.0	21.8
HT-20	25.0	24.0	-4.0	23.8	-4.8	22.7	-9.2	22.0	-12.0	20.1	-19.6	22.9
BRW-8708	29.0	26.7	-8.0	25.0	-13.8	24.8	-14.5	23.0	-20.7	22.1	-23.8	25.1
HT-147	25.3	24.0	-5.1	23.7	-6.3	22.8	-9.9	21.3	-15.8	21.0	-17.0	23.0
HT-22	26.6	24.8	-6.8	24.7	-7.1	22.9	-13.9	20.8	-21.8	19.5	-26.7	23.2
GS-2027	29.0	27.3	-5.9	25.0	-13.8	23.5	-19.0	22.1	-23.8	21.0	-27.6	24.7
GS-2021	27.8	26.0	-6.5	23.9	-14.0	22.9	-17.6	21.7	-21.9	20.0	-28.1	23.7
HT-8	39.0	34.1	-12.6	31.1	-20.3	30.0	-23.1	27.9	-28.5	23.8	-39.0	31.0
GS-2008	27.0	25.4	-5.9	24.7	-8.5	22.2	-17.8	22.0	-18.5	21.3	-21.1	23.8
GS-1010	24.0	23.0	-4.2	22.1	-7.9	21.6	-10.0	20.3	-15.4	19.5	-18.8	21.8
GS-1001	24.5	22.9	-6.5	21.0	-14.3	20.0	-18.4	19.2	-21.6	17.8	-27.3	20.9
HT-114	25.0	23.0	-8.0	22.8	-8.8	21.7	-13.2	21.0	-16.0	20.1	-19.6	22.3
GS-2028	24.9	24.0	-3.6	23.1	-7.2	22.0	-11.6	21.3	-14.5	20.3	-18.5	22.6
HD-2967	29.9	29.2	-2.5	27.0	-9.7	24.9	-16.7	24.0	-19.7	23.7	-20.7	26.4
BAAZ	30.0	28.4	-5.2	26.0	-13.3	25.6	-14.7	24.6	-18.0	22.5	-25.0	26.2
K-8027	26.0	25.6	-1.4	23.2	-10.8	21.2	-18.5	20.0	-23.1	19.9	-23.5	22.7
GS-1020	26.3	25.0	-4.9	24.9	-5.3	22.3	-15.2	22.0	-16.3	21.1	-19.8	23.6
GS-2007	30.0	29.0	-3.3	27.0	-10.0	25.0	-16.7	24.5	-18.3	23.4	-22.0	26.5
Mean	29.8	28.1	-5.5	26.9	-9.5	25.1	-15.6	23.9	-19.6	22.4	-24.7	26.1

Factor	CD at 5%	CD at 1%	SEM	Significance
Treatments	0.30	0.39	0.11	**
Genotypes	0.82	1.08	0.30	**
T x G	2.01	2.65	0.73	**

% Change indicates decrease over control

** indicates significant at 1%

Conclusion

From the study it was concluded that high temperature and salinity stress are the major factors limiting growth of wheat crop and the extent of deterioration was more pronounced under combined stress. There is a genetic variability among the wheat genotypes that can be used in breeding programs to improve winter wheat yield under combined high temperature and salinity stress conditions. On the basis of result the wheat genotypes KRL-19, HD-2733 and KRL-1-4 were considered as tolerant as they were able to tolerate the different stress interactions and genotypes HD-2985, HT-8 and HI-1563 were considered as susceptible.

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