CONTENTS

SUMMARY

The present study was carried out at the field of Shandaweel Agric. Res. Station, Sohag, Agric. Res. Center, Ministry of Agric., Egypt., during the four growing winter seasons of 2010/2011, 2011/2012, 2012/2013, and 2013/2014. The basic materials used in this investigation consisted of two F_3 populations of Master B x On Ward (Pop. I) and Early Perfection x On Ward (Pop. II) to investigate the comparative importance of two breeding methods, i.e. pedigree selection and selection with intermating schemes for improving both pod yield and earliness as well as study trait relationships.

The studied traits :

1) Number of days to flowering.
2) Pod length (cm).
3) Pod width (cm).
4) Number of seeds per pod.
5) Weight of 100-dry seeds (g).
6) Weight of 100-green seeds (g).
7) Shellout percentage.
8) Stem length (cm).
9) Number of branches/plant.
10) Green pod yield per plant (g).

The obtained results from the present study could be summarized as follow:-

I. Pedigree selection

I - 1- Selection for pod yield /plant:

A- Variances and means:

The results indicate significant or highly significant among genotypes for pod yield/plant and all other studied traits in the three cycles of selection in the two populations. The overall mean of the selected families after three cycles of pedigree selection for pod yield /plant in the two populations ranged from 172.07 and 169.20 g/ plant in the 1st cycle (F_4) to 211.43 and 212.98 in the 3rd cycle (F_6). Also, the bulk sample ranged from 166.14 and 180.75 in the 1st cycle (F_4) to 159.58 and 164.93 in the 3rd cycle (F_6) for pop.I and pop.II, respectively.

The results indicated that Pedigree selection for pod yield /plant in population I, reduced the genetic variability measured as a genotypic coefficient of variability from 8.09 % after the first cycle to 5.28 % after the 3rd cycle of selection in pod yield /plant and from 6.14 (cycle 1) to 0.78 (cycle 3) in 50% flowering date.

B- Heritability estimates

Estimates of broad sense heritability after the three cycles of selection were low for number of seeds/pod (26.35 and 0.77 %), while it was moderate magnitude for pod length (48.62 and 56.42 %) and shellout (51.04 and 58.06 %) and high for each of weight of 100-green seeds (89.23 and 97.20 %), stem length (79.37 and 81.46), pod width (64.71 and 88%),

weight of 100-dry seeds (88.05 and 95.50 %) and pod yield/plant (66.63 and 67.82%) for populations I and II, respectively..

C- Selection advance:

The F_6 selections displayed considerable and almost comparable selection advance in pod yield/plant which ranged from 15.85 to 57.45 gm/plant (Pop. I) and from 12.98 to 59.00 gm/plant (Pop. II) in the three cycles of pedigree selection.

D- Realized and correlated response to selection:

A significant increase in pod yield /plant was achieved by direct pedigree selection for this trait by 32.49 and 37.31 % from the bulk sample and the best parent, respectively, after three cycles of selection in population I. Such increase accompanied by increase in weight of 100-green seeds (4.44 and 19.78%), flowering date 50% (5.54 and 38.31%), number of branches /plant (42.91 and 39.77 %) and weight of 100-dry seeds (0.75and 24.19%), and decreased in shellout (-3.35 and -3.87). The results in population II behaved the same as in population I, except stem length and number of branches decreased by (1.94 and 10.61% from the bulk sample), respectively.

E- Phenotypic and genotypic correlations:

The results of the phenotypic and genotypic correlations indicate negative correlations between pod yield /plant and some studies traits, flowering 50% (-0.17 and -0.05%), weight of 100-dry seeds (-0.09 and -0.11%), pod length (-0.07 and -0.19), weight of 100-green seeds (-0.11 and -0.15%) and number of seeds/pod (-0.13 and -2.73) in population II

indicated that the early families were high in pod yield. In population I, it exhibited negative correlation with weight of 100-dry seeds (-0.02 and -0.01%), number of seeds/pod (-0.25 and -0.85), weight of 100-green seeds (-0.03 and -0.02%) and pod length (-0.26 and -0.42%).

F- Selected families after three cycles of selection

After the third cycle of direct pedigree selection, two high yielding Families No. 6 and 8 outyielded the bulk sample, mid parent and the best parent by (20.38 and 24.42%), (87.93 and 94.24%) and (44.52 and 49.37%), weight of 100-green seeds (3.98 and 5.85%), (41.2 and 43.74%) and (19.26 and 21.41%), number of branches (42.32 and 58.02%), (66.8 and 85.2%) and (39.00 and 54.33%), stem length (41.29 and 37.17%), (33.5 and 29.61%) and (-4.23 and 7.01%) and flowering 50 % (5.28 and 9.51%), (23.85 and 28.83%) and (46.21 and 52.08%) and weight of 100-dry seeds (0.3 and 2.15%), (17.09 and 19.25%) and (11.19 and 13.24%), respectively, in population I.

For population II, family No. 2 was significantly higher in pod yield/plant by (40.45, 88.66 and 64.5%), weight of 100-green seeds (8.10, 44.4 and 23.24%), number of branches (18.04, 31.34 and 24.33%), shellout % (0.096, 21.53 and 9.62%), flowering 50 % (6.1, 13.09 and 17.28%), weight of 100-dry seeds (2.35, 12.67 and 8.42%) and number of seeds/pod (17.55, 8.4 and 6.45%), and decreased in weight seeds of 10 pods (-15.46, -31.7and -41.28%) and pod length (0.01, -1.69 and -5.02%), than the bulk sample, mid parent and , the best parent, respectively.

I - 2 - Selection for earliness: -

A- Variances and means:

The results indicated significant or highly significant differences among genotypes in the two studied populations I and II. The average of days to 50% flowering of the selected families decreased from 51.2 and 60.17 in F_4 generation (cycle 1) to 42.19 and 46.47 days in F_6 generation (cycle 3) of populations I and II, respectively.

The GCV of flowering date and pod yield /plant decreased from 9.18% and 8.06% in the selection cycle 1 (C_1) of population I to 5.50% and 4.40%.for the third cycle (C_3). Also, in population II, the GCV of flowering date and pod yield /plant decreased from 7.13 and 6.34 to 1.54 and 5.35% respectively.

B- Heritability estimates

Estimates of heritability in broad sense after three cycles of selection in population I and II were low or moderate for no. of branches (47.64 and 35.06 %) and no. of seeds /pod (39.22 and 43.08%), while it was high estimates for pod length (73.11 and 72.29 %), weight of 100-green seeds (88.33 and 89.74%), pod width (80.00 and 71.15 %) and weight of 100-dry seeds (89.85 and 91.74%) in populations I & II, respectively, and pod yield /plant (75.02 %) in only population I.

C- Selection advance:

The results indicate that the deviations of the F_6 selections produced by the pedigree selection method were positive or negative, in desirable direction for each of pod yield/plant, weight of 100-green seeds, number of

branch, shellout percentage, weight of 100-dry seeds and stem length in both populations I & II and for number of seeds/ pod and flowering in only population II. The F_6 selections displayed considerable and almost comparable selection advance in pod yield/plant which was 7.16 gm/plant (Pop. I) and 35.18 gm/plant (Pop. II) in the three cycle of pedigree selection.

D- Realized and correlated response to selection:

The results showed that direct selection for pod yield /plant which is the main goal in the all breeding programs increased it by 13.19% from the bulk sample after three cycles of selection. Such increased accompanied with increased in weight of 100-green seeds (6.63%), pod length (3.48%), no. of seeds/pod (13.42%), stem length (15.57%) and of weight 100-dry seeds (5.13%), and decreased in days to 50% flowering (-3.41%) and shellout percentage (-19.15%), in population II. The results in population I behaved the same as in population II.

E- Phenotypic and genotypic correlations:

The correlations between days to flowering 50 % and each of no. of seeds /pod, weight of 100-green seeds, shellout percentage and weight of 100-dry seeds were negative in the cycle 3 of population II. This means that the early families were high in no. of seeds /pod, weight of 100-green seeds, shellout percentage and weight of 100-dry seeds.

F- Selected families after three cycles of selection

In the direct selection, the breeder is concerned with the performance of individual selected families. This is because the overall mean might mask the individual family mean. In population I after three cycles, the

selection for earliness gave families (No. 5 , 10) which out earlier the bulk sample, the best parent and the mid-parent by -11.80, -31.37 and -1.69 %, respectively. In population II the direct selection for earliness resulted in two early families (No. 5 and 10). Family No. 5 earlier -9.22, -21.43 and -18.52 % more than the bulk sample, the best parent and the mid-parent, respectively.

II. Intermating procedure:

A- Variances and means:

After three cycles of selection with intermating, the selected families mean of population I outyielded the bulk sample by 4.05% compared with 0.91% in pedigree selection for pod yield/plant. Also, simultaneous decrease in flowering 50 % by -4.59 % compared with -3.74 %. In population II, the effect of the intermating was similar to those in population I. After three cycles of intermating procedure, the GCV of pod yield/plant and flowering 50 % decreased to 6.78 and 4.49%, respectively, compared with 5.35 and 1.54% in pedigree selection for these traits, respectively, in population II.

B- Heritability estimates:

Estimates of broad sense heritability after the three cycles of selection were low for number of seeds/pod (39.89 and 11.86) and for number of branches (37.07 for only populations I) , while it was of high magnitude for number of branches in population II (63.71 %) and for each of pod yield/plant (95.61 and 99.17%), weight of 100-green seeds (87.08 and 91.87%), stem length (90.96 and 97.42%), shellout % (95.92 and

91.11%) and weight of 100-dry seeds (97.01 and 99.81%), for populations I and II, respectively.

C- Selection advance:

The F_6 selections produced by the intermating selection method were positive for each of shellout percentage, weight of 100-green seeds, number of branches, stem length, weight of 100-dry seeds and pod yield/plant, in both populations I & II and for flowering 50 % in only population I. However, the F_6 selections displayed considerable and almost comparable selection advance in pod yield/plant 6.65 gm/plant (Pop. I) and 29.89 gm/plant (Pop. II) in the third cycle of intermating selection.

D- Realized and correlated response to selection:

The realized gain after the three cycles of selection with intermating technique accounted by -4.59 and -1.41% from the bulk sample for flowering 50 % compared to -3.74 and -3.41% for pedigree selection in populations I and II, respectively. Also, the realized gain reached (4.05 and 15.58 %) from the bulk sample for pod yield/plant, compared to (0.91 and 13.19%) when pedigree selection exerted for the same trait.

E- Phenotypic and genotypic correlations:

The genotypic correlation estimates were positive between flowering 50 % and all studied traits except weight of 100-green seeds (-0.38), number of branches (- 0.65), weight of 100-dry seeds (-0.55) and pod yield/plant (-0.46) in population I. While, the genetic correlation was negative between flowering and all studied traits except number of branches (0.34) in population II

F- Selected families after three cycles of selection

After three cycles of selection in population I, intermating resulted in two high yielding families (No. 3 and 9). The selected family No. 9 yielded 13.73, 48.27 and 14.02 more than the bulk sample, mid parent and the best parent, 14.26, 38.62 and 17.08% for weight of 100-green seeds, 58.19, 59.57 and 22.33% for number of branches, 2.06, 61.89 and 34.76% for stem length and 9.94, 27.07 and 20.66% for weight of 100-dry seeds respectively, and 7.32% for pod length than the bulk sample only, and decreased by -7.79, -3.91 and 13.44% for days to flowering 50% in population I.

For population II, family No. 9 and 10 were significantly higher in pod yield/plant. The selected family No. 10 yielded 25.33, 48.5 and 29.48%, weight of 100-green seeds 1.31, 24.15 and 5.96%, number of seeds/plant 9.68, 3.03 and 0.44%, pod length 15.78, 14.4 and 11.45%, weight of 100-dry seeds 8.40, 22.57 and 17.95%, and stem length 18.51, 25.56 and 21.57%, and decreased for days to flowering by -7.31, -12.85 and -11.86% and pod width -7.75, -14.76 and -27.68% than the bulk sample, mid parent, and the best parent, respectively.

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B- Heritability estimates:

Estimates of broad sense heritability after the three cycles of selection were low for number of seeds/pod (39.89 and 11.86) and for number of branches (37.07 for only populations I) , while it was of high magnitude for number of branches in population II (63.71 %) and for each of pod yield/plant (95.61 and 99.17%), weight of 100-green seeds (87.08 and 91.87%), stem length (90.96 and 97.42%), shellout % (95.92 and

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The F_6 selections produced by the intermating selection method were positive for each of shellout percentage, weight of 100-green seeds, number of branches, stem length, weight of 100-dry seeds and pod yield/plant, in both populations I & II and for flowering 50 % in only population I. However, the F_6 selections displayed considerable and almost comparable selection advance in pod yield/plant 6.65 gm/plant (Pop. I) and 29.89 gm/plant (Pop. II) in the third cycle of intermating selection.

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The realized gain after the three cycles of selection with intermating technique accounted by -4.59 and -1.41% from the bulk sample for flowering 50 % compared to -3.74 and -3.41% for pedigree selection in populations I and II, respectively. Also, the realized gain reached (4.05 and 15.58 %) from the bulk sample for pod yield/plant, compared to (0.91 and 13.19%) when pedigree selection exerted for the same trait.

E- Phenotypic and genotypic correlations:

The genotypic correlation estimates were positive between flowering 50 % and all studied traits except weight of 100-green seeds (-0.38), number of branches (- 0.65), weight of 100-dry seeds (-0.55) and pod yield/plant (-0.46) in population I. While, the genetic correlation was negative between flowering and all studied traits except number of branches (0.34) in population II

F- Selected families after three cycles of selection

After three cycles of selection in population I, intermating resulted in two high yielding families (No. 3 and 9). The selected family No. 9 yielded 13.73, 48.27 and 14.02 more than the bulk sample, mid parent and the best parent, 14.26, 38.62 and 17.08% for weight of 100-green seeds, 58.19, 59.57 and 22.33% for number of branches, 2.06, 61.89 and 34.76% for stem length and 9.94, 27.07 and 20.66% for weight of 100-dry seeds respectively, and 7.32% for pod length than the bulk sample only, and decreased by -7.79, -3.91 and 13.44% for days to flowering 50% in population I.

For population II, family No. 9 and 10 were significantly higher in pod yield/plant. The selected family No. 10 yielded 25.33, 48.5 and 29.48%, weight of 100-green seeds 1.31, 24.15 and 5.96%, number of seeds/plant 9.68, 3.03 and 0.44%, pod length 15.78, 14.4 and 11.45%, weight of 100-dry seeds 8.40, 22.57 and 17.95%, and stem length 18.51, 25.56 and 21.57%, and decreased for days to flowering by -7.31, -12.85 and -11.86% and pod width -7.75, -14.76 and -27.68% than the bulk sample, mid parent, and the best parent, respectively.