J. Agric. Sci. Mansoura Univ., 27 (7): 4371 - 4377, 2002

ESTIMATES OF GENETIC VARIABILITY FOR MAIN SPIKE CHARACTERS IN SOME GENOTYPES OF WHEAT

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ABSTRACT

In 45 F_5 and 10 parents of wheat were used to estimate some genetic variability for main spike characters. The parents were: Gemmeiza1, Gemmeiza3, Sakha 69, Sids 1, Giza 165, Sakha 8, Giza 163, Giza 162, Sakha 92 and Giza 164. The 45 F5 genotypes were introduced through diallel crosses mating design10x10. The studied characters were, heading date, spike length, number of grains/spike, 1000-grain weight and grain weight/spike. This investigation was conducted at Tag El-Ezz Research Station Dakahlia Governorate during 2000/2001 and 2001/2002 growing seasons. The results indicated that the cross Gemmeiza1x Giza 163 show earliness, longest of spike and highest of 1000-grain weigh while cross (Sids1xGiza 164) was the highest for number of grains/spike and grain weight/spike. Phenotypic and genotypic variances showed highest estimates concerning of all studied characters. Estimates of phenotypic and genetic advance indicated high values for heading date 1000 grain weight and grain weight/spike. Heritability in broad sense was high for these characters; it was 95.29% for heading date, 94.56% for 1000-grain weight and 94.31% for grain weight/spike. The phenotypic correlation coefficients cleared that there was highly significant and positive correlation between grain weight/spike and remaining characters, except 1000-grain weight whereas it was highly significant and negatively between 1000-grain weight and both spike length and number of grains/spike.

INTRODUCTION

Main spike yield is highly heritable character and indirectly contributes to yield with appreciable amount, such high potential of genetic variability encourage breeders for more effect and further information to be obtain. Genotypic and phenotypic variabilities; heritability, genetic advance and phenotypic correlation were studied to investigate the nature inheritance of spike length. Wong and Baker 1986, Bruckner and Frohberg 1987, Nachit 1990, Abid and Shahid 1991, Abd El-Moneim (1993), and Eissa *et al.* (1994). Variability / ear and ear weight was high and significant heritability in broad sense was found by Mark *et al.* (1988). Singh *et al.*, 1985 found that additive genetic variance was the prevailed type controlled heading date and spike length. However, Sharma *et al.* 1986 and Alkaddoussi and Eissa 1989 found that the additive genetic variance controlled the inheritance of grain weight/ spike. Positive correlation were found between number of grains/ear and ear weight.

Thakur *et al.* 1999 showed that the highest of genetic coefficient of variations, heritability values and genetic advance for ear length were detected.

MATERIALS AND METHODS

At Tag El-Ezz Research Stations Dakhlia Governorate, 10 wheat genotyps and 45 F_5 families obtained by diallel crosses excluding reciprocal were sown during 2000-2001 and 2001-2002 growing seasons. These genotypes were, Gemmeiza1, Gemmeiza3, Sakha 69, Sids1, Giza 165, Sakha8, Giza 163, Giza 162, Sakha 92 and Giza 164 and the pedigree are showing in Table 1.

Table (1): Description of the studied parental wheat genotypes

Serial Number	Genotype	Pedigree
1	Gemmeiza 1	Haya 74 / on / 11 / 60. 147 / 3 / Bb / Gall / 4 /Chat "S"
2	Gemmeiza 3	Bb / 7c * 2 // Y50E / Kal * 3 x Sakha 8 / 4 / PRV / WW15 / 3 / BJ "S" // on * 3 / Bon.
3	Sakha 69	Inia / RL 4220 // 7C / Yr "S"
4	Sids 1	HD2171 / Pavan "S" // 52.57 / Maya 74 "S"
5	Giza 165	Cno / Mfd1 / Man "S"
6	Sakha 8	Indus / Nortano "S"
7	Giza 163	*T. aestivum* / Bon // Cno / 7c
8	Giza 162	V cm // Cno 67 / 7c / 3 / Kal / Bb
9	Sakha 92	Napo 63 / Inia 66 // Wern "S"
10	Giza 164	Kvz / Buha "S" // Kal / Bb

Sowing date was 15th of November in both two growing seasons. A randomized complete blocks design with three replications were used. Each plot was 2x2 m. having 10 rows spaced 20 cm a part, plant to plant spaced 10 cm. The optimum agricultural practices were performed. Data were recorded on 30 guarded plant in each genotypes for the following characters: heading date (day), spike length (cm) number of grains/spike, 1000 grain weight (gm) and grain weight/spike (gm).

A combined analysis of variances and covariances for both growing seasons and genotypes as fixed variable (Le Clerg *et al.*, 1966) showed the genotypic and phenotypic variances (s^2_g and s^2_{ph}) were calculated from the combined analysis. genotypic and phenotypic coefficients were calculated according to Burton (1951) as follows:

$$G.C.V = \frac{\sqrt{\sigma^2_g}}{x} \times 100$$

$$P.C.V = \frac{\sqrt{\sigma^2_{ph}}}{x} \times 100$$

Broad sense heritability (H) was calculated according to (Hanson 1963). The expected genetic advance under selection [G_s] as outlined by Johnson *et al.* (1966), genetic advance percentage (G_s%) and phenotypic

correlation coefficient between studied characters were estimated as described by Steel and Torrie (1980).

RESULTS AND DISCUSSION

The stand point of any statistical is to study the mean performance of families (First degree statistics). Since other statistics (second and third degrees) are derived from the means. The relationship between mean and variance that exist for higher degree statistics (second and third degrees).

Mean performance

Results in biased estimates for the parameters calculated (Mather and Jinks, 1982). In the present study the mean values for main spike grain weight and related characters as affected by 55 wheat genotypes combined over two successive growing seasons of 2000-2001 and 2001-2002 are presented in Table (2). The results of all studied characters were differed significantly when tested.

The results revealed that there were a wide ranges in the studied characters. The overall averages of the ranges were 16.8, 6.9, 37.8, 13.19 and 1.69 for heading date, spike length; number of grains/spike, 1000-grain weight and grain weight/spike, respectively. Similar results were found by Abd El-Monim (1993). The highest values recorded in Sakha 8 x Giza 162 (98.2) for heading date, Cemmeiza1x Giza 163 (16.2) for spike length, Sids1x Giza 164 (79.4) for number of grains/spike, Gemmeiza1x Giza 163 (53.71) for 1000-grain weight and Gemmeiza 3 x Sakha 69 (3.73) for grain weight/spike.

On the other hand, the lowest values are record at Gemmeiza 1x Giza 163 (81.4) for heading date, Sakha 8 (9.3) for spike length, Giza 162x Giza 164 (41.6) for number of grains/spike; Giza 163 (40.52) for 1000-grain weight and Sakha 8 (2.04) for grain weight/spike.

Genetic parameters

The estimates of phenotypic and genotypic variances as well as environmental variance for studied characters are presented in Table (3). The results revealed that the highest value of phenotypic variance and environmental obtained for number of grains/spike, similar results were recorded by Nachit (1990) and , Mark *et al.* (1988), while for the remaining characters the values of genotypic and phenotypic variation are low.

The estimates of phenotypic coefficient of variation (P.C.V.) and genotypic coefficient of variation (G.C.V) shown in Table (4). The results indicated that values of P.C.V. and G.C.V. were 20.38 and 19.22 for grain weight/spike respectively.

Percentage heritabilities in broad sense were 95.29, 89.86, 51.84, 94.58 and 94.31for heading date, spike length, number of grains/spike, 1000-grain weight and grain weight/spike respectively. The high values of heritability was found by Nachit (1990). Abid and Shahid (1991), Eissa *et al.* (1994) and Mark *et al.* (1988) for these characters.

Table (2): The mean Performances for main Spike characteristics in studied wheat genotypes (Combined analysis over both 2000/2001 and 2001/2002 seasons)

genotypes	Heading date(day)	Spike Length (cm)	Number of grains / spike	1000 grain (g)	Grain weight / spike (g)
1x2	85.2	15.7	60.0	49.83	3.21
3	84.6	14.2	62.0	46.22	2.99
4	84.8	16.2	64.0	47.71	3.10
5	83.4	14.2	59.1	46.82	2.76
6	82.2	15.3	63.6	51.66	3.40
7	81.4	16.2	68.5	53.71	3.60
8	81.5	15.0	61.4	52.41	3.59
9	85.6	14.0	66.6	52.77	3.51
10	88.4	13.2	70.2	52.36	3.61
2x3	89.8	14.1	71.4	52.81	3.73
4	88.8	14.1	62.2	53.40	3.32
5	92.5	14.2	64.1	51.81	3.31
6	94.2	15.3	65.2	53.66	3.48
7	96.1	15.2	63.3	50.90	3.15
8	92.2	13.4	62.4	50.31	3.10
9	98.3	13.2	58.7	51.00	2.99
10	84.2	13.2	54.8	48.71	2.77
3x4	85.1	14.3	53.8	47.39	2.58
5	94.4	12.2	55.7	48.44	2.90
6	92.2	14.3	54.6	45.32	2.58
7	91.4	13.4	58.6	43.61	2.56
8	91.6	13.8	57.7	45.82	2.64
9	92.2	12.2	61.6	48.31	2.94
10	94.4	13.4	64.7	49.85	3.22
4x5	95.6	14.4	62.8	44.31	2.78
6	82.9	15.0	68.8	48.31	3.32
7	88.2	15.3	51.0	46.46	3.36
8	84.3	16.2	70.0	48.92	3.42
4x9	87.4	16.1	65.3	47.38	3.08
10	88.1	16.1	79.4	48.54	2.76
5x6	84.2	14.2	71.1	44.63	3.12
7	85.2	13.2	63.0	43.12	2.73
8	88.4	13.9	58.0	45.32	2.61
9	87.0	12.2	52.0	46.71	2.39
10	92.0	12.3	51.4	48.22	2.44
6x7	91.1	13.4	53.3	47.31	2.49
8	98.2	12.6	49.2	44.65	2.15
9	97.3	12.4	49.9	48.74	2.35
10	94.1	12.9	44.2	47.92	2.20
7x8	94.2	13.6	53.3	46.39	2.55
9	95.3	13.4	52.2	45.34	2.62
10	94.1	12.1	51.4	45.26	2.72
8x9	92.2	12.2	58.2	44.37	2.66
10	94.2	11.1	41.6	44.38	2.04
9x10	93.3	12.2	51.2	43.61	2.25
Parents					
(1) Gemmeiza1	88.2	14.6	62.3	50.22	3.24
(2) Gemmeiza 3	87.4	13.7	64.4	51.41	3.29
(3) Sakha 69	92.2	12.2	57.2	46.22	2.64
(4) Sids 1	94.2	15.4	65.6	49.28	3.22
(5) Giza 165	94.5	13.1	54.2	46.82	2.54
(6) Sakha 8	93.0	9.3	49.1	41.31	2.04
(7) Giza 163	82.2	11.4	56.3	40.52	2.29
(8) Giza 162	84.0	11.2	53.2	42.43	2.26
(9) Sakha 92	90.4	12.4	52.1	44.72	2.32
(10) Giza 164	95.3	12.0	45.0	45.38	2.50
Mean	89.87	13.65	59.09	47.72	2.88
C.V. %	5.28	10.91	12.57	6.83	16.30

Table (3): Phenotypic, genotypic and environmental variances for main spike characters in wheat genotypes over 2000/2001 and 2001/2002 seasons

Source of variance	Heading date (Day)	Spike length (cm)	Number of grains/ spike	1000-grain weight (g)	Grain weight / spike (g)
Phenotypic	178.31	68.49	89.52	18.66	1.82
Genotypic	169.92	61.55	46.41	17.48	1.77
Environment	5.63	3.24	25.62	1.20	0.03

The results of the genetic advance under selection G_3 in Table 4 showed that these characters have more chance for wheat yield development among the genotypes were used. Heading date was 26.21, spike length 15.32, number of grains/spike 10.10, 1000-grain weight 8.41 and 2.62 for grain weight/spike, high value of genetic advance are recorded by Nachit (1990), Mark *et al.* (1988) and Thakur *et al.* (1999).

Table (4): Phenotypic coefficient of variation (P.C.V), genotypic coefficient of variation (G. C. V), heritability (H%), genetic advance under selection (G3) and genetic advance as % of general mean (G3%) of main spike characters in wheat over 2000/2001 and 2001/2002 seasons

Source of variance	Heading date (Day)	Spike length (cm)	Number of grains/ spike	1000-grain weight (g)	Grain weight / spike (g)
P.C.V	18.34	10.22	13.61	15.88	20.38
G.C.V	17.93	9.92	12.00	14.80	19.22
H%	95.29	89.86	51.84	94.58	94.31
G3	26.21	15.32	10.10	8.41	2.62
G3%of X	36.00	18.92	14.53	30.94	39.59

It could be concluded that heading date and grain weight/spike were more important characters in wheat breeding programs and it could be used these traits for improving wheat grain yield.

The values of phenotypic correlation coefficient among pairs of studied characters are cleared in Table (5). The results showed that there were highly significant correlation and positive correlation between grain weight/spike and the other studied traits except 1000-grain weight, number of grains/spike and both heading date, spike length and 1000-grain weight with heading date.

On the other hand correlation coefficient between 1000-grain weight and each of spike length and number of grains/spike was negative and highly significant as well as spike length with heading date.

Table (5): Phenotypic correlation coefficients between main spike characters over 2000/2001 and 2001/2002 seasons

Characters	Spike length (cm)	Number of grains/ spike	1000-grain weight (g)	Grain weight / spike (g)
Heading date (Day)	- 0.231**	0.312**	0.612**	0.524**
Spike length (cm)		0.841**	-0.232**	0.463**
Number of grains/ spike			-0.837**	0.342**
1000-grain weight (g)				0.161
Grain weight / spike (g)				

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تقدير الاختلافات الوراثية لصفات السنبلة الرئيسية لبعض التراكيب الوراثية في القمح

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أجري هذا البحث بمحطة البحوث الزراعية بتاج العز دقهلية وذلك بهدف دراسة الاختلافات الوراثية لصفات السنبلة الرئيسية في القمح لعشرة من التراكيب الوراثية والجيل الخامس الناتج من التهجين بين هذه التراكيب وتم زراعة جميع التراكيب الوراثية في موسمي للزراعة ٢٠٠٠-٢٠٠١ ، ٢٠٠١-٢٠٠٢ وكانت النتائج المتحصل عليها هي:

١- أظهرت النتائج اختلافات معنوية بين التراكيب الوراثية المستخدمة في الصفات تحت الدراسة.

٢- وجد أن الهجين جميزة١ × جيزة ١٦٣ أفضل الهجن من حيث التبكير في الطرد وطول السنبلة ووزن الألف حبة وكذلك أظهر الهجين (سدس١ × جيزة ١٦٠) أفضل الهجن من حيث عدد حبوب السنبلة ووزن حبوب السنبلة الرئيسية.

٣- اختلفت باقي التراكيب الوراثية في الصفات من حيث الارتفاع والانخفاض في المتوسط العام.

٤- أظهرت جميع الصفات المدروسة قيم مرتفعة للتباين المظهري الوراثي.

٥- وجد أعلى قيم في معاملات الاختلاف المظهري الوراثي وكذلك معامل التوريث بالمعنى الواسع ونسبة التحسين الوراثي المتوقع لصفة ميعاد طرد السنابل ووزن الألف حبة ووزن حبوب السنبلة.

٦- وجد ارتباط مظهري موجب بين وزن حبوب السنبلة وباقي الصفات ما عدا صفة وزن الألف حبة بينما كان الارتباط سالب ومعنوي بين وزن الالف حبة وكلا من طول السنبلة وعدد حبوب السنبلة.

يتضح من النتائج السابقة أنه يمكن استخدام بعض التراكيب الوراثية السابقة في برامج تحسين القمح وزيادة كمية المحصول.