Advances in Environmental Biology, 5(7): 1941-1946, 2011
ISSN 1995-0756

This is a refereed journal and all articles are professionally screened and reviewed

ORIGINAL ARTICLE

Genetic Diversity and Correlation among Agronomic and Morphological Traits in Wheat Genotypes (*Triticum Aestivum* L.) Under Influence of Drought

[1]Mehdi Habibpor, [2]Mostafa Valizadeh, [1]Hossein Shahbazi and [3]Mostafa Ahmadizadeh

[1]Islamic Azad University-Ardabil Branch, Ardabil, Iran.
[2]Department of Agronomy and Plant Breeding, Faculty of Agriculture, University of Tabriz, Tabriz, Iran.
[3]Young Researchers Club, Jiroft Branch, Islamic Azad University, Jiroft, Iran.

Mehdi Habibpor, Mostafa Valizadeh, Hossein Shahbazi and Mostafa Ahmadizadeh: Genetic Diversity and Correlation among Agronomic and Morphological Traits in Wheat Genotypes (*Triticum Aestivum* L.) Under Influence of Drought

ABSTRACT

This study was done in the agricultural research station of Islamic Azad University of Ardabil Branch with the aim of investigating the present genetic variation among northwest wheat landraces regarding agronomy and morphological traits. Experiment was undertaken on fifty units of north-west wheat landraces along with six controls (Pishtaz, Alvand, Azar2, Fankang, Konia2002 and Gork79). The present study was done based on randomized complete block design with three replications during the 2008 and 2009 cropping year. Drought stress produced through watering stop at the stem. There was a significant difference among genotypes regarding the under investigation traits which indicates that there are great variations among genotypes in order to use in improvement plans. Grain yield nad Grain yield per unit area of genotypes evaluated and they varied respectively from 8/2 to 84g and 192.04 to 710.77g in each square meter. With calculating correlation coefficient, the relation between under investigation traits examined and identified the traits such as Biological yield, harvest index and fertile tillers per plant in plant Tolerance to drought can be effective. WARD cluster analysis was used based on standardized data in order to classify the under investigated genotypes. The genotypes analysis classified in three cluster groups.

Key words: Wheat landraces, genetic variation, drought stress, cluster analysis.

Introduction

Wheat produces in extensive limits of ecological conditions and geographical areas, and its diffusion extent is higher than any other species due to high compatibility with environmental different weather conditions, and it's a crop as a main food for a majority of worldwide increasing population [26]. Biotic and abiotic stresses result in decreasing yield of agricultural plants and prevent yield potential occurrence, annually. Among abiotic environmental stresses, drought stress is one of the most important factors for decreasing yield in the majority of cultivation areas for agricultural plants [26]. Drought is a rising threat of world. Most of the countries of the world are facing the problem of drought. It is the creeping disaster, slowly taking hold of an area and tightening its grip with time [13]. Therefore, drought stress is the most widespread environmental stress, which effect growing and productivity, it induces many physiological, biochemical and molecular response on plants, so that plants are able to develop tolerance mechanisms which will provide to be adapted to limited environmental conditions [14]. Iran, with about 220 mm of average annual rainfall is located in dry part of the world and except some northern provinces which are located in the vicinity of the Caspian Sea, in the most areas of the country wheat crop encounters serious drought stress especially after anthesis [21]. Response of plants to

Corresponding Author
Mostafa Ahmadizadeh, Young Researchers Club, Jiroft Branch, Islamic Azad University, Jiroft, Iran.
E-mail: ahmadizadeh.mostafa@yahoo.com: Tel: +989194457655

drought stress depends on time and place, and especially in field conditions can be mixed with the effects of the other stresses such as high temperature [4]. Furthermore, responses to drought stress are extremely different according to the plant genetic background. Inter-and intra-species variations in drought tolerance are almost well known [22]. Depending on the plant growth stages, drought stress influences morphology, anatomy, physiology and biochemistry of plants [12]. In water deficient condition management practices can help to reduce yield loss, but great progress can also achieve through genetic improvement. Plant responses to water stress include morphological and biochemical changes and later as water stress becomes more severs to functional damage and loss of plant parts [24]. According to several reports, between grain yield in wheat and grain weight, fertile tillers or spikes per plant, spikelet's per spike and spike has a significant correlation [27,20]. Solidarity, especially in plant height and heading time, different results (depending on variety and planting systems used) is seen [15]. Renold *et al.,* [23] with different grain review concluded that a whole wheat linear relationship between stress and the yield is. (m9). Plant height, spike lengths, grain number and total grain weight for well-watered and stress plants were compared by Majer *et al.,* [17].

Dofing and Knight, [6] stated that effects on yield components to grain yield are positive and effects of number of spike per square meter on the other two components and effect of number of grain per spike to grain weight were negative.

Heydari et *al.,* [11] to study genetic diversity of different traits in 157 lines of double haploid bread wheat, indicated that their under-study lines have higher genetic diversity for last internode length, number of fertile spike per area unit, plant height, number of grain and grain yield per spike in comparison with other traits like grain volume weight, days to maturity, days to heading and days to anthesis.

Harvest index is one of the important features affecting the grain yield and also is one of the production standards of new varieties of cereal, and based on reports by Slafer and Andred [29], it was used as a very important selection criterion in the production of new varieties of grain. They reported significant and positive correlation between grain yield and harvest index. Dawari and Luthra [5] in his studies on bread wheat cultivars showed that the harvest index, kernels per plant and spike length were important components of performance and selection It could be the basis for improved performance to be effective.

Garavandi and Kahrizi [8] by evaluation of 20 bread wheat genotypes reported that genotypes have higher genetic diversities for grain yield, spike number per square meter, number of seed per spike, spike density and awn length in comparison with other traits. Development of cultivars with high yield is the main goal in water limited environments but success has been modest due to the varying nature of drought and the complexity of genetic control of plant responses [18].

Landraces are important genetic resources for improvement of crops in dry areas, since they have accumulated adaptation to harsh environment over long time. The present research was conducted to evaluate genetic diversity among different genotypes of wheat to compare them for association of morphological traits under water stress conditions, as well as to use in breeding programs and to identify near and far groups of genotypes for using them in suitable crosses.

Material and method

Experiments were undertaken on fifty wheat landraces selected from the collection of "Research Institute on Breeding and producing Seed and Seedling Iran" along with six controls (Pishtaz, Alvand, Azar2, Fankang, Konia2002 and Gork79) was evaluated under drought stress condition. Based on randomized complete block design with three replications, the experiment was carried out in the agricultural research station of Islamic Azad University, Ardabil branch, Iran (Northwest of Iran), during the 2008 and 2009 cropping year. The seeds of the experiment were disinfected before being planted with 2 in 1000 coefficient with fungicides carboxin thiram to avoid hidden smut. To fight the weeds which had side leaves and also thin leaves, a mixture of Granstar and Pumasuper was used. It was respectively 20 grams and one liter in hectare in tillering stage until stem elongation. Drought stress through do not irrigate on shoot stage and Use a plastic cover to prevent rainwater from reaching the field, was applied. The studied characters were plant height, number of tillers, peduncle length, spike length, grain per spike numbers, fertile tillers per plant, 1000 grain weight, harvest index, Biological yield, Flag leaf width, Flag leaf length, Grain yield per unit area, Biological yield per unit area and Grain yield. The analysis of variance (ANOVA) for each character was performed following the Duncan's new multiple range test [30], to test the significance difference between means. For evaluated relation between traits used in Pearson correlation. To Category genotypes cluster analysis was performed using Ward. The data were statistically analyzed by Mstat-c and Spss software's.

Results and discussion

Analysis of variance under investigations traits showed that (Table 1) there is a significant difference at the level of 1% among the investigated genotypes regarding agronomy and morphological traits in drought stress condition. Can be concluded that the genetic diversity of genotypes under study and needed to changes to achieve a favorable combination of available. Variable coefficient (CV %) was under %20 except from harvest index and biological yield. Which indicates the high carefully measurements or experimental error is low. Genotype 21 had the most and genotypes 1 and 51 had the least grain yield (Table 2). Also, genotype 24 had the most and genotypes 22, 40, 49, 50, 4, 53 had the least grain yield in each square meter. Genotypes 37 and 41 had the most biological yield.

Genotypes 33, 38, 42, 41, 43, 40, 5, 15, 21, 24, 35, 18, 34, 27, 26 and 45 had the most and genotypes 49, 44, 4, 19, 3, 14, 56, 55, 37, 9, 11, 629, 23 and 8 had the least harvest index (Table 2). Harvest index as a quantifier trait shows the plant efficiency in spreading photosynthesized material toward seed. Although some researchers a low heritability for this trait have been reported [31]. Genotypes 48, 25 and 37 had the most and genotypes 53, 55, 17, 40, 50 and 12 had the least spike length (table 2). Genotypes 37, 10 and 25 had the most and genotypes 55, 52 and 43 had the least 1000 grain weight (table 2). Genotypes 37, 10, 25, 9 and 19 had the most grain per spike numbers. Genotypes 40, 12 and 43 had the least of these traits (table 2). In different studies about sensitive stages relevant to drought stress in wheat, the most sensitive stage is the time when Time of the formation of pollen mother cells undergo meiosis process are subject to the final period as the pregnancy is [3,7]. The stress in this stage decreases both the grain per spike numbers per unit area and grain per spike numbers [28,9] and Zhong-hu and Rajram, [33] at different treatments about drought stress understood that the number of grain per spike had the most sensitivity to drought stress. Also, genotypes 37, 49, 25, 26, 36, 47, 55, 19 and 41 had the most and genotype 33 had the least plant height among other genotypes. Studying the table of Comparison means (table 2) shows that there are genotypes among under investigation wheat landraces which have closer or higher amount of traits in comparison to control Cultivars. This superiority can be used in different improvement plans such as resistance against drought stress.

Correlation:

The simple correlation amounts of 15 under investigated traits are shown in table 3. The correlation coefficient of grain yield with number of tillers, peduncle length, spike length, grain per spike numbers, fertile tillers per plant, 1000 grain weight, harvest index, Biological yield and Flag leaf width was significant. Amini *et al.*, [2], Golparvar *et al.*, [10], Mohammadi *et al.*, [19] showed in their experiments similar correlations, too. Also, grain yield in square meter had significant correlation with harvest index per unit area. In research of Sinebo [28] biological yield had the most correlation with grain yield. Besides, KhodaRahmi *et al.*, [16] showed the most correlation between grain yield with biological yield and fertile tillers per plant, and these are similar to the results of this research. Harvest index had positive and significant correlation with grain yield and also is one of the most effective features which affect the grain yield. Slafer and Andrade [29] reported positive and significant correlation between wheat grain yield and harvest index. There was a positive and significant correlation (0.88**) between grain yield with spike length. The results of these studies correspond to the results of Yildirim *et al.*, [32]. There was a positive and significant correlation among harvest index and grain per spike numbers. Biological yield had positive and significant correlation with the number of tillers (0.70**) and fertile tillers per plant (0.73**). Flag leaf width had negative and significant correlation with the grain per spike numbers in 1% possibility level. Also, there was a positive and significant correlation between the number of tillers and fertile tillers per plant (0/96**). AkbariMogadam [1] claimed that decreasing the number of tillers in plant leads to decreasing the fertile tillers per plant.

Cluster analysis:

Cluster analysis was used based on standardized data in order to classify the under investigation genotypes. Obtained dendrogram were cut with the most distance from the other groups, and 56 genotypes were included in three clusters. (figur 1). In order to show the value of each cluster regarding investigated traits, mean deviation percent of each cluster was calculated from the total mean. The cluster which had the highest mean in comparison with the mean of the first cluster will be appropriate for using in different improvement plans. The first cluster included genotypes 27, 52, 24, 28, 51, 11, 35, 45, 38, 1, 16, 42, 33. The mean deviation percent of this cluster for traits such as peduncle length, the number of grain per spike, the grain yield, Grain yield per unit area, biological yield per unit area and harvest index was positive. In the second cluster, genotypes 32, 30, 46, 53, 55, 12, 22, 50, 21, 29, 6, 39, 17, 5, 18, 36, 8 and 4 are included in the genotypes of this cluster, had the most value regarding spike length, biological yield, stem harvest index and 1000 grain weight had the most value and other traits showed lower than average total value of genotypes. This cluster had the most mean of harvest

Table 1: Mean squares of 56 wheat genotypes under drought stress condition

S. O. V.	D.F	Mean Square							
		Total Tiller No.	Fertile Tillers	Plant Height	Peduncle Length	No. of grain per Spike	Flag leaf length	Flag leaf width	Spike length
Replication	2	85.018**	59.04**	392.6^{NS}	0.036 ^{NS}	22.50 ^{NS}	424.3 ^{NS}	3.70 ^{NS}	13.5 ^{NS}
Genotype	55	101.93**	77.59**	67695.5**	1.779**	601.9**	2387.1**	3.32**	1029.7**
Error	110	2.336	2.349	9785.9	0.145	12.60	525.92	0.66	33.61
CV	(%)	9.93	11.08	10.4	9.6	6.72	13.3	7.3	5.13

S. O. V.	D.F	Mean Square						
		1000 grain weight	Biological yield per plant	Grain yield per plant	harvest index per Plant	Biological yield per unit area	Grain yield per unit area	harvest index per unit
Replication	2	36.93 ^{NS}	279100**	12198.2**	16073**	16073**	15878	143.5*
Genotype	55	69.67**	73815**	14725.5**	65943.8**	659434**	26987**	115.25**
Error	110	13.48	15551.7	1212.2	66.64	0.325	7304.7	31.747
CV	(%)	8.12	25.8	18.9	20.2	22.8	19.5	23.8

**,* and Ns, significant at 1%, 5% level of probability and non-significant, respectively

Table 2: Comparison means of 56 wheat genotypes under drought stress condition

No	Accession no	Total TillerNo.	Fertile Tillers	Plant Height	Peduncle Length	Flag leaf length	Flag leaf width	No. of grain per Spike	Spike length	1000 grain weight	Biological yield per per plant	Grain yield per plant	harvest t index	Biological per unit area	Grain yield unit area	harvest index per unit area
1	11204	12.0	9.50	68.0	19.55	19.20	1.86	41.5	118.5	40.17	26.65	8.20	40.57	2375	636.24	27.05
2	12075	20.5	17.0	101.5	20.5	17.75	1.99	38.0	124	45.71	28.00	22.00	51.81	1667	418.87	25.75
3	10531	13.5	13.0	98.0	19.9	15.20	1.84	35.0	114.5	35.36	33.60	13.00	39.24	2937	375.25	13.40
4	10532	18.0	17.0	90.0	24.75	22.75	1.95	41.0	97.50	48.92	42.05	15.60	30.51	1938	217.66	11.65
5	11203	6.50	6.00	97.75	12.6	17.65	1.93	63.0	116.5	44.21	25.55	8.00	68.37	2042	434.77	20.90
6	12196	17.0	16.0	102.1	20.5	17.05	2.09	49.5	100.5	46.55	53.45	20.40	28.84	2375	384.58	16.55
7	11018	27.0	19.0	63.0	23.0	14.80	1.97	35.0	124	46.12	62.10	18.30	55.72	1750	387.08	22.05
8	11479	18.5	18.5	99.5	14.7	15.75	2.05	40.0	117	55.73	50.65	15.85	32.98	1875	338.66	18.00
9	11028	10.5	9.50	87.0	14.4	17.05	2.17	73.5	114	46.25	43.75	12.80	78.36	2292	379.33	16.50
10	12197	13.0	12.5	101.5	9.4	18.00	2.14	78.5	116	43.32	57.95	21.40	29.38	1917	362.33	19.80
11	11039	7.00	5.00	95.5	23.25	12.10	1.97	62.0	112	52.23	30.50	12.60	43.02	3417	516.22	15.15
12	11028	11.0	8.00	92.0	19.0	13.00	2.10	61.0	81.5	42.36	32.50	84.00	38.59	1812	489.45	26.70
13	12194	15.5	15.5	103.0	24.35	15.45	2.05	69.0	105	43.86	63.60	24.70	25.38	1479	390.58	26.25
14	11486	27.5	24.0	106.5	29.0	18.00	2.00	50.0	136.5	47.42	74.80	30.20	24.16	2312	319.95	13.83
15	11030	20.0	18.0	110.3	15.3	23.50	2.04	56.5	114.5	42.31	70.10	24.30	58.57	1496	474.04	31.66
16	11076	14.5	13.0	52.25	19.85	19.10	1.99	56.0	110.5	46.00	50.65	17.90	41.74	2354	545.74	24.71
17	12193	16.5	15.0	107.7	26.85	13.25	2.04	40.0	76	51.69	62.65	26.00	34.63	2000	438.62	22.45
18	12194	14.0	12.0	84.80	20.55	18.65	1.84	45.5	111.5	50.57	36.60	15.95	28.21	1375	410.73	29.85
19	11478	19.0	19.0	111.2	18.90	16.40	2.02	73.0	118	38.47	65.70	23.60	42.42	2479	294.25	11.85
20	11036	26.5	24.0	98.25	26.40	20.50	2.05	51.0	120	37.53	75.05	27.30	15.06	1750	483.83	27.62
21	11031	29.0	24.0	106.0	11.00	23.00	1.93	39.0	120	47.85	52.70	41.50	42.83	1958	594.24	31.63
22	11200	10.5	09.5	100.1	22.60	14.30	2.00	44.0	98	49.31	34.65	13.25	65.04	1229	269.25	25.45
23	11072	15.0	13.5	104.2	14.85	12.00	1.97	57.5	84	33.63	37.85	13.60	41.05	2667	445.12	17.53
24	10425	6.50	06.5	77.35	16.70	12.00	1.89	64.5	107	32.88	19.50	8.25	46.01	2333	710.77	30.32
25	11072	16.0	15.0	116.4	13.10	20.90	2.00	78.0	154	48.26	84.60	27.70	49.86	1646	383.75	23.43
26	11063	19.0	17.0	115.3	17.30	24.00	1.97	61.0	140	44.08	74.50	23.50	39.83	1729	466.87	28.75
27	11020	9.50	08.5	76.00	06.25	12.90	2.00	59.0	107	41.18	32.30	12.50	34.63	1750	505.41	28.8
28	11037	9.50	09.5	96.30	21.00	15.35	1.93	69.0	135.5	45.29	39.55	15.10	57.43	2396	617.41	25.72
29	11198	22.5	21.5	96.00	24.70	20.80	2.04	41.5	122.5	59.11	74.85	32.75	69.23	3146	538.83	17.05
30	11064	13.0	11.0	100.5	21.00	16.45	2.02	64.0	122	34.49	41.80	13.60	65.04	1896	309.16	25.00
LSD	LSD 5%	3.56	3.54	16.19	4.72	3.75	0.15	8.21	13.42	6	20.41	8.05	13.36	911.8	171.2	11.29
31	11204	15.0	14.0	102.5	15.10	15.75	2.02	68.5	123	45.00	64.00	24.65	61.82	1937	503.24	26.35
32	12075	11.0	11.0	76.60	11.55	13.25	1.89	31.5	107	54.65	26.80	13.40	43.24	2313	472.66	21.25
33	10531	9.50	9.05	64.35	13.40	22.00	2.23	71.5	106	42.89	36.85	22.00	20.52	1333	499.91	37.45
34	10532	21.0	18.0	91.20	14.90	18.20	1.93	50.0	110	43.63	60.70	18.40	98.11	1562	437.24	29.14
35	11203	12.0	12.0	89.00	29.50	16.10	1.95	62.5	111.5	43.18	38.45	14.60	26.22	1896	571.62	30.10
36	12196	13.5	11.5	115.3	15.00	18.80	1.93	41.0	121	54.72	35.65	14.20	26.22	1896	368.62	19.75
37	11018	27.0	26.0	127.0	17.05	27.00	2.13	81.0	145	38.04	112.2	16.00	31.18	3292	464.16	15.00
38	11479	16.0	14.5	95.00	23.05	16.10	1.96	45.5	109.5	45.24	52.20	14.50	31.18	1687	634.95	38.95
39	11028	18.0	16.5	98.90	17.85	18.90	2.00	46.5	111.5	43.90	54.95	21.65	26.57	1958	385.99	20.10
40	12197	9.00	9.00	111.2	64.00	17.50	2.13	46.0	80.50	42.67	29.40	10.90	35.27	1896	251.79	14.45
41	11039	23.5	20.0	110.9	13.95	19.80	2.00	47.5	123.5	46.54	95.60	29.75	55.59	1354	479.12	35.90
42	11028	10.5	8.00	90.40	19.55	21.25	1.95	55.5	107.5	34.97	27.65	8.500	55.59	1479	511.33	37.05
43	12194	20.5	19.0	87.35	16.35	17.30	1.91	29.0	123.5	55.06	32.70	18.90	55.78	1583	542.33	35.10
44	11486	18.5	15.5	91.85	11.00	16.00	2.02	51.5	122.5	45.40	42.85	14.50	14.26	3837	336.79	8.55
45	11030	16.5	16.5	86.00	14.80	15.65	1.99	53.5	126.5	42.00	36.85	13.50	58.97	1896	534.58	28.10
46	11076	12.0	11.0	94.20	13.00	16.50	1.93	53.0	95	53.13	40.30	16.30	48.38	1271	351.91	27.40
47	12193	18.0	13.0	113.0	17.50	19.00	2.00	70.0	130	38.67	46.80	12.80	49.88	1708	369.87	21.45
48	12194	11.0	7.50	108.5	18.80	20.25	2.04	63.5	156	40.75	43.10	13.70	60.46	1396	367.74	27.20
49	11478	20.0	17.0	124.2	23.25	13.50	1.93	56.0	130	41.18	63.20	19.70	63.45	2542	192.04	7.60
50	11036	19.0	17.0	95.0	57/00	19.50	2.10	70.0	81.5	45.57	52.40	20.20	35.27	1500	217.45	14.30
51	11031	18/5	17.0	94.75	20.55	18.00	2.13	49.0	115	49.83	58.40	29.90	51.84	1750	579.95	34.30
52	11200	7.50	7.50	87.0	12.75	13.75	2.00	25.0	100	45.50	21.35	12.70	55.66	2371	487.95	20.42
53	11072	6.00	6.00	94.0	16.00	15.25	1.98	29.5	68.5	49.00	39.40	28.00	57.50	1208	241.66	19.95
54	10425	12.0	12.0	101.1	19.60	15.35	1.93	49.0	110	52.10	45.10	18.55	78.48	2625	543.04	21.31
55	11072	10.5	10.5	88.25	20.60	9.40	1.95	23.0	69	54.00	36.85	15.50	21.44	1729	595.37	34.80
56	11063	7.50	7.50	87.0	12.30	13.75	2.04	53.5	120	45.00	25.10	15.10	31.16	1958	428.25	22.15
57	11020	3.56	3.54	16.19	4.72	3.75	0.15	8.21	13.42	6	20.41	8.05	13.36	911.8	171.2	11.29
58	11037	15.0	14.0	102.5	15.10	15.75	2.02	68.5	123	45.00	64.00	24.65	61.82	1937	503.24	26.35
59	11198	11.0	11.0	76.60	11.55	13.25	1.89	31.5	107	54.65	26.80	13.40	43.24	2313	472.66	21.25
60	11064	9.50	9.50	64.35	13.40	22.00	2.23	71.5	106	42.89	36.85	22.00	20.52	1333	499.91	37.45
LSD	LSD 5%	21.0	18.0	91.20	14.90	18.20	1.93	50.0	110	43.63	60.70	18.40	98.11	1562	437.24	29.14

Table 3: Correlation coefficients between agronomic and morphologic traits under drought stress condition

	Grain yield	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
Biological yield (1)	0.7**													
Harvest index (2)	0.4**	0.32**												
Grain yield unit area (3)	-0.04	-0.15	0.1											
Biological yield unit area(4)	-0.14	-0.04	-0.14	0.13										
Harvest index unit area(5)	0.08	-0.04	0.16	0.65**	0.61**									
No. of grains per Spike (6)	-0.05	0.23	0.41**	-0.06	0.01	0.48**								
Spike length (7)	0.29**	0.49**	0.2	0.88**	0.13	-0.07	0.34**							
1000 grain weight(8)	0.28**	0.08	0.27*	0.03	0.03	0.03	0.44**	-0.04						
Total Tiller No.(9)	0.64**	0. 7**	-0.04	-0.11	-0.01	-0.04	-0.13	0.48**	0.08					
Fertile Tillers(10)	0.69**	0.73**	-0.02	-0.10	0.03	-0.07	-0.12	0.44**	0.13	0.96**				
Flag leaf length (11)	0.41**	0.43**	-0.02	-0.06	-0.18	0.16	0.17	0.43**	-0.08	0.46**	0.46**			
Flag leaf width(12)	0.21	0.3	0.013	-0.20	-0.13	-0.02	-0.39**	-0.15	-0.02	-0.01	0.02	0.44**		
Length of Peduncle(13)	0.33**	0.2	0.2	-0.12	-0.05	-0.03	0.39**	0.07	0.22	0.35**	0.36**	0.12	0.06	
Plant Height(14)	0.21	0.4**	-0.22	-0.34**	0.07	0.33**	0.06	0.19	-0.02	0.28*	0.26*	0.04	-0.21	0.24*

** and *, significant at 1%, 5% level of probability, respectively

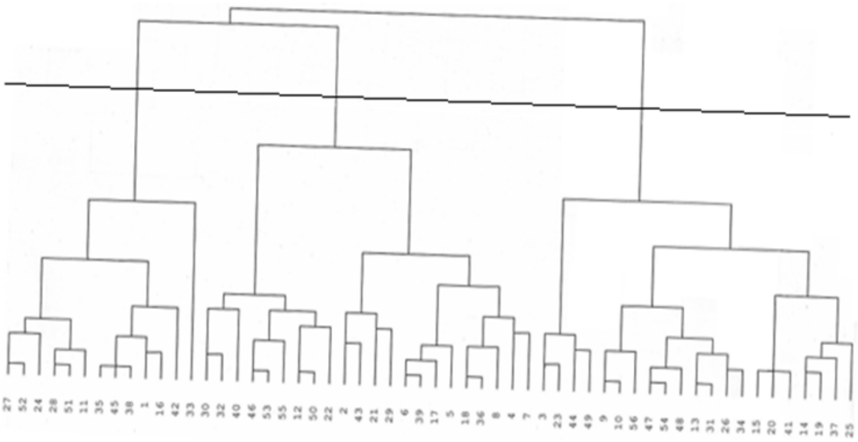

Fig. 1: Dendrogram obtained by cluster analysis of 50 genotypes and six check cultivars using WARD method

index and a 1000 grain weight with the other two clusters. The third cluster included genotypes 3, 23, 44, 49, 9, 10, 47, 54, 48, 41, 26, 14, 19, 37 and 25. This cluster had the positive mean deviation in the number of tillers, plant height, peduncle length, number of grain per spike, grain yield, biological yield and biological yield per unit area. This cluster had the most means deviation from total mean in comparison with other two clusters.

References

1. AkbariMogadam, A., 2002. Effects of early planting dates, planting normal and delayed planting on yield and yield components and some morphological traits in Advanced Cultivars of wheat. Abstracts Seventh Congress Agronomy and Plant Breeding. Karaj, page 51.
2. Amini, A., M. Eamailzade-Mogadam and M. Vahabzadeh, 2005. Genetic diversity based on agronomic performance among Iranian wheat landraces under moister stress. Proc. The 7th International Wheat conference, Nov. 27-dec 2, 2005. Mardel Plata – Argentina.
3. Boyer, J.S., 1996. Advances in drought tolerance in plant. Adv. Agron., 56: 187-218.
4. Cattivelli, L., F. Rizza, F.W. Badeck, E. Mazzucotelli, A.M. Mastrangelo, E. Francia, C. Mare, A. Tondelli and A.M. Stanca, 2008. Drought tolerance improvement in crop plants: An integrated view from breeding to genomics. Field Crop Res., 105: 1-14.
5. Dawari, N.H. and O.P. Luthra, 1991. Character association studies under high and low environments in wheat (*Triticum aestivum* L.) Indian. J. Agric. Res., 25: 515-518.
6. Dofing, S.M. and C.W. Knight, 1992. Alternative model for analysis of small grain yield. Crop Sci., 32: 487-489.
7. Duggan, B.L., D.R. Domitruk and D.B. Flowler, 2000. Yield component variation in winter wheat grown under drought stress. Can. J. Plant sci., 80(4): 739-745.
8. Garavandi, M. and D. Kahrizi, 2010. Evaluation of genetic diversity of bread wheat genotypes for phenologic and morphologic traits. The 11th Crop Sci. and Plant Breeding Congress, Iran, pp: 537-541.
9. Giunta, F., R. Motzo and M. Deidda. 1993. Effects of drought on yield and yield components of durum wheat and triticale in a Mediterraneum environment. Field Crops Res., 33: 399-409.

10. Gol Parvar, A., M.R. Ghanadha, A. Zali and A.hmadi, 2003. Determine of the best selection traits for yield improvement df bread wheat under drought stress. Seed and Plant Journal, 18: 144-155.
11. Heydari, B., Gh. Saeedi, B.A. Seyyed Tabatabaei and K. Soenaga, 2006. Evaluation of genetic diversity and estimation of heritability of some quantity traits in double haploid lines of wheat. Iranian J. Agric. Sci., 37(2): 347-356.
12. Houshmand, S., H. Abasalipour, A. Tadayyon and H. Zinali, 2011. Evaluation of four chamomile species under late season drought stress. International Journal of Plant Production, 5(1): 9-24.
13. Khan, A.S., S. Ul Allah and S. Sadique, 2010. Genetic variability and correlation among seedling traits of wheat (*Triticum aestivum*) under water stress. International Journal of Agriculture & Biology, 12(2): 247-250.
14. Khayatnezhad, M. and R. Gholamin, 2011. Scrutiny of hexaploid and tetraploid (*Triticum durum*) wheat's genotypes to some physiological responses in drought stress. Middle-East Journal of Scientific Research, 7(1): 12-16.
15. Khayatnezhad, M., M. Zaefizadeh, R. Gholamin, S. jamaati-e- Somarin and R. Zabihi-e-Mahmoodabad, 2010. Study of morphological traits of wheat cultivars through factor analysis. American-Eurasian J. Agric. & Environ. Sci., 9 (5): 460-464.
16. KhodaRahmi, M., A. Amini and M.R. Bihamta, 2006. study of traits correlation and path analysis grain yield triticale. Iranian Journal of Agriculture Science, 1-37(2): 77-83.
17. Majer, P., L. Sass, T. Lelly, L. Cseuz, I. Vass, D. Dudits and J. Pauk, 2008. Testing drought tolerance of wheat by complex stress diagnostic system installed in greenhouse. Acta Biol. Sezegediensis, 52: 97-100.
18. Mirbahar, A.A., G.S. Markhand, A.R. Mahar, S.A. Abro and N.A. Kanhar, 2009. Effect of water stress on yield and yield components wheat (*Triricom Aestivum* L.) varieties. Pak. J. Bot., 41(3): 1303-1310.
19. Mohammadi, M., M.R. Ghanadha and A. Talei, 2003. Study of genetic diversity in local Iranian wheat lines by multivariable statistical methods. Seed and Plant Journa, 18: 328-347.
20. Mohiuddin, S.H. and L.I. Cory, 1980. Flag leaf and pedancle area duration in relation to winter wheat grain yield. Agron. J., 72: 299-301.
21. Nouri-Ganbalani, A., G. Nouri-Ganbalani and D. Hassanpanah, 2009. Effects of drought stress condition on the yield and yield components of advanced wheat genotypes in Ardabil, Iran. Journal of Food, Agriculture & Environment, 7(3&4): 228-234.
22. Rampino, P., S. Pataleo, C. Gerardi, G. Mita and C. Perrotta, 2006. Drought stress response in wheat: physiological and molecular analysis of resistant and sensitive genotypes. Plant Cell Environ., 29: 2143-2153.
23. Renold, M.B. Skovmand, R.T. Ve Thowar and W. Pfeiffe, 2000. Wheat program, CIMMYT.
24. Sangtarash, M.H., 2010. Responses of different wheat genotypes to drought stress applied at different growth stag. Pakistan Jornal of Biological Sciences, 13(3): 114-119.
25. Shahryari, R. and V. Mollasadeghi, 2011. Introduction of two principle components for screening of wheat genotypes under end seasonal drought. Advances in Environmental Biology, 5(3): 519-522.
26. Shahryari, R., B. Mahfoozi, V. Mollasadeghi and M. Khayatnezhad, 2011. Genetic diversity in bread wheat for phenological and morphological traits under terminal drought stress condition. Advances in Environmental Biology, 5(1): 169-172.
27. Shanahan, J.F., K.J. Donnelly, D.H. Smith and D.E. Sminka, 1985. Shoot developmental properties associated with grain yield in Winter wheat. Crop. Sci., 25: 770-775.
28. Sinebo, W., 2002. Determination of grain protein concentration in barley. Yield relationship of barleys grown in atropical high land environment. Crop Sci., J. 24: 428-437.
29. Slafer, G.A. and F.H. Andrade, 1991. Changes in physiological attributes on the matter economy of bread wheat (*Triticum aestivum*) through genetic improvement of grain yield potential at different regions of the word. Euphytica, 58: 37-49.
30. Steel, R.G.D. and J.H. Torrie, 1960. Principles and Procedures of Statistics. Pp. 107-109. McGraw Hill Book Co. Inc., New York.
31. Wang, H., T.N. McCaig., R.M. Depauw., F.R.C. Larke, and J.M.Clarck, 2002. physiological characteristics of recent Canada Western red spring wheat cultivars: Yield components and dry matter production. Can. J. plant Sci., 82: 299-306.
32. Yildirim, M., N. Budakand and Y. Arshas, 1993. Factor analysis of yield and related traits in bread wheat. Turkish Journal of Field crop 1: 11-15.
33. Zhong-hu, I.I. and S. Rajaram, 1994. Differential response of bread wheat characters to high emperature. Euphytica, 72: 197-200.