

Evaluation of Germination Properties of Different Durum Wheat Genotypes under Osmotic Stress

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Abstract: Seed germination of each seed is considered as one of the first and most fundamental life stages of a plant, so that the success in growth and yield production is also dependent on this stage. Soil moisture is one of the factors limiting crops germination, especially in rainfed areas. In such areas, the varieties have great importance that are tolerant to drought in the stage of germination and emergence and have high yield potential. The present study were carried out to evaluate germination properties of durum wheat genotypes under osmotic stress conditions of laboratory. Results showed that Nakhjivan3 genotype had the maximum germination index rate and final germination percent in the both of normal and stress conditions. This genotype was places in a class of mean comparisons for root length, wet weight and dry weight. In terms of other traits, it had also noticeable amounts. The reason of high in evaluated traits in this genotype, was related to its potential in terms of all traits. Also, this genotype had the maximum tolerance related to others pay attention to GMP, MP and STi osmotic pressure tolerance indices. Therefore, we can introduce Nakhjivan3 genotype in the varieties selection with high germination, radical and plumule production and resistance resources to osmotic stress indices.

Key words: Osmotic stress • Germination • Drought • Durum wheat

INTRODUCTION

In such cases to ensure that the plant is more established, planting depth between 8 to 12 cm is considered. However, the optimal moisture conditions suitable planting depth of about 2 to 4 centimeters is [1]. Low depth makes non-uniform emergence of seed plants are usually very fast because it dries and can not beat buds. The deeper planting delayed emergence, increased the risk of damage to plant pests and diseases and if what is planting depth is too high, plants are weak and may not be green plants [2]. fick and qualset [3] Associated with deep planting and seeding observed that seed planting depth of 10 cm long, green plant size has reduced 40 percent. However, hot and dry conditions in some more depth of seed planting to reduce the damage caused by soil drying on the germination finds necessary. In cases where rainfall before sowing seeds in dry soil is done, the planting depths are deeper than usual. Because this makes the light rain that plant growth is not enough what, seeds can not wear buds. In such a case

that, during coleoptile importance of plentiful and enjoy one of the most important factors that affect seed emergence [3-5]. Cornish and marsh [6] in this regard, the correlation between seed size and coleoptile length and, Evans and bhatt [7] effects on seed vigor it has been studied.

Asghari [8] the classification of varieties of wheat drought resistance by creating different levels of dry sugar manitol germination stage concluded that drought reduced root and shoot length are compared, but (shoot / root What) with increased stiffness dramatically increases. The ratio (shoot / root what) for the breakdown of the figures is a good drought tolerance trait. Qalambaran [9] in the power of germination of wheat seeds under the influence of water stress caused by changes in osmotic potential solution sorbitol concluded that the grain before germination period be exposed to mild stress, speed and power will have a better germination. General functions such as water and water week alternating elongation of plant seeds increases resistance to stress what can be intense.

Rostaei [10] in the effect of length and depth nodes coleoptile collar cold and drought tolerance in wheat varieties concluded that coleoptile elongated, forming nodes in the depth of the soil collar and the ability to form more tillers per plant, useful traits to increase and sustainability performance is cold and dry areas.

Percent, high germination rate and vigor under various environmental characteristics of crop seeds suitable for cultivation, especially in arid and semiarid regions are. Most of the results of research conducted shows that the percentage of decreased levels of osmotic potential [8, 11, 12], germination rate and vigor decrease.

Emmerichand and hardegree [13] reduced germination under high osmotic potential (more negative) to causing potential of toxic compounds and osmotic and sepanlu and siadat [14] to reduce surface contact with the seeds and lower water hydraulic water around seeds consider relevant [15]. Degree of sensitivity associated with different physiological characteristics and speed of germination to different osmotic potentials showed that the germination rate of more than germination was sensitive to water stress in high osmotic potential greater intensity than germination is reduced.

MATERIALS AND METHODS

This review was carried out in 2009 and was in the form of laboratory. For drought tolerance in different durum wheat genotypes, including as a factorial (5 concentration levels as the first factor) and 15 genotype as second factor in completely randomized design (CRD) with two replication was performed. Stage surgery first seed in 15% solution sodium hypochlorite for 50 seconds disinfected and then into the Petri glass with filter paper previously for 2 hours at a temperature of 120°C by autoclave sterilized were (20 numbers seeds per Petri) has been transferred more different doses (0, 88, 129, 161 and 5 / 188 g) against the table and Mitchell Kaufman (1973) Polyethylene glycol 6000 (6000 PEG) solution to provide zero (control), 4/0-, 8/0-, 2/1- and 6/1- MPa (MPa) action and the solutions produced glass Petri spatial (6 mm) were cast. It should be noted that each step in speed and quiet and no air flow (under the hood) was done. End test and tangible changes in water potential was prevented. Petri is the next step within the laboratory temperature 25°C was placed.

Every day the number of seeds germinated (2 mm radical) recorded for 10 days continued at the eleventh day as root and coleoptiles measurements and fresh weight of root and coleoptiles measurement and into the oven at temperatures 75°C for 24 hour were placed after the mentioned period of dry samples was measured and recorded.

RESULTS AND DISCUSSION

The analysis of variance showed that the effect on the average concentration during coleoptiles mean root length, mean of dry weight, germination, germination rate index, index of germination, final germination percentage and mean germination time was significant in 1% probability level. This means that different genotypes of different effects in different levels of concentration were evident. Except for cultivar traits than the average weight of 5% probability level was significant at 1% remaining traits were significant. Interaction of concentration × genotype results was different. So that the average length and germination coleoptile second day at 5% level, coefficient of germination rate, final germination and mean germination time in 1% and the remaining traits were not significant (Table 1). Index of germination, final germination in normal conditions and in terms of maximum stress in the genotype nakhjavan3 were allocated to. In terms of indicators GMP, MP, STI this genotype also indicators of drought tolerance of germination and germination finals were so, the genotype also in terms of indicators important germination rankings were and resources of resistance to drought stress were. But genotypes Ahar and nakhjavan1 communicated one with indicators of germination less than other genotypes were the genotypes also in terms of traits generally at least indicators of tolerance to osmotic pressure than for GMP, MP, STI allocated to were. However Shamakhy genotype has lower GI was in normal mode this genotype was more the amount of stress. Seems to exist due to the interaction of genotype in terms of significant osmotic stress has been. So judging these case genotypes for stress tolerance indexes GMP, MP and the STI will therefore carefully TOL index can be used for judging. The value of TOL genotypes at least in terms of GI and FGP trait has been. In All can be stated that genotypes nakhjavan2 and3, langan and Modified variety barakatly 95 with sources of resistance to osmotic pressure in terms of germination were nice these genotypes with indicators of germination and germination ultimate high

Table 1: Analysis of variance (MS) characteristics assessed at germination stage

		MS								
S.O.V	df	Mean of coleoptile length	Average root length	Average dry weight	Average wet weight	Germination index	Coefficient Germination rate	The germination rate index	Percent Ultimate germination	Average duration Germination
Rep	2	0/77	9/222	0/0007	0/0000006	1460187/3	4/90	0/02783	0/696	0/144
Concentration	2	164/77**	2230/298**	0/289**	0/003**	1243445115/5**	207/015**	8/876**	221/889**	1/648*
Genotypes	14	1/2**	22/369**	0/0017*	0/00002*	21701768/1**	30/567**	0/237**	5/923**	0/994**
G × C	28	0/403 ^{ns}	8/897 ^{ns}	0/001 ^{ns}	0/000008 ^{ns}	4803402/2 ^{ns}	29/741**	0/06526**	1/631**	0/809**
Error	88	0/364	4/957	0/0009	0/000009	4447176/9	4/293	0/02751	0/688	0/145

** And * denotes significant at the 0.01 and 0.05 levels, respectively

Table 2: Mean germination, final germination and mean germination period of durum wheat genotypes of different indicators of stress tolerance than the control treatment and osmotic pressure 8 / 0 Mega Pascal

Genotypes	STI final germination	STI germination index	MP germination index	MP final germination	GMP Final germination percent	GMP germination index	TOL final germination percent	TOL germination index	Final germination stress	Stress germination index	Final germination Percent	Germination index
Xanlar	0.48	0.80	10342.83	3.28	3.23	10286.52	1.16	2155.67	2.70	9265	3.86	11420.67
Barakatli 95	0.44	0.94	11294.67	3.31	3.08	11110.25	2.40	4065.33	2.11	9262	4.51	13327.33
Ahar	0.14	0.59	8871.83	1.81	1.77	887.94	0.73	2125.67	1.44	7809	2.17	9934.67
Seimareh	0.75	0.62	9321.50	4.45	4.03	9068.14	3.77	4317.00	2.57	7163	6.34	11480.00
Sanandaj	0.29	0.69	9969.83	2.65	2.50	9552.95	1.75	5705.67	1.77	7117	3.52	12822.67
Nakhjavan3	1.69	1.49	13995.83	6.16	6.06	13990.76	2.23	753.67	5.05	13619	7.28	14372.67
khachmaz	0.53	0.56	8945.17	3.53	3.40	8589.25	1.91	4996.33	2.58	6447	4.49	11443.33
Nakhjavan2	1.43	1.41	13629.17	5.62	5.56	13609.91	1.57	1448.33	4.83	12905	6.40	14353.33
Hasan baroq	0.76	0.65	9552.33	4.41	4.06	9244.80	3.48	4808.67	2.67	7148	6.15	11956.67
shamakhi	0.36	0.52	8313.33	2.79	2.78	8310.30	0.51	-449.33	2.54	8538	3.05	8088.67
Sahand	0.70	0.49	8126.00	4.09	3.90	8067.17	2.47	1952.00	2.85	7150	5.32	9102.00
Langan 1	0.78	1.08	11918.67	4.20	4.11	11908.23	1.73	997.33	3.33	11420	5.06	12417.33
Langan 2	0.48	0.76	9987.83	3.30	3.22	9987.82	1.43	33.67	2.58	9971	4.01	10004.67
Ardabil	0.44	0.71	9883.33	3.25	3.10	9670.22	1.99	4082.67	2.26	7842	4.25	11924.67
Nakhjavan1	0.19	0.41	7610.00	2.33	2.03	7362.24	2.29	3852.00	1.19	5684	3.28	9536.00

Table 3: Comparison of characteristics evaluated on three levels of concentration

Concentration (MPa)	Average coleoptile length (cm)	Average root length (cm)	Average dry weight (g)	Average wet weight (g)
(0)	3.7613 ^a	13.7104 ^a	0.1492 ^a	0.01678 ^a
(-0.4)	1.2404 ^b	3.9540 ^b	0.02383 ^b	0.005352 ^b
(-0.8)	0.007111 ^c	0.04044 ^c	0.0002029 ^c	0.0001731 ^c

in stress conditions and the conditions were normal (Table 2). Coleoptiles average length, radical, the average dry weight in comparison is listed in Table 3. Average maximum four traits evaluated in the control concentration (0) was observed significantly in 'A' separate class was grouped and a minimum average concentration of traits (8/0- MPa) was observed with concentration 1.2 - and 6.1- MPa had no significant difference. Study the process of reducing average traits show that the concentration up to concentration series - 8 / 0 MPa genotypes tolerance had decreased, but then so was severe bearing index calculations for normal conditions and - 8 / 0 MPa was applied (Table 3) Comparison of genotypes in terms of traits during coleoptile Duncan method at level 0.05 was performed. The results are listed in Table 4. Most

coleoptile communicated in nakhjavan3 (1.614) was seen as significant in rank A, with the other genotype was a significant difference. Minimum length to genotype coleoptile Ahar (0.724) that d had been in class. Genotypes with an average length of nakhjavan2 coleoptile (1.2513) were in second place. Other genotypes were shared in class and differences were not significant. Compared to average genotypes in terms of traits root length maximum root length in genotype nakhjavan 3 (5.926) was found to significantly ranked a was with other genotypes except genotype communicated two significant differences found. The minimum root length to genotype Shamakhy (2.1547) that the class d is located. Comparison of genotypes in terms of mean fresh weight traits, the highest rate of fresh weight in sprouts nakhjavan3

Table 4: Comparison of characteristics evaluated for

Genotypes	Average coleoptile length (cm)	Average root length (cm)	Average dry weight (g)	Average wet weight (g)
Xanlar	1.1180	3.3787	0.03394	0.0492700
Barakatli 95	1.0293	3.4000	0.02738	0.0043380
Ahar	0.7240	2.7560	0.02963	0.0003719
Seimareh	0.8760	2.9600	0.03167	0.0038590
Sanandaj	0.9307	3.4687	0.03537	0.0046410
Nakhjavan3	1.6147	5.9260	0.05699	0.0070260
khachmaz	0.9613	3.4020	0.03286	0.0037470
Nakhjavan2	1.2513	5.1513	0.04609	0.0593700
Hasan baroq	1.0053	4.1467	0.03705	0.0047780
shamakhi	0.8033	2.1547	0.02702	0.0034060
Sahand	0.8567	3.1413	0.03429	0.0039880
Langan 1	1.1373	3.4127	0.03854	0.0050030
Langan 2	0.9773	3.5927	0.03576	0.0044890
Ardabil	0.9327	3.5507	0.03166	0.0045650
Nakhjavan1	0.8087	2.6733	0.02247	0.0034060

Table 5: Correlation coefficients between traits measured for different genotypes in different levels of drought stress on germination stage

	GMP germination index	GMP final germination percent	GMP Average germination period	MP germination index	MP final germination percent	MP final germination percent	STI Germination index	STI final germination percent	STI final germination percent	Average coleoptile length	Average root length	Average wet weight	Average dry weight
GMP germination index	1												
GMP final germination percent	0.77**	1											
GMP Average germination period	0.33	0.84**	1										
MP germination index	0.99**	0.77**	0.33	1									
MP final germination percent	0.73	0.99**	0.86**	0.73**	1								
MP final germination percent	0.32	0.84**	1**	0.32	0.86**	1							
STI Germination index	0.996**	0.79**	0.36	0.99**	0.75**	0.35	1						
STI final germination percent	0.804**	0.98**	0.78**	0.802**	0.97**	0.77**	0.83**	1					
STI final germination percent	0.33	0.84**	0.99**	0.33	0.86**	0.99**	0.36	0.78**	1				
Average coleoptile length	0.93**	0.88**	0.53*	0.93**	0.85**	0.52**	0.96**	0.91**	0.53**	1			
Average root length	0.83**	0.84**	0.53	0.84**	0.82**	0.52*	0.85**	0.88**	0.55**	0.90**	1		
Average wet weight	0.81**	0.88**	0.61*	0.81**	0.85**	0.601*	0.83**	0.91**	0.63**	0.89**	0.91**	1	
Average dry weight	0.91	0.81**	0.44	0.91**	0.78**	0.43	0.91**	0.86**	0.46	0.93**	0.93**	0.92**	1

(0.05699) was seen as significant in rank A and was with other genotypes except genotype nakhjavan2 significantly different There was at least the average wet weight in genotype nakhjavan1 (0.02247) was located in the class C. Because of high trait studied genotype nakhjavan3 related to the potential of this figure was all traits. Average of traits for genotypes showed that genotype originated from nakhjavan3 (Azerbaijan) in coleoptile length, root length, the average fresh weight and mean dry weight was the maximum average. This genotype seems to be a good potential

among genotypes has. However, genotype nakhjavan2 (Azerbaijani origin) significant differences in some traits with nakhjavan33 was not so communicated, the two genotypes could be as superior genotypes in breeding programs to increase the average traits should be used. Nakhjavan3 also in terms of indicators of tolerance to osmotic pressure GMP, MP and STI was significant compared to other genotypes showed maximum tolerance. So in selecting varieties with high index of germination, root and shoot production (coleoptile) and sources of resistance to osmotic stress can be introduced genotype

nakhjavan3. Although the three-year information about the spatial field experiments indicate that this result (Table 4). Average dry weight correlated with geometric mean indicator index, germination percentage and germination was significant and positive. Attribute this result to mean fresh weight and mean root length and coleoptile were similar. Genotypes to reach the length and weight and awn coleoptile germination stage can be based on GMP index germination index and germination can be used. Average of dry weight index, final germination and mean germination time and tolerance index Fernandez terms of final germination and germination index was significant and positive correlation means that the average dry weight of seeds increased resistance indices MP, GMP and STI has increased. So having different coefficient of resistance above can be used by dry weight. This result indicators and mean fresh weight and root length was consistent throughout coleoptile. There are positive and significant correlation between length and root length coleoptile mean dry weight shows that each of these traits can be selected for osmotic resistance can be used (Table 5).

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