

SUMMARY

One field experiment was carried out at Mariut Research Station, Desert Research Center, Egypt during the two successive seasons 1994/1995 and 1995/1996 to evaluate two safflower (*Carthamus tinctorius* L.) varieties under different levels of mineral nitrogen and phosphorus and bio-fertilizer (nitrogen fixation and phosphate dissolving bacteria).

The soil of the experiments is calcareous (27.06% CaCO_3) with a sandy loam texture, a very low organic matter content (0.37) and pH value (8.20).

Each experiment included 32 treatments which were the combination between the two varieties (Giza 1 and Aceitera), four treatments of nitrogen (zero, biofertilizer, 30 and 60 kg N/fed) as ammonium sulphate 20.6% N and four treatments of phosphorus (zero, biofertilizer, 15.5 and 31.0 kg P_2O_5 /fed) as calcium superphosphate.

The experimental design was split-split plot with four replication, where the two varieties were arranged at random in main plot, the levels of nitrogen were assigned at random within the sub-plot, while the P-levels were randomly distributed in the sub-sub plots. The sub-sub plot area was 10.5 m².

Results could be summarized as follows :

I. Effect of Varieties :

1. Growth characters and petal yield :

1. The two varieties (Giza 1 and Aceitera) showed no significant differences in stem length and stem diameter in both successive seasons except at 120 days in the second one. The local variety (Giza 1) was

significantly surpassed the exotic variety (Aceitera) in the two studies growth i.e. stem length and stem diameter.

2. The number of leaves/plant of two varieties was significant only at later stage of growth (120 days from sowing) in the second season. The higher number of leaves/plant was recorded by local variety (Giza 1) as compared to exotic one (Aceitera).
3. Leaf area/plant was not significantly affected by the two different varieties, except at later stage (120 days) in the second season. The high value was recorded by Giza 1 as compared with Aceitera.
4. Local variety Giza 1 was significantly surpassed the exotic variety (Aceitera) in leaf area index at 120 days from sowing in the second season.
5. Specific leaf weight and number of leaves for head production were not affected by two different varieties at all stages in the two successive seasons.
6. Varieties exhibited highly significant differences in leaves/stem and branches ratio only at later growth stage (120 days from sowing) for both seasons. The greatest value in the first season was obtained from local variety and from exotic variety in the second one.
7. There were significant differences between two studied varieties in fresh and dry weight of stem in the samples taken after 120 days from sowing in both successive seasons.
8. There were significant differences in fresh and dry weight of leaves/plant in the sample taken at 120 days from sowing in both season.

9. Fresh and dry weight of petal yield was not significantly affected by the two tested varieties for both season.

2. Seed yield and its components :

1. Local variety Giza 1 recorded high number of heads/plant in the two successive seasons as compared with the exotic variety Aceitera, but the differences was not significant in the first season.
2. There was not significant differences between the two evaluated varieties in head weight in both seasons. However, the local variety Giza 1 recorded higher values in the two successive seasons.
3. The two varieties had a significant effect on head diameter of safflower only in the first season. The local variety produced chick diameter than obtained from the exotic variety.
4. Seeds number/head behaved the same trend as that of head diameter. However the local variety was superior on the exotic one in both seasons.
5. Statistical analysis show significant different in seeds weight/head as affected by the two studied varieties. The high mean values were recorded by local variety in the two growth seasons as compared with exotic variety (Aceitera) which produced the low value.
6. 1000-seed weight, the exotic variety (Aceitera) surpassed the local variety (Giza 1) in two successive seasons, but the difference was not significant in the first one.
7. Seed yield kg/fed, exotic variety produced the high seed yield in the first season while the low yield was obtained from local variety without

significant differences. In the second season, opposite result was obtained whereas the local variety resulted the high value and the exotic one low value and the difference between them was significant.

3. Oil yield and chemical contents :

1. Protein, phosphorus and oil percentage in seeds were not affected by the two different varieties in both seasons.
2. There was significant difference between two varieties in the first season only in oil yield kg/fed whereas the exotic variety produced high oil yield. However in the second season the local variety Giza 1 recorded the high oil yield, but this difference was not significant.

II. Effect of Nitrogen Fertilizer :

1. Growth characters and petal yield :

1. Stem length was not significantly affected by the four nitrogen treatments at 90 and 120 days from sowing in the first season, but this character was significantly affected by nitrogen fertilization (30 and 60 kg N/fed) in the second one.
2. Stem diameter was significantly affected by nitrogen supply for both seasons at all sampling dates except at 90 days from planting in the first season. However, the differences between the low mineral of N (30 kg N/fed) and the nitrogen fixation did not reach to the 5% level of significant.
3. No. of leaves/plant was significantly affected only at early age (60 days from planting in the first season and at later age (120 days from planting) in the second season, 60 kg N/fed produced the higher value of no. of leaves/plant in both seasons at two significant sample, but the

6. The weight of 1000-seed was not significantly affected by nitrogen fertilizer for both seasons.
7. Nitrogen fertilizer exhibited significant effect on seed yield kg/fed in the second season and insignificant in the first one. It is evident that seed yield gradually increased up to 60 kg N/fed in the two successive seasons.

3. Oil yield and chemical contents :

1. The differences in protein % were significant for both seasons, with regard to this chemical content, there was a gradually increasing nitrogen supply up to 60 kg N/fed.
2. Phosphorus % in seeds of safflower was not affected by nitrogen fertilizer for both season.
3. The oil percentage was significant affected by nitrogen application in the second season.
4. Nitrogen treatment significant effected on oil yield in the second season.

III. Effect of Phosphorus Fertilizer :

1. Growth characters and petal yield :

1. There are no significant differences between phosphorus treatments on stem length except at later age for second season, the differences between (PDB) and the low mineral level were not significant.
2. Results obtained that there are no relevance between the phosphorus fertilizer as mineral or (PDB) and stem diameter.

3. The number of leaves/plant was significantly affected by phosphorus application only in the first season at age 120 days. Treatments could be arranged in a descending order as following 31.0, 15.5 kg P_2O_5 /fed and phosphate solubilizing without significant.
4. Leaf area/plant was significantly affected by phosphorus application only in the first season at age 120 days. The highest values were attributed from 31 kg P_2O_5 /fed as following by phosphate solubilizing without significant.
5. Leaf area index and specific leaf weight were not significantly affected by phosphorus fertilizer for both seasons.
6. No. of leaves for head production was significantly affected by phosphorus fertilizer at 120 days from planting in the first season, as compared to control.
7. Leaf/stem and branches ratio was not affected by phosphorus fertilizer at all samples taken for both seasons.
8. Analysis of variance revealed significant differences in stem and branches fresh and dry weight by different source of phosphorus fertilization except at 90 days from sowing. Raising phosphorus supply from 15.5 to 31.0 kg P_2O_5 /fed was significantly increased stem + branches fresh weight in the first season, but without significant in the second one. Dry weight of stem + branches the differences between 15.5 and 31.0 kg P_2O_5 /fed were not significant for two seasons.
9. Fresh weight of leaves were significantly affected by phosphorus fertilization only at early age (60 days) in the first season and at later age (120 days) in the second one. The highest value was observed by

using 15.5 kg P_2O_5 /fed for the early age, but in the second season the highest value was attained from seed inoculated with (PDB).

10. Phosphorus application significantly affected on leaves dry weight as compared to without fertilizer at later age (120 days from sowing) for both seasons.
11. There is no significant differences between the studied treatment on the fresh and dry weight of petal yield kg/fed in the two successive seasons.

2. Seed yield and its components :

1. Treatment of phosphorus fertilizer had no significant effect on heads number/plant.
2. The effect of phosphorus fertilizer had no significant effect on head weight for both seasons.
3. Head diameter was not significant effected by the different source of phosphorus fertilizer.
4. The significant difference between the phosphorus treatments in seeds number/head in the first season. The highest value was obtained from seed inoculated by phosphate dissolving bacteria and it was significant declined by using phosphorus supply at 15.5 kg P_2O_5 /fed and 31 kg P_2O_5 /fed and the difference between them were not significant.
5. Seeds weight/head for both seasons were not significant by all treatments of phosphorus.
6. Weight of 1000-seed was not significant by the treatment of phosphorus.

7. Seed yield kg/fed was not affected by adding different levels of phosphorus and using PDB, under two growth seasons.

3. Oil yield and chemical contents :

1. Protein percentage was significantly affected by phosphorus fertilizer only in the first season. Protein % significantly increased by using the two mineral phosphorus as well as (PDP) as compared with control treatment, but the difference between these three treatments were not significant.
2. Phosphorus percentage was significantly increased by phosphorus fertilizer in both growth seasons. The high value of phosphorus was recorded by using (PDB).
3. Oil percentage was not significantly affected by different treatments of phosphorus fertilizer under the two growth seasons.
4. Oil yield kg/fed was not significantly affected by different treatments of phosphorus fertilizer under the two growth seasons.

IV. Effect of the Interaction :

1. Varieties x Nitrogen :

This interaction had significant only on :

1. Stem diameter at age 120 days from planting for first season, whereas the highest was observed from 60 kg N with Aceitera.
2. Number of leaves/plant at 60 days from sowing in the second season, the high number was recorded when using N-fixation with Giza 1.
3. Number of leaves/plant at 120 days from sowing in the second season, the high number was observed from 60 kg N with Giza 1.

4. Leaves fresh weight at 120 days from sowing in the first season, whereas the highest was recorded when using N-fixation with Giza 1.
5. Protein percentage of safflower seed in the first season was higher when using 30 kg N/fed with Giza 1.

2. Varieties x Phosphorus :

This interaction had significant only on :

1. Specific leaf weight at 120 days from sowing in the second season, whereas the highest value was observed from 31 kg P_2O_5 /fed with Aceitera.
2. Dry weight of leaves at 120 days from sowing in the second season was higher when using 15.5 kg P_2O_5 /fed with Giza 1.
3. Fresh weight of petal yield in the first season was higher when using 15.5 kg P_2O_5 /fed with Giza 1.
4. Dry weight of petal yield was recorded by Aceitera variety with control.
5. Heads number/plant in the first season was higher when used PDB with Giza 1.

3. Nitroge x Phosphorus :

This interaction had significant only on :

1. Stem frish weight at age 90 days from sowing in the first season, whereas the highst value was observed from 60 kg N + 15.5 kg P_2O_5 /fed.
2. Stem frish weight at age 120 days from sowing in the first season was observed whereas nil nitrogen applied with 15.5 kg P_2O_5 kg/fed.

3. Number of leaves/plant at 90 days from sowing in the first season, when used N-fixation with 31 kg P_2O_5 /fed.
4. Leaves dry weight at 60 days from sowing in the second season, whereas the highest value was recorded when used 60 kg N with 15.5 kg P_2O_5 /fed.
5. Leaves dry weight at 90 days from sowing in the second season, whereas the highest value was observed from 60 kg N with (PDB).

4. Varieties x Nitrogen x Phosphorus :

This interaction had significant only on :

1. Specific leaf weight at age 120 days from sowing in the second season, whereas the highest was observed from Giza 1, 30 kg N/fed with (PDB).
2. Fresh weight of stem and branches at 120 days from sowing in the first season was recorded by used Aceitera variety, nil nitrogen and 31 kg P_2O_5 /fed.