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GROUPING MORPHOLOGICAL CHARACTERISTICS OF SOME CULTIVARS AND WINTER LINES IN ARDABIL WITH CLUSTER ANALYSIS

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ABSTRACT

To group morphological characteristics of some cultivars and winter lines in Ardabil, an experiment was performed in Ardabil Agricultural Research and Natural Resources Station in 10 km of east of Ardabil (Aralelo Zone) in agricultural year of 2012-2013. In this research, 8 promising cultivars and lines were cultivated as randomized complete block design with three replications. Traits of the total number of tiller, number of fertile tiller, plant height, rhizoid length, peduncle length, spike length, number of spikelet per spike, number of grain in spike, 1000 kernel weight, grain weight in main spike, grain weight per plant, weight of straw, grain yield in experimental plot (6 m²/g), day to 50% of heading and day to physiological maturity were evaluated. After standardizing data, cluster analysis was performed with WARD and Square Euclidean distance coefficient and genotypes were included in 2 groups. The first spike included 6 genotypes. Mean deviation of this spike was positive for traits of day to physiological maturity, total number of tiller, rhizoid length, peduncle length, spike length, plant height, 1000 kernel weight, grain weight in main spike, straw weight and total weight of plant. Genotypes of this spike had negative mean deviation. In the second spike which included 2 genotypes, traits of day to 50% of heading, number of fertile tiller, number of spikelet in spike, number of grain in spike, weight of grain in plant, harvesting index and yield had positive mean deviation.

Keywords: Winter Barley, Cluster Analysis, Morphological Characteristics

INTRODUCTION

Barley the same as wheat is one of the most significant plants of cereal species (*Gramineae*) a plant of *Hordeum* and *Sativum* or *Vulgare* species (Khodabande, 2005). Barley can be cultivated in many parts of the world due to tolerance to non- environmental issues and the need of little moisture and adaptation to crop field. Barley has a short growth growing period, so it grows in the northern hemisphere and in highlands where ice period is short. It is also cultivated in tropical areas and in highlands with altitudes of 3500 m. Barley needs a minimum rain of 200 – 250 mm during plant growth period. The minimum germination temperature and barley's growth is 2 °C, desirable temperature is 15 – 20 °C and the maximum temperature is 40 °C. Barley production in Iran in year 2008 was 5.1 million tons which has declined to less than 4 million tons in year 2009 owing to drought. Iran's import rate increased from 0.92 million tons in year 2008 to more than 1.3 million tons in year 2009. In addition, barley consumption in Iran rose from 3.8 million tons in year 2008 to 4.5 million tons in year 2009. Iran's barley supply in year 2008 was announced 0.6 million tons (FAO, 2009).

When specialist of plant breeding wants to categorize varieties and cultivars, in order to figure out the genetic distance and their diversity, he uses cluster analysis methods via mathematical formulas (Farshadfar, 1999 and Bryan and Manly, 2004). Since the varieties in a group have less genetic distance in comparison to the varieties of the other groups, therefore in hybridization, according to the varieties in different groups and amount of mean value of each group in order to achieve a better yield, phenomena such as Heterosis and transgressive segregation can be used.

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MATERIALS AND METHODS

Experiment Location:

This experiment was conducted at Agricultural research and Natural Resources station in Ardabil (with 1350 meters height, latitude 38 degrees and 15 minutes north and longitudinal 48 degrees and 15 minutes east and annually mean rain 280-300 mm) 10 km east from Ardabil (Aralloo region) in 2012-2013 crop year. The physicochemical results from tested from soil sample are given in Table 1. And the regional climate specifications of the experiment are given in Table 2.

Table 1: The physicochemical results from tested farm soil sample

Tissue	Percent Sand	Percent Silt	percent Clay	Percent Lime	Percent saturation	pH	Salinity (ds/m)
Clay loam	31	30	39	5	53	7.76	2.04
Percent organic carbon	N (p.p.m)	Resorbable phosphorus (p.p.m)	Potassium Resorbable (p.p.m)	Zn (p.p.m)	Fe (p.p.m)	Cu (p.p.m)	Ma (p.p.m)
0.858	0.08	2.2	594	2.32	2.52	8.56	4.27

Table 2: Atmosphere specifications of Experiment location in Ardabil in 2012-2013 crop year

Parameter	Local	Mehr	Aban	Azar	Dei	Bahman	Esfand
Rainfall	Ardabil	8.3	25.6	26.7	11	28.5	24.1
Average minimum temperatures	Ardabil	7.3	4.8	0.3	-2.4	1	1.1
Average maximum temperature	Ardabil	21.9	16.9	8.9	6	11.1	11.9
Average daily temperature	Ardabil	14.6	10.9	4.6	1.8	6.1	6.5
Average minimum humidity	Ardabil	42	48	60	41	45	43
Average maximum moisture	Ardabil	97	94	94	82	84	84
Average humidity	Ardabil	70	71	77	62	65	64
Total sunshine hours	Ardabil	244	168.4	120.1	173	170.5	154.8

Source: Meteorological Ardabil Province

Continued Table 2

Parameter	Local	Farvardin	Ordibehesht	Khordad	Tir	Mordad	Shahrivar
Rainfall	Ardabil	10.7	48.1	57.3	0.7	16	6.4
Average minimum temperatures	Ardabil	2.4	4.2	9.3	11.3	12.4	11.5
Average maximum temperature	Ardabil	16.9	18.2	22.9	23.8	22.3	25.2
Average daily temperature	Ardabil	9.7	11.2	1.16	17.6	17.4	18.4
Average minimum humidity	Ardabil	40	45	44	43	52	43
Average maximum moisture	Ardabil	87	86	89	85	91	92
Average humidity	Ardabil	64	66	67	64	72	68
Total sunshine hours	Ardabil	214.5	247	280.1	346.9	253.9	275

Source: Meteorological Ardabil Province

Experiment Plot:

In this research 8 promising varieties and lines of barley (table 3) were cultured in a complete block design with three replications. The irrigation was traditionally done 4 times until physiological maturity.

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Each line and variety were considered in 6 rows plots and each plot was 7 meters and the space between lines was 20 cm. Grain density was 350 seeds per square water. Two- four-D was used to control grass and broad leaf weeds during cultivation. Fertilizing of cultured land was done based on fertilizer advice on soil test tillage and disk. The following traits were measured in this research; total number of tiller, fertile tiller number, plant height, awn length, Peduncle length, spike length, spikelet number per spike, grain number per spike, 1000 grain weight, grain weight per spike, grain weight per whole plant, straw weight, grain yield per experimental plot (6 meter square to gram) harvest index, day to 50% heading and day to physiological maturity.

Table 3: Names the studied genotypes

Number	Genotype and Line	Number	Genotype and Line
1	Bahman	5	Bereke-54/Alanda
2	ALGER/(CI10117/CHOYO../1-BC-80467	6	Debut/5/B/A/4/A/3/Jotun/5*Hudson//Ri/VA66-42-45/6/K-273/Ste
3	ALGER/(CI10117/CHOYO../Zarjow/U.N.K	7	L.1242/ZARJOW//LB.Iran/Una8271//Gloria"S"/Com"S"
4	Ste/L.640//Hml-02/Arabi Abiad*2/3/1-BC-80593	8	Legia/3/Torsh/9Cr.279-07//Bgs

Statistical Analysis:

To determine the genetic affinity of genotypes and grouping them, cluster analysis using WARD method and Euclidean distance square distance coefficient was performed (Hoque and Rahman, 2006). For statistical analysis SPSS and Minitab software were used.

Discussion

In this study, in order to classify genotype cluster analysis based on standard data and WARD methods was used. In a breeding program as the parents are genetically distant from each other; transgressive segregation of their offspring will be increased. The main goal of cluster analysis is to determine genetic distance of hybrids from each other, so the researcher instead of spending time on a huge number of randomized genotype to obtain a good result accidentally, first categorizes the studied genotypes according to cluster analysis and then by choosing some hybrids from spurious from the distant clusters and based on their traits takes some blocks of hybridizations. Thus in hybridization among distant genotypes, which has been chosen from distance clusters, the possibility of achieving optimum results increases. This method acts based on SS minimization of total traits in clusters and a state is considered in each stage which has lower SSr. For this reason, that method is called minimization. Calculations in this method are based on observations and similarity or distance matrix is used. Therefore, it has statistically optimal property. But this optimality is not perfect because it is possible to separate people from a cluster and include it in different clusters (Farshad, 2005). Phenotype correlation coefficient is a criterion of relationship between traits and can be used as important selective indices. They are also useful for identification of the traits which have low significance or lack significance in selective plan. To differentiate characteristics of each group in terms of the studied traits, mean of each cluster and mean deviation of each cluster from total mean were calculated (Table 4). The cluster which has higher mean than the total mean for a trait can be introduced as a top genotype. The first cluster included 6 genotypes. Total mean deviation of this cluster was positive for traits of day to physiological maturity, total number of tiller, rhizoid length, peduncle length, spike length, plant height, 1000 kernel weight, grain weight in main spike, straw weight and total weight of plant. Genotypes of this cluster had negative mean deviation in terms of other traits. In the second cluster which included 2 genotypes, traits of day to 50% of heading, number of fertile tiller, number of spikelet per spike, number of grain in spike, grain weight per plant, harvesting index and yield had positive mean deviation. Poorsiah (1998) specified seven genotypes by measuring 15 different agricultural traits in 100 Durum wheat line and with cluster analysis.

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Table 4: Average, deviation from the mean of the 2 clusters obtained from cluster analysis for all traits

Cluster	statistic parameter	Days to 50% heading	Date of maturity	The total number of tillers	Number of fertile tillers	Awn length	Peduncle length	Spike length	Plant height	The number of spikelets per spike
1	$\bar{X}$	120.94	181.39	3.32	2.57	10.48	37.44	4.05	85.57	11.77
	$\bar{x}_h - \bar{x}_{..}$	-0.06	0.49	0.08	-0.33	0.29	0.16	0.14	1.33	-0.18
2	$\bar{X}$	125.17	170.5	3	2.9	9.3	26.79	3.49	80.33	12.5
	$\bar{x}_h - \bar{x}_{..}$	3.17	-10.4	-0.24	0.25	-0.89	-0.49	-0.42	-4.01	0.55
Mean		122	180.9	3.24	2.65	10.19	27.28	3.91	84.24	11.95

Continued Table 4

Cluster	statistic parameter	Number of grains per spike	1000 grain weight	The main spike grain weight	Seed weight per plant	Straw weight	Total plant weight	Harvest Index	Yield
1	$\bar{X}$	29	42.69	1.5	1.13	3.37	6.68	47.38	4262.22
	$\bar{x}_h - \bar{x}_{..}$	-1.35	1.85	0.03	-2.1	0.13	0.21	-1.66	-174.44
2	$\bar{X}$	24.28	25.28	1.39	3.6	2.86	6.46	54	4960
	$\bar{x}_h - \bar{x}_{..}$	4.03	-5.56	-0.08	0.37	-0.38	-0.01	4.96	523.34
Mean		30.35	40.84	1.47	3.33	3.24	6.47	49.04	4436.66

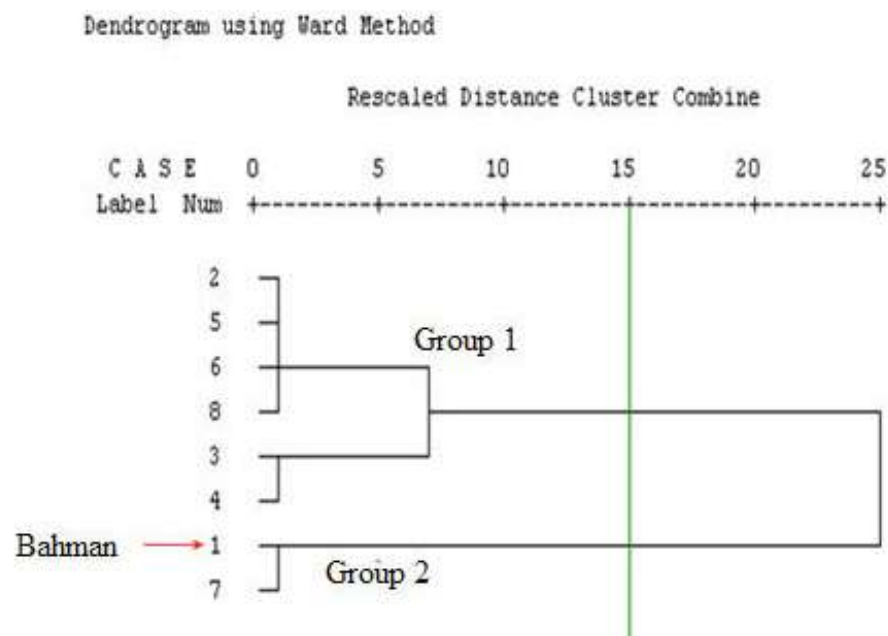


Figure 1: Dendrogram of cluster analysis with Ward Least Variance Ratio

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