

Grouping of Lines and Different Cultivars of Wheat in terms of studied traits in Laboratory Condition

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ABSTRACT: This study was conducted in a randomized complete block design (CRD) with three replications at the Agricultural Laboratory of Islamic Azad University of Ardabil. For grouping the genotypes, clustering analysis by Ward's method using Euclidean distance based on the average standard, 12 evaluated attributes were done in the laboratory and 58 lines with cutting in Euclidean distance underwent in five groups. Diagnosis function analysis also confirmed this grouping. In analysis of variance between groups in terms of all traits, results showed the most significant differences between the groups at 1% level that confirmed grouping. The fourth group were consists of lines 9, 18, 19, 27, 31, 37, 39, 45, 48, 49 and 50 which had the highest value in terms of the Mean Time Germination (MTG) and the lowest value in terms of the coefficient of velocity of germination (CVG) and germination rate (RS) and underwent in the first grade. Whatever coefficient of velocity of germination (CVG) and germination rate (RS) is low is better. The results showed that the was second group with lines 1, 2, 3, 5, 7, 13, 15, 25, 34, 38 and 43 among the five groups as a superior group because in most characters respectively had high value.

Keywords: Wheat, cluster, Laboratory Condition

INTRODUCTION

Cereals provide 70 percent of the human food in earth and truly these plants are the main base of the fed and human survival (Emam, 2007). Wheat is one of the most important crops in the world because of its nutritional value and important role in daily energy intake. Regarding the fact that the world population as of the beginning of 21st century is already more than 6 billion people which more than 700 millions of them are struggling with the lack of food and famine and up to 3 billion suffer from malnourishment (Aulinger, 2002). With irregular and uncontrolled increase of world population it is predicted that the world it will reach 8 billion people by year 2020, from which 6.7 billion live in developing countries. Therefore, one of the politically, economically and socially important issues, especially in developing countries, is to supply for food requirements of vast human population (Patnaik and Khurana, 2001). Wheat is produced under a

wide range of climactic conditions and geographical areas and due to its high adaptability with various climactic conditions of environment, its distribution range is more than any other plant species and it is the staple food for most of the world's increasing population (Jalal Kamali, 2008). Apart from its important commercial aspect in the world, wheat is an increasingly functional tool in political and global relations. Although Iran boasts only around 1% of the world population, it consumes roughly 2.5% of wheat produced in the world .Wheat is a strategic good like energy and is considered one of the important indices of agriculture (Akbari et al, 2010).

The main objective to the following research is to grouping of lines and different cultivars of wheat in terms of studied traits in laboratory condition.

MATERIALS AND METHODS

This study was designed at the Agricultural Laboratory of Islamic Azad University of Ardabil in 2011-2012 crop years. In this experiment, 55 wheat lines received from the International Research Institute of Wheat and Maize (CIMMYT) and varieties of Bezostaya, Katya and Konya were investigated as control. Pedigree of tested lines is included in Table 1. This study was conducted in a randomized complete block design (CRD) with three replications. First, seeds were disinfected in a solution of sodium hypochlorite 15% for 30 seconds. After placing the seeds in Petri (25 seeds per Petri) distilled water (6 mm in each Petri) was poured into the Petri and was prevented tangible changes in water potential until the end of the experiment. To prevent Bunt and disinfection of the all seeds, fungicide Karbuksyn Tyram ratio 2 in a thousand was added and mixed to distilled water. In these experiments, some important features, such as indicators of seed germination, root length, seedling length and seedling dry weight, and root were measured. Then ensuring the normal distribution of data, for data analysis with statistical methods such as cluster analysis (cluster) was performed by ward procedure. Computer software MSTAT-C, Minitab-16 was used for statistical computing.

RESULTS AND DISCUSSION

For grouping the genotypes, clustering analysis by Ward's method using Euclidean distance based on the average standard, 12 evaluated attributes were done in the laboratory and 58 lines with cutting in Euclidean distance underwent in five groups (Figure 1). Diagnosis function analysis also confirmed this grouping (Table 2). In analysis of variance between groups in terms of all traits, results showed the most significant differences between the groups at 1% level (Table 3) that confirmed grouping. To distinguish the characteristics of the groups in terms of studied traits, the mean of each cluster and the total mean for each trait were calculated (Table 3) and characteristics of each cluster are as follows:

The first group were consists of lines Bezostaya, Konya and Kataya, 11, 14, 17, 24, 26, 30, 33, 35, 47, 53, 54 and 55 which were allocated higher values in terms of seedling length.

The second group were consists of lines 1, 2, 3, 5, 7, 13, 15, 25, 34, 38 and 43 which had more value and were in the first grade in terms of the characteristics such as the germination rate index (GRI), seedling fresh weight, root fresh weight, root length, seedling dry weight, and root dry weight.

The third group were consists lines 4, 6, 8, 10, 20, 21, 22, 23, 28, 29, 32, 36 and 42 which had more value and underwent in the first grade in terms of the characteristics such as final germination percent (FGP) and mean daily germination (MDG).

The fourth group were consists of lines 9, 18, 19, 27, 31, 37, 39, 45, 48, 49 and 50 which had the highest value in terms of the Mean Time Germination (MTG) and the lowest value in terms of the coefficient of velocity of germination (CVG) and germination rate (RS) and underwent in the first grade. Whatever coefficient of velocity of germination (CVG) and germination rate (RS) is low is better.

The fifth group were consists of lines 12, 16, 41, 44, 46, 51 and 52 which had moderate and low value in terms of the most traits.

So it can be introduced, the second group with lines 1, 2, 3, 5, 7, 13, 15, 25, 34, 38 and 43 among the five groups as a superior group because in most characters respectively had high value.

Arzani (2002) in their study for grouping 450 studied genotypes used the cluster analysis and classified the collection of germplasm under review into 17 distinct clusters.

Van Bunynjan and Bush (1997) in assessment of genetic diversity among the 270 varieties of spring wheat in North America related to three regions of America, Canada and Mexico had used cluster analysis and they could to obtain 20 major groups, each consisting of four or more digits and 6 small groups, each consisted of two digits.

Table 1. Pedigree and characteristics of 58 wheat lines and cultivars

12Entry No	Cross	CROSS ID	SELECTION HISTORY	ORIGIN COUNTRY
check1	BEZOSTAYA	CHECK		RUS
check2	KATIA1	CHECK		BG-KC
check3	KONYA	CHECK		TR
1	LOCAL CHECK			
2	SHARK-1/3/AGRI/BJY//VEE/4/SHARK/F4105W2.1	TCI012033	-030YE-30E-6E-0E-1E-0E	TCI
3	RSK/CA8055//CHAM6/4/NWT/3/TAST/SPRW//TAW12 399.75	TCI-02-47	-0AP-0AP-25AP-0AP-4AP-0AP	TCI
4	PYN/PARUS/3/VPM/MOS83-11-4-8//PEW/4/Bluegil	TCI011322	-030YE-30E-2E-0E-1E-0E	TCI
5	F6038W12.1/ERYT25221//F6038W12.1	TCI012174	-030YE-30E-3E-0E-1E-0E	TCI
6	4WON-IR-257/5/YMH/HYS//HYS/TUR3055/3/DGA/4/VPM/MOS	TCI-02-80	-0AP-0AP-42AP-0AP-3AP-0AP	TCI
7	Ns46.11/3/Sdy/Ti.Rese1//KtA1/4/55.1744/MEX67.1//NOS 7/3/ATTILA	TCI011413	-030YE-30E-2E-0E-1E-0E	TCI
8	BSP01/18 (Duzi)			SA

9	CH111.14422	WW		SWITZERLAND
10	ID800994.W/VEE//PIOPIO/3/MNCH/4/FDL4/KAUZ	TCI011378	-030YE-30E-2E-0E-3AP-0AP	TCI
11	PBII013.13.3/3233.35/3/STAR//KAUZ/STAR	CMSW01W M00425S	-030YE-30E-3E-0E-3E-0E	MX-TCI
12	PYN/PARUS/3/VPM/MOS83-11-4-8//PEW/4/Bluegil	TCI011322	-030YE-30E-2E-0E-1AP-0AP	TCI
13	PSK/NAC//SABALAN/3/GUN91/MNCH	TCI011656	-030YE-30E-10E-0E-1E-0E	TCI
14	SONMEZ			TE-TCI
15	TRK13 RESEL//TRAP#1/BOW/3/JAGGER 'SIB'	TCI-02-678	-0AP-0AP-4AP-0AP -1E-0E	TCI
16	093.44/N057/3/[258.2.2]/NAD//BEZ/6/IAS58/IAS55//ALD/3/MRNG/4/ALD/IAS58.103A//ALD/5/BUC/7//KAUZ//KAUZ/STAR	CMSW01W M00803S	-030YE-30E-4E-0E-1E-0E	MX-TCI
17	DEMETRA			UKR-MIR
18	ECONOMKA			UKR-MIR
19	T06/13			SA
20	Olifants			SA
21	SULTAN95			MX-OR
22	00*0100-51			US-AGRIPRO
23	POSTROCK			US-AGRIPRO
24	KUMA			RUS-KRAS
25	ANDIJON1			UZB
26	CORDIALE			UK
27	SERI			MX
28	SULTAN95			MX-OR
29	HEREWARD			UK

Continued Table 1. Pedigree and characteristics of 58 wheat lines and cultivars

12Entry No	Cross	CROSS ID	SELECTION HISTORY	ORIGIN COUNTRY
30	Bul 5052-1/6/C126-15/Cofn/3/N10B/P14//P101/4/21183/CO652643//Lcr/KS6/5/Rpb 8-68/Chrc	TE 5649	-8T-2T-1T-2T-1T-0T	TR-TE
31	1-60-1//Emu"s"/Tjb84/3/1-12628/MV17			IR-Karadj
32	Chamran/5/Bez/4/On/6*Ph//Kf/3/Tob"s"/Nap//No66/6/Spn/Mcd//Cama/3/Nzt/4/Urles*2/Prl"s"			IR-Mashhad
33	Alamoot/Shiroodi			IR-Mashhad
34	Vopona/Hd2402/3/Tirchmir/Ico//Sabalan			IR-Mashhad
35	Alamoot/4/Gv/D630//Ald"s"/3/Azd			IR-Ardebil
36	(KS95U522/TX95VA0011)F1/Jagger	AP05T2413		AgriPro South
37	HATCHER			US-COL
38	MV-TALLER			HU-MV
39	DB 66			BG-KC
40	CADET/6/YUMAI13/5/NAI60/3/14.53/ODIN//CI13441/CANON	TCI-02-417	-0AP-0AP-1AP-0AP-5A-0AP	TCI
41	Sau41/Sad1/5/Agri"S"/093-44/3/Kkk/ld/Lov29/4/FKong15//Bow/Pwn/6/1518-4-38K	TE 5857	-1T-2T-2T-1T-0T	TR-TE
42	PLK/LIRA/5/NAI60/3/14.53/ODIN//[CI13441]/4/GRK79/6/MNCH/7//CROC_1/AE.SQUARROSA (213)//PGO	CMSW01WM00578S	-030YE-30E-3E-0E-1E-0E	MX-TCI
43	SERI			MX
44	SULTAN95			MX-OR
45	J15418/MARAS//SHARK/F4105W2.1	TCI011194	-030YE-30E-1E-0E-2E-0E	TCI
46	AGRI/BJY//VEE/3/BUL6687.12/4/F6038W12.1	TCI992137-030YE-0E-1E-0E-2E-0E		TR-YE
47	SONMEZ			TE-TCI
48	CATBIRD//CNO79*2/HE 1	A-29707		CHL
49	RAINER	RAINER		AUSTRIA
50	KOMAROM	KOMAROM		AUSTRIA
51	SOISSANA	SOISSANA		AUSTRIA
52	GT 4131-2KK	GT 4131-2KK		BG
53	GT 01N62-62	GT 01N62-62		BG
54	Lau/Agd/3/Odes95//Olv/B16	TE 5402	-3T-1T-1T-1T-1T-0T	TR-TE
55	BETTA			S.AFRICA

Table 2. Canonical diagnosis function analysis

Test of Function(s)	Wilks' Lambda	Chi-square	df	Sig.
1 through 5	0.003	284.312	60	0.000
2 through 5	0.028	172.357	44	0.000

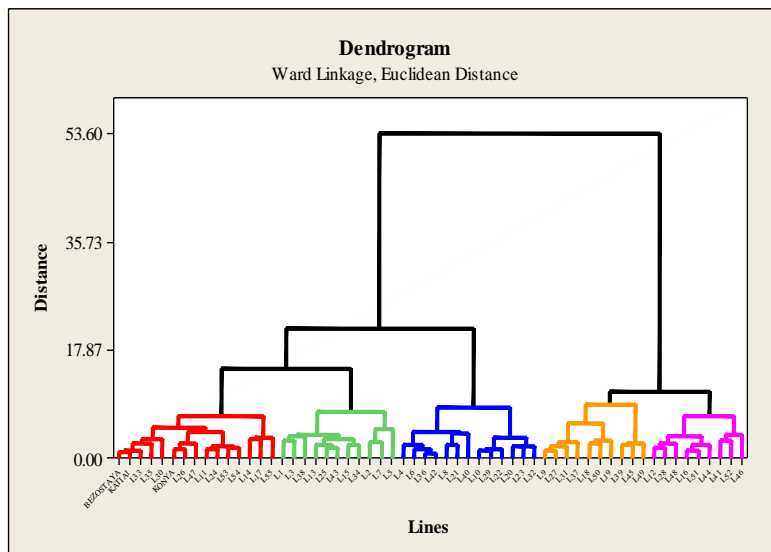


Figure 1. Dendrogram form cluster analysis by the minimum variance of ward method of 58 wheat line and cultivar on the basis of study traits in laboratory condition

Table 3. Mean, total mean deviation in cluster analysis for study traits in laboratory condition

Cluster	Statistical parameters	Root dry weight	seedling dry weight	Root length	seedling length	Root fresh weight	seedling fresh weight	Mean Daily Germination (MDG)	Germination Rate (RS)	Mean Time Germination (MTG)	Final Germination Percent (FGP)	Germination Rate Index (GRI)	Coefficient of Velocity of Germination (CVG)
Group 1	\bar{x}	0.004 ₆	0.0109	8.73	16.29	0.039	0.083	8.28	0.137	7.34	79.26	6.63	13.62
	$\bar{x}_h - \bar{x}_{..}$	0.000 ₄	0.002	0.72	2.34	0.003	0.011	0.46	0.002	-0.05	4.91	0.46	0.07
Group 2	\bar{x}	0.006	0.0113	11.03	14.83	0.049	0.086	8.52	0.143	6.96	79.09	8.33	14.37
	$\bar{x}_h - \bar{x}_{..}$	0.002	0.007	3.03	0.89	0.012	0.014	0.70	0.008	-0.43	4.74	2.16	0.82
Group 3	\bar{x}	0.004 ₅	0.0076	8.40	12.73	0.038	0.062	9.11	0.135	7.37	84.10	7.04	13.57
	$\bar{x}_h - \bar{x}_{..}$	0.000 ₃	-0.001	0.39	-1.21	-0.002	-0.011	1.29	-0.0004	-0.02	9.75	0.87	0.02
Group 4	\bar{x}	0.002 ₇	0.007	5.69	12.34	0.025	0.057	6.98	0.126	7.92	68.67	4.01	12.64
	$\bar{x}_h - \bar{x}_{..}$	-0.001	-0.002	-2.31	-1.59	-0.011	-0.014	-0.83	-0.009	0.52	-5.68	-2.17	-0.91
Group 5	\bar{x}	0.002 ₈	0.0083	5.09	12.47	0.026	0.065	5.26	0.132	7.46	52.59	3.91	13.42
	$\bar{x}_h - \bar{x}_{..}$	-0.001	-0.001	-2.91	-1.47	-0.011	-0.007	-2.56	-0.003	0.06	-21.75	-2.25	-0.13
Total mean		0.004	0.0092	8.01	13.94	0.036	0.071	7.82	0.135	7.39	74.35	6.17	13.55
F		**	**	**	**	**	**	**	**	**	**	**	**

CONCLUSION

The results showed that the was second group with lines 1, 2, 3, 5, 7, 13, 15, 25, 34, 38 and 43 among the five

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