**FACULTY OF AGRICULTURE (SABA BACHA)**

# SELECTION FOR EARLINESS, YIELD AND ITS COMPONENTS WITHIN SEGREGATED GENERATION OF HYBRIDS OF BROAD BEAN

**A Thesis**

**Presented to the Graduate School of the Faculty of Agriculture- Saba Basha- Alexandria University**

**In Partial fulfillment of the Requirements for the degree**

**Doctor of Philosophy**

**(HORTICULTURE-VEGETABLES)**

**Department of Plant Production**

**BY**

**Adel Fahmy Ibrahim Ahmed Gohar**

**2021**

# TABLE OF CONTENTS

# LIST OF TABLES

# LIST OF FIGURES

# 5- Summary

The present investigation carried out in experimental farm of faculty of agriculture saba basha, Alexandria university and Sabahya horticulture research station through 3 winter successive season of 2016/2017, 2017/2018 and 2019/2020. On broad bean variety explained as follows:

1- (P1) Reina mora (Spanish variety).
2- (P2) Luz de onto (Spanish variety).
3- (P3) Giza planka (Local variety).
4- (P4) isolated line from Sabaty.
5- Line Produced from cross (P1×P2) (P1: Reina mora × P2: Luz de onto).
6- Line produced from cross (P2×P1) (P2: Luz de onto × P1: Reina mora).
7- Line produced from cross (P1×P3) (P1: Reina mora × P3: Giza planka).
8- Line produced from cross (P3×P1) (P3: Giza planka × P1: Reina mora).
9- Line produced from cross (P3×P4) (P3: Giza planka × P4: Sabaty).
10- Cleopatra as a test variety, developed by the Agricultural Research Center.

Selection with self-pollination was conducted for 5 isolation of broad bean, by two methods of selection were used, namely mass selection and individual selection of some important characteristics associated with early yield and high productivity of the crop, as these characteristics were as follows:

1-Number of nodes to the first pod appears.
2- Stem thickness.
3- Number of branches.
4- Plant high
5-Number of days until the first pod appears.
6- Pod length
7-Average pod width
8-Average pod weight
9-Average number of pods / plant
10- Total fresh yield / plant.
11- Average number of seeds / pod
12- Total dry yield / plant.

In separate evaluation season (11 November of 2018/2019) 9 population were planted, tow population from each parents, 2 strains from original population, 2 strains from first mass selection generation, 6 strains from first individual selection generation, 2 strains from second mass selection generation, 6 strains from second individual generation and check cultivar Cleopatra. In randomized complete block design with three replicates Experimental units with a seed / hole on lines 4 meters long and 80 cm wide, and the distance between the hills is 40 cm. 10 plants were selected for each genotypes to assess the previous characteristics. Rough treatment, irrigation, fertilization, weed control and pests were also carried out according to the recommendations of the Ministry of Agriculture and Commercial Production. To measure the amount of progress in yield and its components and early yield traits of broad bean for two cycles in both selection methods, in addition to a comparison between the progress in using the mass and individual selection and documenting the difference between progress using both methods. In addition genetic parameters like phenotypic and genotypic variance, phenotypic and genotypic coefficient of variance, heritability estimates, genetic advance, inbreeding depression, path analysis, correlation coefficient analysis and compared the development which achieving by two different selection methods.

## The most important results obtained are summarized below:

1- There were significant differences between all strains in all traits under study and this result is very important as the high differences and isolations that differ from some of them in performance are considered good genetic material for plant breeders.

2- There was superiority of the second selection generation and the commercial cultivar over the original population, and also it is noticeable that the standard devotion has become more in the selection generations and the commercial cultivar, this indicates that the selection generations and the commercial cultivar are more homogeneous than the original population in all traits under study.

3- Line (P1×P2) produced from second mass selection generation scored highest value in plant height trait. Where strains $(P1\times P3)_{L1}$ and $(P1\times P3)_{L2}$ produced from second individual selection generation scored highest values in branches number trait, strain (P3×P4) scored heist value in stem thickness trait.

4- Strain (P3×P1) produced in second mass selection generation scored best values in most early yielding traits.

5- In total yield trait, strain (P3×P1) produced in second mass selection generation scored the highest value.

6- Regarding pod measurements traits, strain (P3×P1) produced from second mass selection generation scored highest value.

7- Standard deviation values decreased in first, second selection generation and check cultivar, these may be refer to that selection generation more homogeneous than original population.

8- In relation to the values of the heritability in the broad sense were the characteristics of the stem thickness, the number of days until flowering, the height of the first flower node, the number of nodes until the first flower, the number of days until the first pod, the height of the first fruit node, the number of nodes until the appearance of the first pod, average total fresh yield, the average dry yield, the length of the pod, the average weight of the green pod and the average weight of the dry pod are achieved for the highest values and therefore these characteristics selection in them are effective in improving the broad bean crop but the value of the genetic equivalent depends on the method used to measure it and the estimated population In which.

9- Estimates of the genetic advance due to selection were the characteristics of the average total green yield, the average dry total yield and the average weight of the green pod in achieving the highest values while attributes such as the average number of branches, the number of days from planting to flowering, the height of the first flowering node, the number of nodes until the first flower, the number of days until the first fruit, the height of the first fruit node, the number of nodes until the first pod, the length of the pod, the average dry weight of the pod and the average weight of 100 seeds recorded moderate values.

10- As for the deterioration resulting from the inbreeding, it was present in the early yielding trait, where there was a decrease in it (the number of days and the number of nodes until the appearance of the first flower and the first pod, and the height of the first flower and the first pod), but that is mostly due to the selection where the selection was the lowest value in these characteristics , which made the mean of the values tend to decrease in the first and second selection generations. As for the other of the attributes, there was no deterioration of them in the selection generations compared to the original population.

11- The most important characters which have significant and positive correlation with yield, were plant height (cm), number of branches, average number of pods / plant, pod length (cm), average number of seeds /pod, average fresh pod weight (g), average dry pod weight (g) and 100 seeds weight (dry), so selection for these traits may be effective in yield improvement.

12- Regarding negative correlation being between early yielding traits and total yield traits

13- Concerning path coefficient analysis between Traits, total fresh yield (main trait) and each of the; plant height, number of branches, stem thickness, early yielding traits, total number of node / plant, total of number pod / plant. The most important positive direct relation, were between total fresh yield and stem thickness.

14- Positive indirect relationships, they were present in the trait number of branches through their effect on the number of total pods / plant.

15- Negative direct relations, it was through the characteristics of the height of the first flower node, number of the nodes until the first flower and the number of the nodes until the first pod and consequently the selection for the lower value in it has a positive effect on the yield.

16- Indirect, negative relations, it was in the characteristic of the number of node until the first pod through its relationship with the number of days until the appearance of the first flower and number of days until the first pod appears.

17- Concerning path coefficient analysis between Traits, total dry yield (main trait) and each of the; plant height, number of branches, stem thickness, early yielding traits, number of node / plant, number of pod / plant. The most important direct positive relationships were through the traits stem thickness and total number of pods / plant, while the most important direct negative relationships were through the traits number of nodes until the first flower and number of nodes until the first pod.

18- Positive indirect relations, it was through the trait stem thickness and its effect on both the length of the plant, number of branches and the number of pods / plant. As for the negative indirect relations, it was through the traits number of nodes until the first pod and their effect on all of the rest of the early characteristics.