(3)　　　　　　(2)　　　　　　(1)

2005/2004 2004/2003

( )

(Line×Tester)　　×　　　　( )

(GCA)

(SCA)

_1000

.

.

.Lignee1335 **7** Tipper.. :

× A5468 Melusine × **7** Tipper × **7** :

.Melusine × A5468 Tipper.

:

.

.	30621 : .	(2) 　　　 (1)
.	113 : .	(3)

189

Study of Genetic Behavior of Grain Yield and its Components in Barley Crosses

M. Katkout [1], H. Kayyal[2] , and A. Ghneim[3]

ABSTRACT

This study was carried out in cooperation between the Faculty of Agriculture, Damascus University and the General Commission for Scientific Agricultural Research (GCSAR) in Karahta station of field crops researches during two growing seasons (2003-04 & 2004-05).

Four local improved barley lines and cultivars (female parents) were crossed with five exotic lines and cultivars (male parents) using line × tester method. The crosses were grown along with their parents in a randomized complete block design (RCBD) with three replications to estimate general combining ability (GCA), specific combining ability(SCA) and both mid and high parent heterosis for number of spikes per plant, number of grains per spike, thousand kernel weight, and grain yield per plant.

The results indicated that both additive and non-additive types of gene action were involved in the inheritance of traits under study, with preponderance of non-additive gene effects for number of spikes per plant, number of grains per spike and the dominance of these effects particularly for grain yield per plant. For the number of grains per spike, both additive and non-additive gene effects were involved in equal proportion in the control of this trait.

High general combiners for grain yield and its components were obtained with the best parents Tipper, Furat7 and Lignee1335, this suggests these lines to be used as important parents in barley hybridization program because of their ability to transmit their characteristics to their progenies.

Many positive specific combiners, having both mid and high parent heterosis and derived from positive general combiners, were obtained such as Furat7 × Tipper, Furat7 × Melusine, A5468 × Tipper, and A5468 × Melusine. These crosses are important combinations for selection in subsequent generations to reach distinct barley lines for grain yield.

Key Words: Hybridization, General combining ability, Specific combining ability, Heterosis, Grain yield and its components.

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(*Hordeum Vulgare* L.)

(1947 FAO)

(2002 FAO) 140 50

% 28 % 67

%5 .(2002 Ullrich)

( )

Fischbech)

.(2002

/ 5 (350)

/ 1500

/ 650 (250 – 200)

.(2005 Nabulsi Arabi)

1.3 5

.(2005 FAO)

( )

. 300

15.4

.(2002) 1.3 1.03

.(2001) 3000

(Kashif   Khaliq   2003).

(Singh   1999).

(Additive effects)
(Non_ Additive effects)
Nasr 1968 Lambert Smith 1967 Rasmusson Updhayaya)
(1972.

(heterosis)   F1

F2   Vavdinoudi)
Sotiriou 1999).

(heterotic combinations)   :
(General Combining Ability GCA)
(Specific Combining Ability SCA)

(Semagn 1999).

Haussmann)
(1999.

192

Singh) (1998 Chowdhry)

(1999 .

Jiang (1998)

.

(Line × tester) ×
.(1999 Semagn)

.(1997 Djakoune Bouzerzour)

Grausgruber (2002)

1000_

.

.(2003 Khaliq Kashif)

.

(2005/2004 2004/2003)
30
(633 159)
–
(GCSAR) .
(2003/12/24 12/3) (2004 –2003)
1 275 / ^{2}

193

(Line×Tester)

(Lines) :

:7 -

.

. :A5473 -

: -

.

. :A5468 -

(Testers)

(ICARDA) :

Tipper//ER/Apm -

Melusine/Aleli/3/Matic/Jet//Shyri/4/Canela -

. Furat 2 (WI2355) -

Lignee1335 -

Harmal -

20 F1 (2005 –2004)

2 30

15 .

/

/ /

-1000

.

(Line × Tester)

(RCBD) (1957 Kempthorn)

Genestat.

(RCBD)

(GCA)

(SCA) GCA SCA (Line × Tester

(within RCBD :

- ‫‬   :(Lines)

$$Gi = (Xi… / T.R) – (X… / L.T.R)$$

- ‫‬   :(Testers)

$$Gj = (Xj… / L.R) – (X… / L.T.R)$$

Gi: i . Xi: .

X: Gj: t .

Xj: L: .

T: R: .

- ‫‬   :

$$Sid = (Xij… / R) – (Xi… / T.R) – (Xj… / L.R) + (X… / L.T.R)$$

Sid: i j .

Xij: .

.(1985 Chowdhary Singh)

‫‬   :

$$\text{Mid Parent Heterosis} = (MF1 – MP) / MP * 100$$

$$\text{High Parent Heterosis} = (MF1 – HP) / HP * 100$$

$MF1$: $F1$.

MP: .

HP: .

(1975 Kahana Sinha)

(1)   (   )

/   /   _1000

/   .

195

(1) .

/ ( )	_1000 ( )	/	/		
39.17	47.04	25.67	47.33	A5473	1
30.64	43.4	26.13	45.53	Furat7	2
36.94	46.04	23.53	41.07	A5468	3
29.91	50.04	23.67	41.47	A.Muhassan	4
39.43	46.19	28.43	37.67	Tipper…	5
34.46	55.44	26.8	34.6	Melusine…	6
39.79	50.72	26.3	40.33	Furat2	7
39.57	48.62	28.73	36.07	Lignee1335	8
43.66	48.15	24.67	44.8	Harmal	9
38.9	50.29	29	38.13	A5473 ×Tipper…	10
39.56	52.40	28.3	39.33	A5473 ×Melusine	11
38.32	50.38	24.4	40.47	A5473 ×Furat2	12
43.3	50.31	28.43	42.2	A5473 ×Lignee1335	13
39.48	49.83	26.87	43.6	A5473 ×Harmal	14
48.76	51.88	28.8	48.2	Furat7 ×Tipper…	15
49.83	53.52	30	41.27	Furat7 ×Melusine...	16
36.48	49.07	26.97	48.87	Furat7 ×Furat2	17
45.12	53.03	29.07	41.2	Furat7 ×Lignee1335	18
38.55	49.63	27.03	40.8	Furat7 ×Harmal	19
47.54	49.04	30	44.07	A5468 ×Tipper…	20
50.07	54.06	29.03	42	A5468 ×Melusine…	21
36.84	53.55	26.83	39.07	A5468 ×Furat2	22
39.82	53.52	27.53	37.47	A5468 ×Lignee1335	23
30.84	48.98	25.8	35.6	A5468 ×Harmal	24
45.40	51.36	27.5	48.47	A.Muhassan ×Tipper..	25
21.4	46.67	25.67	30.2	A.Muhassan × Melusine..	26
36.14	49.35	24.93	39	A.Muhassan ×Furat2	27
46.28	55	28.23	42.53	A.Muhassan×Lignee1335	28
30.89	51.71	23.4	38.2	A.Muhassan ×Harmal	29
4.396	1.244	0.777	3.054	SE Mean	
12.453	3.524	2.202	8.651	LSD at 0.05	
19.417	4.282	4.994	12.894	CV %	

(2)

(SCA)

0.36   8.38   (GCA)

(Non _ Additive gene action)

Djakoune   Bouzerzour   .

Javaid (1999)   Singh   (1997)

.   (2001)

(2)

/	**_1000**	/	/	
0.63	- 0.05	0.21	0.18	**GCA**
25.80	3.71	0.40	8.38	**SCA**
1.25	- 0.10	0.41	0.36	
25.80	3.71	0.40	8.38	

/   Tipper   **(3)**

3.68

(2   7   ,Tipper)

.   GCA   3.68   0.82

.   /   **(3)**

%		SCA (ij)	GCA (j)	GCA (i)		
HHP	**HMP**					
-19.44	-10.28	-6.30	3.68	-0.29	A5473 ×Tipper…	1
-16.90	-4	1.42	-2.83	-0.29	A5473 ×Melusine..	2
-14.49	-7.67	-1.10	0.82	-0.29	A5473 ×Furat2	3
-10.84	1.2	1.64	-0.18	-0.29	A5473 ×Lignee1335	4
-7.88	-5.36	4.34	-1.48	-0.29	A5473 ×Harmal	5
5.86	15.87	0.45	3.68	3.03	Furat7 ×Tipper…	6
-9.36	2.99	0.03	-2.83	3.03	Furat7 ×Melusine...	7
7.34	13.84	3.98	0.82	3.03	Furat7 ×Furat2	8
-9.51	0.98	-2.68	-0.18	3.03	Furat7 ×Lignee1335	9
-10.39	-9.67	-1.78	-1.48	3.03	Furat7 ×Harmal	10
7.30	11.94	0.74	3.68	- 1.39	A5468 ×Tipper…	11
2.26	10.99	5.19	-2.83	- 1.39	A5468 ×Melusine…	12
-4.87	-4	-1.39	0.82	- 1.39	A5468 ×Furat2	13
-8.77	-2.85	-1.99	-0.18	- 1.39	A5468 ×Lignee1335	14
-20.54	-17.09	-2.56	-1.48	- 1.39	A5468 ×Harmal	15
16.88	22.49	5.10	3.68	- 1.35	A.Muhassan ×Tipper..	16
-27.18	-20.61	-6.65	-2.83	- 1.35	A.Muhassan× Melusine..	17
-5.96	-4.65	-1.50	0.82	- 1.35	A.Muhassan ×Furat2	18
2.56	9.7	3.04	-0.18	- 1.35	A.Muhassan×Lignee1335	19
-14.73	-11.45	0.00	-1.48	- 1.35	A.Muhassan ×Harmal	20
		3.05	1.53	1.37	St. Error	

Melusine.. × A5468   (3)
SCA   (5.19)
5.19   0.03

×

×

.   ×

Tipper.. ×
(%16.88   22.49)

(%22.49 _ 0.98)
.(3   ) (%16.88 _ 2.26)
(2)
(0.40) (SCA)
0.41   (0.21) (GCA)
0.40

Vimal 1997 Djakoune   Bouzerzour)
(2000 Konak Yilmaz   1999 Vishwakarama

(2003 Khaliq   Kashif)
Tipper..   (4)
1.43
Tipper.. :
A5473 A5468 Melusine.. Lignee1335 7
.   GCA   1.43   0.01

/   (4)

%		SCA (ij)	GCA (j)	GCA (i)		
HHP	HMP					
2	7.21	0.16	1.43	0.01	A5473 ×Tipper…	1
5.6	7.85	0.04	0.86	0.01	A5473 ×Melusine..	2
-7.22	-6.12	-1.39	-1.61	0.01	A5473 ×Furat2	3
-1.04	4.52	0.11	0.93	0.01	A5473 ×Lignee1335	4
4.67	6.75	1.08	-1.61	0.01	A5473 ×Harmal	5
1.30	5.57	-1.01	1.43	0.98	Furat7 ×Tipper…	6
11.94	13.33	0.77	0.86	0.98	Furat7 ×Melusine...	7
2.55	2.86	0.20	-1.61	0.98	Furat7 ×Furat2	8
1.18	5.98	-0.23	0.93	0.98	Furat7 ×Lignee1335	9
3.44	6.42	0.27	-1.61	0.98	Furat7 ×Harmal	10
5.52	15.47	0.72	1.43	0.45	A5468 ×Tipper…	11
8.32	15.34	0.33	0.86	0.45	A5468 ×Melusine…	12
2.02	7.66	0.60	-1.61	0.45	A5468 ×Furat2	13
-4.18	5.36	-1.23	0.93	0.45	A5468 ×Lignee1335	14
4.58	7.05	-0.42	-1.61	0.45	A5468 ×Harmal	15
-3.27	5.57	0.12	1.43	-1.44	A.Muhassan ×Tipper..	16
-4.22	1.70	-1.14	0.86	-1.44	A.Muhassan× Melusine..	17
-5.21	-0.24	0.59	-1.61	-1.44	A.Muhassan ×Furat2	18
-1.74	7.75	1.36	0.93	-1.44	A.Muhassan×Lignee1335	19
-5.15	-3.19	-0.93	-1.61	-1.44	A.Muhassan ×Harmal	20
		0.78	0.39	0.35	St. Error	

Lignee1335 ×   (4)

1.36

13

SCA   1.36   0.04

×

×

.   ×

Melusine.. × 7   Tipper.. × A5468

(%11.94   15.47)

(% 15.47 _ 1.7)

_ 1.18)

.(4   ) (% 11.94

(2)   _ 1000

(GCA)   3.71

- 0.10

Vimal Vishwakarama (1999) Yilmaz Konak (2000)

Singh (1999) Kashif Khaliq (2003)

.

(5)   Lignee1335

1000_

1.78   1.78   0.25   :

Lignee1335 A5468 ..Melusine   7.

(5)

1000_ .

الرقم	الهجين	GCA (i) للأب الأول	GCA (j) للأب الثاني	SCA (ij) للهجين	قوة الهجين %	
					HMP	HHP
1	A5473 ×Tipper…	-0.54	-0.54	0.19	7.87	6.91
2	A5473 ×Melusine..	-0.54	0.48	1.28	2.26	-5.48
3	A5473 ×Furat2	-0.54	-0.59	0.33	3.07	-0.67
4	A5473 ×Lignee1335	-0.54	1.78	-2.12	5.19	3.48
5	A5473 ×Harmal	-0.54	-1.14	0.33	4.68	3.49
6	Furat7 ×Tipper…	0.25	-0.54	0.99	15.80	12.32
7	Furat7 ×Melusine...	0.25	0.48	1.61	8.3	-3.46
8	Furat7 ×Furat2	0.25	-0.59	-1.76	4.27	-3.25
9	Furat7 ×Lignee1335	0.25	1.78	-0.18	15.26	9.07
10	Furat7 ×Harmal	0.25	-1.14	-0.66	8.41	3.07
11	A5468 ×Tipper…	0.65	-0.54	-2.25	6.33	6.17
12	A5468 ×Melusine…	0.65	0.48	1.74	6.54	-2.49
13	A5468 ×Furat2	0.65	-0.59	2.31	10.69	5.58
14	A5468 ×Lignee1335	0.65	1.78	-0.10	13.08	10.08
15	A5468 ×Harmal	0.65	-1.14	-1.71	3.99	1.72
16	A.Muhassan ×Tipper..	-0.36	-0.54	1.08	6.73	2.64
17	A.Muhassan× Melusine..	-0.36	0.48	-4.63	-11.51	-15.82
18	A.Muhassan ×Furat2	-0.36	-0.59	-0.87	-2.04	-2.70
19	A.Muhassan×Lignee1335	-0.36	1.78	2.39	11.49	9.91
20	A.Muhassan ×Harmal	-0.36	-1.14	2.03	5.32	3.34
	St. Error	0.56	0.62	1.24		

Lignee1335 ×   (5)
2.39

2.39 0.19   SCA
×

×

.   ×

Tipper.. × 7

(%12.32 15.80)

(% 15.80 _ 2.26)

.(5   ) (% 12.32 _ 1.72)

(2)

(GCA)

1.25   25.80

Djakoune Bouzerzour (2000) Budak

Singh   (2005) Barriga Rivas (1997)

.   (2003) Khaliq Kashif (1999)

Tipper   (6)

4.97

A5468 Lignee1335 7   Tipper :   (GCA)

4.97 0.04   Melusine

.GCA

Melusine.. × A5468   (6)

9.01

9.01 0.04   SCA

×

×

.   ×

201

.   /   (6)

%		SCA (ij)	GCA (j)	GCA (i)		
HHP	HMP					
-1.34	-1.02	-5.99	4.97	-0.26	A5473 ×Tipper…	1
1	7.44	-0.39	0.04	-0.26	A5473 ×Melusine..	2
-3.69	-2.94	1.64	-3.23	-0.26	A5473 ×Furat2	3
9.43	9.98	-0.06	3.45	-0.26	A5473 ×Lignee1335	4
-9.57	-4.68	4.80	-5.24	-0.26	A5473 ×Harmal	5
23.66	39.16	0.04	4.97	3.57	Furat7 ×Tipper…	6
44.60	53.09	6.04	0.04	3.57	Furat7 ×Melusine...	7
-8.32	3.58	-4.04	-3.23	3.57	Furat7 ×Furat2	8
14.03	28.51	-2.08	3.45	3.57	Furat7 ×Lignee1335	9
-11.70	3.77	0.04	-5.24	3.57	Furat7 ×Harmal	10
20.57	24.48	1.54	4.97	0.84	A5468 ×Tipper…	11
35.54	40.25	9.01	0.04	0.84	A5468 ×Melusine…	12
-7.41	-3.99	-0.95	-3.23	0.84	A5468 ×Furat2	13
0.63	4.08	-4.66	3.45	0.84	A5468 ×Lignee1335	14
-29.36	-23.47	-4.94	-5.24	0.84	A5468 ×Harmal	15
15.14	30.95	4.41	4.97	-4.15	A.Muhassan ×Tipper..	16
-37.9	-33.52	-14.66	0.04	-4.15	A.Muhassan× Melusine..	17
-9.17	3.70	3.35	-3.23	-4.15	A.Muhassan ×Furat2	18
16.96	33.22	6.80	3.45	-4.15	A.Muhassan×Lignee1335	19
-29.25	-16.04	0.11	-5.24	-4.15	A.Muhassan ×Harmal	20
		4.40	2.20	1.97	St. Error	

Melusine.. × 7

(44.6   53.09)

(% 53.09_3.58)

.(6   ) (% 44.6 _ 0.63)

×

(1956) Griffing

:

Tipper // ER / Apm

GCA   7
Lignee1335   _1000
                                    _1000   GCA
.

×

.(2004   )
F1   SCA   GCA

:
.   2   × 7   Tipper.. × 7   -
A5473 Melusine.. ×A5468 Tipper..×A5468 Melusine..× 7   -
        Melusine..×A5473 Lignee1335×A5473 Tipper..×
                                    .

.   _1000   Melusine..× 7   Melusine..× A5468 -
×A5468 Tipper..× A5468 Melusine..×7   Tipper..× 7   -
                    .   Melusine..

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