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Study of Genetically Variation in Synthetic Genotypes of Wheat Resulted from Hybridizing Between Wheat and Corn Plants

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Abstract: Genetically variation is of the most important tool in plant breeding, so making and investigating of the variation in genotypes can be a factor of success in selection of favorable traits in crop randomized complete block design with three replications was conducted using the 96 double haploid genotypes of resulted from wheat and corn hybridation with embryo rescue along with the four local controls in Ardabil, Iran, in 2007 and 2008 cropping season. During the season, agricultural and morphological traits as well as yield and yield components were measured. It was cleared that there were significant differences between the genotypes were placed in the first group and low yielding ones placed in the second group, which can be used to attain the more heterosis by hibridation of the genotypes in the both groups. Highly yielding genotypes generally are derived from the corn father lines of CMH81, CMH82 different mother lines.

Key words: Agricultural traits, cluster, genetically variation, synthetic wheat yield, yield components, embryo

INTRODUCTION

Present genetically variation among the under study genotypes is a very important statistical method and the basic tool in plant breeding works (Moghaddam *et al*., 1997). Investigations of genetical variations have been conducted using the morphological traits (Moghaddam *et al*., 1997) and biochemical and genetical markers (Smale and McBride, 1997).

Recently, integrated method of these methods named Genetical Recowces Information (GRIS), a distinct and definite manner based on the overall pattern of genes relations, is used to evaluate the variations to among the genotypes (Manifesto *et al*., 2001).

Wheat is a plant feed by the majority of the people around the world. So, study of the genetically variations especially in synthetic genotypes is of the first important steps to breed for the high yield and quality as well as the source of the different resistances. Pecetti and Damania (1996) reported that among the traits such as yield components.

Moghaddam *et al*. (1997) studying the 7 wheat cultirars and 53 lines found the remarkable variations in growth aspects and other quantitative ones and expressed that the local cultivars had the longer period of time to spike appearance, had the higher height but were lower in number of grain per spike, 1000 grain weight, grain yield and harvest index than the newer ones and some of local cultivars were similar to newer ones in yield.

Belay *et al*. (1993) evaluated 60 tetraploid local wheat genotypes derived from the central heights of the Ethiopia along with the one commercial variety (Boohai) for the yield and some other aspects and stated that genetically variation among the genotypes for the mentioned aspects was very significant.

Tesemma *et al*. (1998) illustrated that among the breeded cultivars ready to release, there were some variations for traits such as yield components that may use to select. Synthetics wheat derived from hybridation between wheat as mother parent and corn as father parent via organ culture (embryo rescue) and increase in chromo some number using the chemical mutagen substances are of high yielding and rather favorable quality wheat, so this research was carried out to study the important agricultural traits and variation among the genotypes to select and transfer the favorable traits and classifications to the later hybridations.

The aim of this project was the evaluation of genetically variations among the synthetic wheat varieties as a result of wheat x corn hybridation in Ardabil, Iran.

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MATERIALS AND METHODS

In order to study genetically variation in wheat synthetic genotypes resulted from wheat x corn hybridation, an experiment based on randomized complete block design with three replications was carried out in agricultural research station of Islamic Azad University, Ardabil branch, Ardabil, Iran, during the 2007 and 2008 cropping year. Genotypes included 96 synthetic genotypes and 4 local genotypes (kaspard, kaskogen, MV_{17} and Bezostaya).

Seeds were sown on 6th November with a plant density of 350 plant m^{-2}. Each experimental plot included 10 rows each 6 m in 12 m^2. To study the variation, after the ripening of plants at the end of the growing season, whole plants of the plots were harvested and transferred to the laboratory to measure the traits such as: grain weight, number of fertile tillers, number of total tiller, number of internodes, plant height, peduncle length, awn length, number of grains per main spike, number of grains per spike let, grain weight in main spike, total grain weight in tiller, total plant dry weight and weight of main spike. Resulted data were subjected to analysis by SPSS procedure and means of treatments were compared using Duncan's multiple range test.

Then, resulted means were classified into the two group of high and low yielding genotypes by means of cluster method.

RESULTS AND DISCUSSION

Result of analysis of variance indicated that there were significant differences among the genotypes in the majority of traits. This illustrates the high potential of these genotypes to use them as the genetically source for breeding purposes.

Comparisons of means Table 1 showed that the most grain yield derived from 1, 4 and 81 genotypes, which had no significant differences with 64, 67, 62, 58, 32, 31, 28, 3, 2 and 71 genotypes. In these genotypes, higher yields pertained to the higher number of grain and higher grain weight, total grain weight in tillers and number of fertile tillers.

Existence of high genetically CV among the genotypes for the yield components indicates the variation caused by the synthetic hybridation between wheat and corn, however, this can be due to the effect of mutagen substances presented in the medium to rescue the embryo or duplication of number of chromosomes.

Table 1: The means of yield components in genotypes

Codes	No. of total tiller	Main spike length	No. of grains/main spike	Grain weight	Codes	No. of total tiller	Main spike length	No. of grains/main spike	Grain weight
1.00	3.7500	11.3000	49.8000	701.3000	50.00	7.6000	8.7000	50.5000	300.3000
2.00	2.5000	9.0000	39.7500	633.5000	51.00	3.8000	11.8000	67.0000	351.5000
3.00	5.0000	8.9000	31.8000	633.5000	52.00	3.2500	9.1500	66.0000	122.1000
4.00	3.6600	11.3700	47.2500	682.0000	53.00	2.4000	8.5000	37.7500	38.9000
5.00	5.2500	9.8700	34.7500	234.9000	54.00	6.6000	8.0000	31.7500	164.1000
6.00	4.0000	12.2000	44.4000	182.6000	55.00	6.0000	8.5000	50.3000	155.3000
7.00	3.6000	11.2000	52.8000	416.0000	56.00	3.0000	7.4400	53.0000	87.7000
8.00	2.6000	9.2000	44.8000	464.3000	57.00	4.0000	6.4000	25.2500	89.2000
9.00	3.0000	9.7500	35.7500	130.7000	58.00	3.7500	10.2500	63.2500	191.4000
10.00	3.8000	8.7000	50.6000	251.6000	59.00	5.2000	10.2000	69.6600	349.4000
11.00	5.6000	8.9000	40.0000	215.1000	60.00	6.4000	7.5600	36.5000	517.7000
12.00	3.4000	8.2600	46.4000	197.9000	61.00	8.4000	8.4200	39.8000	541.2000
13.00	4.0000	7.6000	25.0000	188.0000	62.00	8.8000	8.4600	43.4000	605.3000
14.00	4.5000	7.8000	21.0000	72.8000	63.00	5.0000	8.9000	32.8000	224.3000
15.00	5.4000	9.0000	18.2500	140.9000	64.00	3.8000	9.0000	51.2500	211.1000
16.00	4.0000	8.5600	24.8000	184.2000	65.00	4.4000	8.9000	41.2000	207.4000
17.00	3.4000	8.8000	23.8000	167.1000	66.00	3.2000	11.2000	93.0000	264.7000
18.00	2.6000	7.7000	13.2500	78.1000	67.00	5.4000	9.3600	33.2000	385.2000
19.00	3.6000	7.5000	13.6000	78.5000	68.00	7.8000	8.9000	29.0000	393.4000
20.00	3.8000	11.8000	55.0000	207.1000	69.00	5.6000	10.4000	51.2500	407.5000
21.00	2.6000	11.2000	40.0000	92.6000	70.00	3.7500	12.0000	64.0000	670.5000
22.00	10.7500	9.3000	10.3000	119.9000	71.00	6.0000	10.3000	47.8000	654.5000
23.00	7.6000	10.9000	19.6000	132.4000	72.00	6.6000	10.2000	61.8000	516.5000
24.00	3.8000	10.1000	52.0000	367.1000	73.00	9.4000	10.3200	65.7500	494.5000
25.00	7.4000	11.7600	78.3300	185.5000	74.00	6.4000	9.0000	48.2000	594.7000
26.00	4.8000	8.7000	32.7500	216.7000	75.00	9.0000	11.8000	56.7500	644.3000
27.00	2.0000	8.6000	44.0000	213.5000	76.00	8.8000	11.9000	47.5000	461.8000
28.00	3.8000	9.5000	33.8000	74.0000	77.00	9.0000	9.9400	39.0000	410.9000
29.00	3.6000	10.4000	55.5000	230.9000	78.00	7.4000	10.5000	67.0000	642.5000
30.00	6.4000	11.5000	50.6000	437.9000	79.00	11.0000	10.8000	45.8000	473.4000
31.00	2.7500	10.4600	26.7500	358.4000	80.00	4.4000	11.0600	73.7500	430.0000
32.00	2.6000	9.6000	50.0000	402.0000	81.00	5.2000	10.8000	52.0000	684.6000

Table 1: Continue

Codes	No. of total tiller	Main spike length	No. of grains/main spike	Grain weight	Codes	No. of total tiller	Main spike length	No. of grains/main spike	Grain weight
33.00	8.8000	9.6000	39.7500	322.8000	82.00	6.0000	9.7000	45.6000	419.9000
34.00	3.8000	11.3000	83.6000	420.2000	83.00	7.2000	10.6800	71.6700	569.4000
35.00	6.2500	11.1000	62.8000	666.7000	84.00	9.0000	9.8000	38.2000	203.0000
36.00	5.0000	10.6000	38.7500	394.2000	85.00	9.8000	9.8200	33.6600	406.7000
37.00	5.6000	10.8000	55.8000	455.4000	86.00	8.6000	10.4000	43.5000	634.9000
38.00	4.6000	10.6000	45.7500	630.8000	87.00	7.2500	12.0000	51.5000	386.3000
39.00	4.0000	10.2600	60.4000	670.1000	88.00	7.6000	8.6800	32.8000	378.1000
40.00	9.0000	8.8000	43.7500	486.5000	89.00	11.2500	10.0000	29.4000	401.1000
41.00	7.0000	9.5000	48.8000	624.2000	90.00	7.2000	13.1200	99.4000	282.9000
42.00	8.3300	7.4000	35.0000	560.4000	91.00	5.5000	11.8000	67.6000	287.4000
43.00	5.0000	7.4800	35.6000	572.7000	92.00	2.8000	10.0000	53.4000	208.7000
44.00	3.4000	9.0000	28.6000	392.7000	93.00	4.4000	10.8700	66.7500	278.4000
46.00	5.4000	9.8000	58.0000	310.1000	95.00	2.4000	7.6000	27.4000	117.1000
47.00	4.4000	10.2000	40.2500	211.1000	96.00	3.2000	6.8600	46.3300	79.6000
48.00	3.5000	9.2000	50.4000	362.2000	Total	5.3931	9.7335	46.0885	350.8542
49.00	4.2000	9.3000	43.4000	386.5000					

The most variation was belonged to the total weight of grain per tillers, grain weight and total plant weight (Table 2) that reveals the high potential of these genotypes in breeding plant.

These were significant differences in number of spikes, length of spikes and length of awns among the control genotypes but not in other traits. It is probably, because of the important of these genotypes for the yield component traits.

At present, there are little works performed on the study of genetically variation in the synthetic genotypes, however, Tesemma *et al*. (1998) have reported existence of the genetically variation for the morphological traits in wheat.

Classification of understudy genotypes for evaluation of similarity among the genotypes based on the 14 morphological and agricultural traits (Fig. 1) revealed that among the synthetic genotypes derived from the wheat and corn hybridation, two large clusters of these ones can be made.

The first and the second clusters included the two sub clusters. The first one contained the genotypes having the higher potentials than the other genotypes such as grain weight, grain number and the length of the spike.

In contrast, the second cluster included the genotypes with lowest grain weight and the highest number of tillers.

This indicates that we can use the hybridation among the genotypes of the two clusters to gain the most heterosis.

In general, it can be said that the hybridation method not only can be resulted in the high amounts of the variation, but may be led to the favorable traits even the highest yields, which is under the extensive researches.

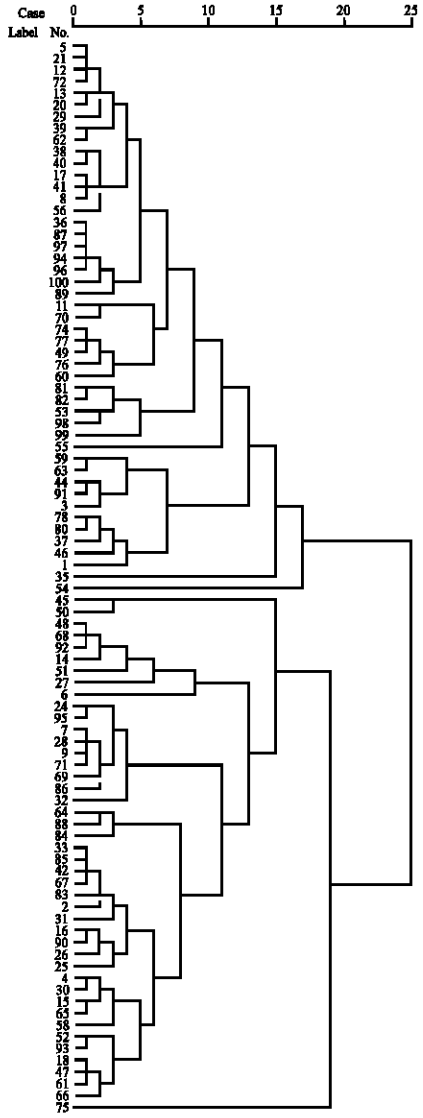

Fig 1: Dendrogram based on 14 agronomical treats among genotypes study

Table 2: Summary of means, range and SD of on measured treats in genotypes

Treats	Mean±SD	Range	Minimum	Maximum	CV
No. of total tiller	7.0761±3.0387	13.40	2.60	16.00	42.943
No. of total tiller	5.3931±2.2447	9.25	2.00	11.25	41.621
plant height	84.2090±11.1127	55.62	53.50	109.12	13.202
No. of internodes	4.9125±0.3199	2.00	4.00	6.00	6.511
Peduncle length	36.6948±4.9064	22.00	23.80	45.80	13.370
Awn length	6.7715±1.5252	11.00	0.50	11.50	22.523
Main spike length	9.7335±1.3716	6.72	6.40	13.12	14.091
No. of grains per main spike	46.0885±16.4985	89.10	10.30	99.40	35.797
No. of grains per spike let	3.4984±0.5767	2.80	2.20	5.00	16.484
Grain weight in main spike	2.3423±.8964	4.18	0.55	4.72	38.270
Total grain weight in tiller	9.0946±6.3178	47.70	0.56	48.26	69.464
Total plant dry weight	28.3988±14.2496	57.38	6.18	36.56	50.176
Weight of main spike	3.5212±1.38842	9.14	0.96	10.10	39.310
Grain weight	350.8542±187.9829	662.40	38.90	701.30	53.578

CONCLUSION

Among the evaluated genotypes, results showed that the most grain yield derived from 1, 4 and 81 genotypes, which had no significant differences with 64, 67, 62, 58, 32, 31, 28, 3, 2 and 71 genotypes. In these genotypes, higher yields pertained to the higher number of grain and higher grain weight, total grain weight in tillers and number of fertile tillers. In general, it can be said that the hybridation method not only can be resulted in the high amounts of the variation, but may be led to the favorable traits even the highest yields, which is under the extensive researches.

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