

**PERFORMANCE of FABA BEAN PARENTS and
HYBRIDS GROWN UNDER FREE and *Orobanche*
INFESTATION and MOLECULAR
CHARACTERIZATION of *O. crenata***

By

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B.Sc. Agric. Sci. (Agronomy), Fac. Agric., Ain Shams Univ., 2003

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ABSTRACT

The field experiments of the present study were carried out at Giza and Sids Research Station, Agricultural Research Center (ARC), Egypt during 2011/2012, 2012/2013 and 2013/2014 seasons. Six diverse faba bean (*Vicia faba* L.) varieties were used in a diallel mating design including reciprocals. In 2011/2012 season all possible crosses of diallel including reciprocals among the six faba bean parents were made after hand emasculation and pollination, under insect free cages. In 2012/2013 season, hybrid seeds and the six faba bean parents were sown under the insect free cage at Giza Research Station to produce F₂ seeds and re-hybridization was made to increase F₁ seeds. In 2013/2014 season, parents, F₁'s and F₂'s were evaluated under both natural heavy *Orobanche* infested soils at Giza and under free fields at Giza and Sids in randomized complete block design with 3 replicates. Results showed significant differences among parents, F₁'s and F₂'s for all studied traits and these differences may be mainly due to the genetic diversity of the parents. The parents and their crosses would be interesting and prospective for improving seed yield and its components in faba bean. Based on the two estimates of heterotic effects (over mid and better parent), 6, 10, 14, 28, 27, 25 and 8 crosses exhibited significantly positive heterotic effects for days to flowering, plant height, number of branches/plant, number of pods/plant, number of seeds/plant, seed yield/plant and 100-seed weight, respectively. The parental genotype Misr3 was a good general combiner for days to flowering and number of pods/plant in F₁, and for number of seeds/plant and seed yield/plant in F₁ and F₂ generations. On the other hand, the parental genotype Cairo 25 was a good combiner for days to flowering, plant height, number of pods/plant, number of seeds/plant and seed yield/plant in F₁ and F₂ generations. Parent Nubaria 1 was good combiner for 100-seed weight in F₁ and F₂ generations. The cross (Cairo 5 x Misr 3) had significant or highly significant positive SCA effects in both F₁ and F₂ generations for number of pods/plant, number of seeds/plant, seed yield/plant and 100-seed weight. Reciprocal-cross differences occurred frequently in the F₁ and F₂ generations. Inbreeding gain was found in some F₂ materials and selection may be practiced to secure transgressive segregates with higher yield and heavier seed index. This research revealed the existence of wide genetic variation among *Orobanche crenata* plants from Egypt collected from faba bean naturally infested field. ISSR markers were suitable to study identifying genetic diversity among *O. crenata* individuals. The breeders have to consider this high genetic variation in *O. crenata* when they breed faba bean for tolerance/resistance to *Orobanche*.

Key words: Faba bean, Broomrape, Heterosis, Combining ability, Heritability, Inbreeding effect, ISSR.

CONTENTS

No.	Title	Page
	INTRODUCTION	1
	REVIEW OF LITERATURE	4
1.	Variability of the faba bean host against <i>Orobanche</i> parasitism.....	4
2.	Variability of the <i>Orobanche</i> parasite.....	14
3.	Genetics of faba bean host resistance/tolerance to <i>Orobanche</i> parasite.....	19
4.	Selection criteria for <i>Orobanche</i> resistance/tolerance	22
5.	Hybridization.....	28
	MATERIALS AND METHODS.....	47
1.	The hybridization studies.....	47
2.	Molecular characterization of <i>Orobanche creneta</i> using ISSR markers.....	55
	RESULTS AND DISCUSSION.....	58
1.	Experiment carried out in <i>Orobanche</i> infested field at Giza Research Station	58
a.	Significance of mean squares under <i>Orobanche</i> infested field.....	58
b.	Performance of the parents.....	58
c.	Performance of hybrids.....	60
d.	Combining ability effects.....	66
1.	General combining ability.....	66
2.	Specific combining ability effects.....	68
e.	Reciprocal effects.....	70
f.	Components of variation in diallel.....	74
2.	Experiment carried out in healthy (free) field.....	78
a.	Sids Research Station.....	78
1.	Significance of mean squares	78
2.	Performance of the parents.....	78
3.	Performance of hybrids.....	78
4.	Combining ability effects.....	83
a.	General combining ability.....	83
b.	Specific combining ability effects.....	87
5.	Reciprocal effects.....	88

6.	Components of variation in diallel.....	91
b.	Giza Research Station.....	95
1.	Significance of mean squares	95
2.	Performance of parents, F_1^s and F_2^s	97
3.	Performance of hybrids, (F_1^s and F_2^s)	97
4.	Combining ability effects.....	100
a.	General combining ability effects.....	100
b.	Specific combining ability effects.....	106
5.	Reciprocal effects.....	107
6.	Estimates of heterosis and heterobeltiosis.....	113
7.	Inbreeding effects.....	115
8.	Genetic components	120
3.	Biodiversity of <i>Orobanche creneta</i> using ISSR Markers	126
	SUMMARY.....	139
	REFERENCES.....	147
	ARABIC SUMMARY ...	

LIST OF TABLES

No.	Title	Page
1.	Origin, pedigree and some features of parental genotypes.	47
2.	Analysis of variance of combining ability.....	51
3.	Inter simple sequence repeat DNA primers used in the analysis of <i>O. crenata</i> populations.	55
4.	Significance of mean squares due to various sources of variation for the studied characters in <i>Orobanche</i> infested field at Giza Research Station in 2013/2014 season.....	59
5.	Mean performance of parents and F ₂ 's for following data, days to flowering, plant height and number of branches/ plant during 2013/2014 season in <i>Orobanche</i> infested field at Giza Research Station.....	63
6.	Mean performance of parents and F ₂ 's for following data, Pods/plant, Seeds/plant and Seed yield/ plant during 2013/2014 season in <i>Orobanche</i> infested field at Giza Research Station.....	64
7.	Mean performance of parents and F ₂ 's for following data, 100-seed weight, <i>Orobanche</i> spike/plot and <i>Orobanche</i> spike dry weight/plot during 2013/2014 season in <i>Orobanche</i> infested field at Giza Research Station.....	65
8.	Estimates of the general combining ability effects (gi) of parental lines in the F ₂ crosses for studied traits (2013/2014 season) in <i>Orobanche</i> infested field at Giza Research Station.....	69
9.	Estimates of the specific combining ability effects (Sij) of the F ₂ crosses for studied traits (2013/2014 season) in <i>Orobanche</i> infested field at Giza Research Station.....	72
10.	Estimates of reciprocal-cross differences effects (Rij) of the F ₂ crosses for studied traits (2013/2014 season) in <i>Orobanche</i> infested field at Giza Research Station.....	73
11.	Estimates of genetic parameters for studied traits in	77

	F ₂ diallel crosses (2013/2014 season) in <i>Orobanche</i> infested field at Giza Research Station.....	
	Significant of mean squares due to various sources of variation for the studied characters in free field of	
12.	<i>Orobanche</i> at Sids Research Station (2013/2014 season)	80
	Mean performance of parents and their crosses in F ₂ generation of faba bean for following data, days to	
13.	flowering, plant height and number of branches/ plant(2013/2014 season) in free field at Sids Research Station.....	82
	Mean performance of parents and their crosses in F ₂ generation of faba bean for following data, Pods/plant,	
14.	Seeds/plant, Seed yield/ plant and 100-seed weight (2013/2014 season) in free field at Sids Research Station.....	83
	Estimates of the general combining ability effects (gi) of parental lines in the F ₂ crosses for studied traits (2013/2014 season) at Sids Research Station.....	86
15.	Estimates of specific combining ability effects (Sij) of diallel crosses for studied traits of F ₂ generation (2013/2014 season) at Sids Research Station.....	89
16.	Estimates of reciprocal-cross differences effects (Rij) of diallel crosses for studied traits of F ₂ generations ((2013/2014) season at Sids Research Station.....	90
17.	Estimates of genetic parameters for studied traits in F ₂ diallel crosses (2013/2014 season) at Sids Research Station.....	94
18.	Mean squares for the studied characters in parents, F ₁ , F ₂ and their reciprocals for diallel cross 2013/2014 season open field at Giza Research Station.....	96
19.	Mean performance of parents and their crosses in F ₁ and F ₂ generations of faba bean for studied traits(2013/2014 season) in free field at Giza Research Station.....	101
20.		

21.	Mean performance of reciprocal crosses in F ₁ and F ₂ generations of faba bean for studied traits(2013/2014 season) in free field at Giza Research Station.....	102
22.	Mean performance of parents and their crosses in F ₁ and F ₂ generations of faba bean for studied traits(2013/2014 season) in free field at Giza Research Station.....	103
23.	Mean performance of reciprocal crosses in F ₁ and F ₂ generations of faba bean for studied traits(2013/2014 season) in free field at Giza Research Station.....	104
24.	General combining ability effects (gi) of faba bean parental genotypes for studied traits in 2013/2014 season at Giza Research Station.....	105
25.	Specific combining ability effects (Sij) of faba bean parental genotypes for Days to flowering, plant height, Branches/ plant and Pods/plant2013/2014 seasonat Giza Research Station.....	108
26.	Specific combining ability effects (Sij) of faba bean parental genotypes for Seeds/plant, Seed yield /plant and 100-seed weight2013/2014 season at Giza Research Station.....	109
27.	Reciprocal-cross differences (Rij) s in F ₁ and F ₂ crosses for Days to flowering, plant height, Branches/ plant and Pods/plant 2013/2014 season at Giza Research Station	111
28.	Reciprocal-cross differences (Rij) s in F ₁ and F ₂ crosses for Seeds/plant, Seed yield /plant and 100-seed weight 2013/2014 season at Giza Research Station.....	112
29.	Heterosis (%) in F ₁ over mid (MP) and better parents (BP) for studied traits in 2013/2014 season at Giza Research Station.....	116