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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APPROVAL SHEET

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Name of Candidate: Hend Abo El-Fetouh Ramadan Ghannam **Degree:** Ph.D.

Title of Thesis: Performance of faba bean parents and hybrids grown under free and *Orobanche* infestation and molecular characterization of *O.crenata*

Supervisors: Dr. Mazhar Mohamed FawzyAbdalla
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Department: Agronomy **Approval**: 4 /4/2017

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 2011/2012season 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 F_2 seeds and re-hybridization was made to increase F_1 seeds.In 2013/2014season, parents, F_1's and F_2'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, F_1's and F_2'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 F_1, and for number of seeds/plant and seed yield/plant in F_1 and F_2 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 F_1 and F_2 generations. Parent Nubaria 1 was good combiner for 100-seed weight in F_1 and F_2 generations. The cross (Cairo 5 x Misr 3) had significant or highly significant positive SCA effects in both F_1 and F_2 generations for number of pods/plant, number of seeds/plant, seed yield/plant and 100-seed weight. Reciprocal-cross differences occurred frequently in the F_1 and F_2 generations. Inbreeding gain was found in some F_2 materials and selection may be practiced to secure transgressive segregates with higher yield and heaver 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.*

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