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Response of Neglected Hexaploid Wheat Species towards Combined Drought and Salinity Stress

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BACKGROUND AND AIM OF THE STUDY

- Combined drought and salinity stress, prevalent in arid and semi-arid regions of the world, is known to have more damaging effects on wheat crops as compared to the individual drought and salinity stress conditions (Kumar et al. 2018; Paul et al. 2019).
- Different hexaploid *Triticum aestivum* subspecies including ssp. *compactum*, ssp. *spelta,* and ssp. *sphaerococcum* have not been well explored for abiotic stress tolerance.
- All these subspecies are autogamous and can be crossed with ssp. *aestivum* to produce fertile offsprings. Hence, it will be useful to identify and utilize the potential genotypes of these subspecies to develop stress tolerant wheat cultivars.
- ***Consequently, the aim of this study was to determine the variation in the tolerance level of different genotypes of these species towards combined drought and salinity stress (Figure 1).***

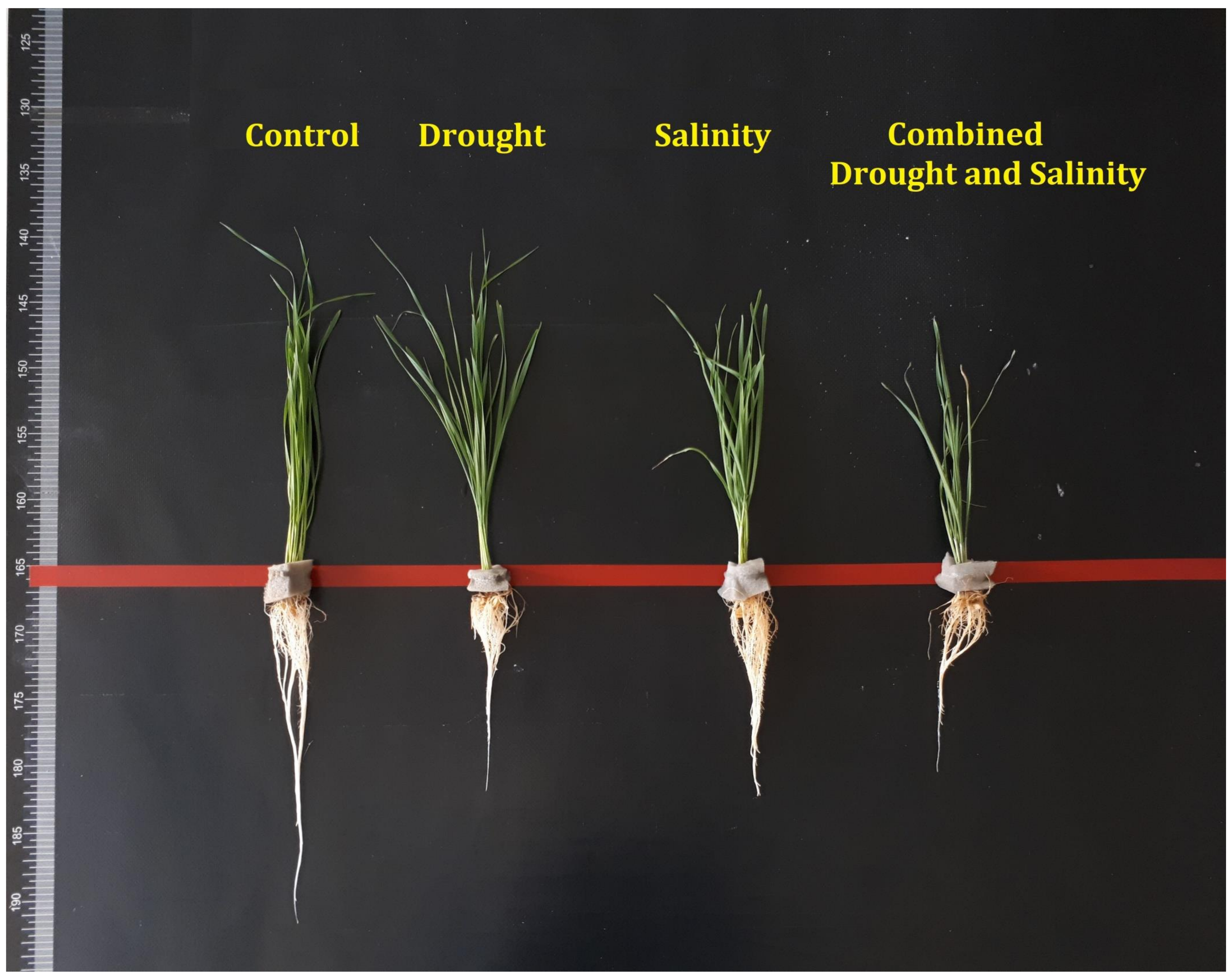

Figure 1. Growth response of one of the neglected hexaploid *Triticum* genotypes under control, drought, salinity, and combined drought and salinity stressed growth conditions.

METHODOLOGY

- More than 20 genotypes of these species have been screened in hydroponic system under control, drought stressed, salinity stressed, and combined drought and salinity stressed growth conditions.
- The tolerance level of these genotypes was estimated in terms of growth parameters, photosynthetic rates, relative water content and electrical conductivity under different stress conditions.

RESULTS

- A huge genetic variation in stress tolerance was observed within and among all the studied species both towards individual and combined drought and salinity stresses. For example, percentage change in shoot length varied from -35 to 20% in drought stress, from -36 to -2% in salinity stress, and from -61 to -17% in combined drought and salinity stress. Similarly, percentage change in root length varied from -53 to 79% in drought stress, from -58 to 23% in salinity stress, and from -65 to 9% in combined drought and salinity stress (Table 1).

Table 1. Percentage Changes in Shoot length (SL) and Root Length of 24 hexaploid *Triticum* genotypes under drought stress (D), salinity stress (S), and combined drought and salinity stress (D+S).

Genotype Code	Species	%SL_D	%SL_S	%SL_D+S	%RL_D	%RL_S	%RL_D+S
G.1	*T. aestivum*	-23	-26	-39	-40	-43	-64
G.2	*T. aestivum*	-21	-22	-32	-34	-26	-31
G.3	*T. aestivum*	-12	-26	-35	-14	-1	-27
G.4	*T. aestivum*	-16	-33	-44	-22	-26	-31
G.5	*T. aestivum*	-11	-33	-44	-42	-43	-49
G.6	*T. compactum*	-22	-29	-36	-40	-32	-47
G.7	*T. compactum*	-8	-22	-34	-36	-44	-40
G.8	*T. compactum*	-3	-28	-44	-30	-35	-51
G.9	*T. compactum*	20	-14	-17	1	-16	-25
G.10	*T. compactum*	-35	-35	-40	-53	-22	-36
G.11	*T. compactum*	-19	-28	-45	-47	-37	-45
G.12	*T. spelta*	-12	-30	-53	-29	-22	-42
G.13	*T. spelta*	-20	-25	-50	-48	-50	-60
G.14	*T. spelta*	-13	-28	-61	-40	-27	-50
G.15	*T. spelta*	-21	-36	-53	-36	-20	-45
G.16	*T. spelta*	-21	-35	-49	-40	-30	-35
G.17	*T. spelta*	-15	-34	-42	10	-30	-34
G.18	*T. sphaerococcum*	-11	-18	-29	7	-17	-30
G.19	*T. sphaerococcum*	-5	-2	-26	79	23	9
G.20	*T. sphaerococcum*	-9	-17	-25	63	-10	-29
G.21	*T. sphaerococcum*	-20	-21	-36	14	-28	-36
G.22	*T. sphaerococcum*	-12	-16	-34	-25	-58	-65
G.23	*T. sphaerococcum*	4	-23	-33	12	-43	-35
G.24	*T. compactum*	-13	-31	-34	-2	-33	-35

CONCLUSION

- The obtained results directed that these neglected hexaploid wheat subspecies can be a potential source of combined drought and salinity stress tolerance that can be widely used in the wheat breeding programs targeted towards the trait.

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