Effect of some mineral and bio-fertilization on some varietes of safflower under calcareous soils

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-One field experiment was carried out at Mariut Research Station,Desert Research Center, Egypt during the two successive seasons1994/1995 and 1995/1996 to evaluate two safflower (Carthamus tinctoriusL.) varieties under different levels of mineral nitrogen and phosphorus andbio-fertilizer (nitrogen fixation and phosphate dissolving bacteria).The soil of the experiments is calcareous (27.06% CaC03) with asandy loam texture, a very low organic matter content (0.37) and pH value(8.20).Each experiment included 32 treatments which were the combinationbetween the two varieties (Giza 1 and Aceitera), four treatments of nitrogen .(zero, biofertilizer, 30 and 60 kg N/fed) as ammonium sulphate 20.6% Nand four treatments of phosphorus (zero, biofertilizer, 15.5 and 31.0 kgP20S/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 ofnitrogen were assigned at random within the sub-plot, while the P-Ievelswere 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. TIle two varieties (Giza 1 and Aceitera) showed no significantdifferences in stem length and stem diameter in both successive seasonsexcept at 120 days in the second one. The local variety (Giza 1) wassignificantly surpassed the exotic variety (Aceitera) in the two studiesgrowth i.e. stem length and stem diameter.2. The number of leaves/plant of two varieties was significant only at laterstage of growth (120 days from sowing) in the second season. Thehigher number of leaves/plant was recorded by local variety (Giza 1) ascompared to exotic one (Aceitera).\0..3. Leaf area/plant was not significantly affected by the two differentsvarieties, except at later stage (120 days) in the second season. Thehigh 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 secondseason.5. Specific leaf weight and number of leaves for head production were notaffected by two different varieties at all stages in the two successiveseasons.6. Varieties exhibited highly significant differences in leaves/stem andbranches ratio only at later growth stage (120 days from sowing) forboth seasons. The greatest value in the first season was obtained fromlocal variety and from exotic variety in the. second one.7. There were significant differences between two studied varieties infresh and dry weight of stem in the samples taken after 120 days fromsowing 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 thetwo tested varieties for both season.2. Seed yield and its components:1. Local variety Giza 1 recorded high number ofheads/plant in the twosuccessive seasons as compared with the exotic variety Aceitera, butthe differences was not significant in the first season.2. There was not significant differences between the two evaluatedvarieties in head weight in both seasons. However, the local varietyGiza 1 recorded higher values in the two successive seasons.3. The two varieties had a significant effect on head diameter of saflloweronly in the first season. The local variety produced chick diameter thanobtained 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 bothseasons.5. Statistical analysis show significant different in seeds weight/head asaffected by the two studied varieties. The high mean values wererecorded by, local variety in the

two growth seasons as compared withexotic variety (Aceitera) which produced the low value.6. 1000-seed weight, the exotic variety (Aceitera) surpassed the localvariety (Giza 1) in two successive seasons, but the difference was notsignificant in the first one.7. Seed yield kg/fed, exotic variety produced the high seed yield in thefirst season while the low yield was obtained from local variety withoutsignificant differences. In the second season, opposite resulted wasobtained whereas the local variety resulted the high value and theexotic one low value and the differencebetween them was significant.3. Oil yield and chemicalcontents:1. Protein, phosphorus and oil percentage in seeds were not affected bythe two different varieties in both seasons.2. There was significant difference between two varieties in the firstseason only in oil yield kg/fed whereas the exotic variety produced highoil yield. However in the second season the local variety Giza 1recorded the high oil yield, but tills differencewas not significant.II. Effect of Nitrogen Fertilizer:1. Growth characters and petal yield:1. Stem length was not significantly affected by the four nitrogentreatments at 90 and 120 days from sowing in the first season, but thischaracter was significantlyaffected by nitrogen fertilization (30 and 60kg N/fed) in the second one.2. Stem diameter was significantly affected by nitrogen supply for bothseasons at all sampling dates except at 90 days from planting in the firstseason. However, the differencesbetween the low mineral ofN (30 kgN/fed) and the nitrogen fixation did not reach to the 50/0 level ofsignificant.3. No. ofleaves/plant was significantlyaffected only at early age (60 days from planting in the first season and at later age (120 days fromplanting) in the second season, 60 kg N/fed produced the higher valueof no. of leaves/plant in both seasons at two significant sample, but the-- --- ...._-- - -- _.--- 123 -differences between the low mineral level and nitrogen fixation werenot significant.4. Leaf. area/plant was significantly affected by nitrogen treatment in thefirst sample for the first season and in the third sample for the secondone. The high level of mineral nitrogen produced the increases in leafarea/plant as compared with other treatments.5. Specific leaf weight in the two successive growth seasons for eachsampling date i.e. 60, 90 and 120 days from sowing were notsignificantly affected by nitrogen application.6. No. of leaves for head production was significantly affected by nitrogentreatments only in the third sample for the second’season. The highvalue was obtained from nitrogen fixation as compared with usingmineral nitrogen as well as the nil nitrogen treatment.7. Leaves/stem and branches ratio was significantly affected by nitrogensupply at age (120 days) for both seasons. Thegreat value wasobtained when plant received 60 kg N/fed to following by N-fixationand without nitrogen treatment respectively.8. The fresh weight of stem and branches was affected by nitrogenfertilizer only at later age in the second season where it was significantgreat with nitrogen adding up to 60 kg N/fed.9. Fresh weight of leaves was significantly affected by using nitrogenapplication in third sample for both season and in the second sample inthe second one. Raising nitrogen supply up to 60 kg N/fed increasedsignificantly the leaf fresh weight. The comparison between nitrogen-fixation and using the low mineral level (30 kg N/fed) was notsignificant at third sampe1 for both seasons.10. Leaves dry weight was significant affected by nitrogen treatments atthe third sample in the second season. The high significant value wasresulted when plants were received 60 kg N/fed, as compared withnitrogen fixation and control. The differences between nitrogen fixationand the low level of mineral nitrogen (30 kg N/fed) did not reach to the5% level of significance ..11. There was a significant differences in fresh and dry weight of petalyield as affected by mineral nitrogen fertilizer for the second season, itwas increased with increasing N-Ievel up to 60 kg N/fed.2. Seed yield and its components:1. Heads number/plant was significantly increased with mineral nitrogensupply as compared with N-fixation. The highest value was obtainedwhen plant recieved 30 kg N/fed.2. Mineral nitrogen caused the depression in head weight for bothseasons, whereas the highest value was obtained from N-fixation.3. There was no relevance between different treatment of nitrogen andhead diameter for both seasons.4. Seeds numberlhead was not significant affected by all treatments of nitrogen for both growth seasons.5. Seeds weightlhead was no significant differences between the nitrogentreatments.6. The weight of 1000-seed was not significantly affected by nitrogenfertilizer 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 thatseed yield gradually increased up to 60 kg N/fed in the two successiveseasons. 3. Oil yield and chemical contents:1. The differences in protein 0,10 were significantfor both seasons, withregard to this chemical content,

there was a gradually increasingnitrogen supply up to 60 kg N/fed.2. Phosphorus % in seeds of safllower was not affected by nitrogenfertilizer for both season.3. The oil percentage was significantaffected by nitrogen application inthe second season.4. Nitrogen treatment significant effected on oil yield in the secondseason.III. Effect of Phosphorus Fertilizer:1. Growth characters and petal yield:1. There are no significant differencesbetween phosphorus treatments on\' stem length except at later age for second season, the differencesbetween (PDB) and the low mineral level were not significant.2. Results obtained that there are no relevance between the phosphorusfertilizer as mineral or (PDB) and stem diameter.3. The number of leaves/plant was significantly affected by phosphorusapplication only in the first season at age 120 days. Treatments couldbe arranged in a descending order as following 31.0, 15.5 kg P205/fedand phosphate solubilizing without significant.4. Leaf area/plant was significantly affected by phosphorus applicationonly in the first season at age 120 days. The highest values wereattributed from 31 kg P20S/fed as following by phosphate solubilizingwithout significant.5. Leaf area index and specific leaf weight were not significantly affectedby phosphorus fertilizer for both seasons. 6. No. of leaves for bead production was significantly affected byphosphorus fertilizer at 120 days from planting in the first season, ascompared to control.7. Leaf/stem and branches ratio was not affected by phosphorus fertilizerat all samples taken for both seasons.8. Analysis of variance revealed significant differences in stem andbranches fresh and dry weight by different so~ce of phosphorusfertilization except at 90 days from sowing. Raising phosphorus supplyfrom 15.5 to 31.0 kg P20S/fed was significantly increased stem +branches fresh weight in the first season, but without significant in thesecond one. Dry weight of stem + branches the differences between15.5 and 31.0 kg P20S/fed were not significant for two seasons.9. Fresh weight of leaves were significantly affected by phosphorusfertilization only at early age (60 days) in the first season and at laterage (120 days) in the second one. The highest value was observed byusing 15.5 kg P205/fed for the early age, but in the second season thehighest value was attained from seed inoculated with (PDB).10. Phosphorus application significantly affected on leaves dry weight ascompared to without fertilizer at later age (120 days from sowing) forboth seasons.11. There is no significant differences between the studied treatment on thefresh and dry weight of petal yield kg/fed in the two successiveseasons.2. Seed yield and its components:1. Treatment of phosphorus fertilizer had no significant effect on headsnumber/plant.2. The effect of phosphorus fertilizer had no significant effect on headweight for both seasons.3. Head diameter was not significant effected by the different source ofphosphorus fertilizer.4. The significant difference between the phosphorus treatments in seedsnumber/head in the first season. The highest value was obtained fromseed inoculated by phosphate dissolvingbacteria and it was significantdeclined by using phosphorus supply at 15.5 kg P20S/fed and 31 kgP20s/fed and the difference between them were not significant.5. Seeds weightlhead for both seasons were not significant by alltreatments of phosphorus.6. Weight of IOOO-seed was not significant by the treatment ofphosphorus.7. Seed yield kg/fed was not affected by adding different levels ofphosphorus and using PDB, under two growth seasons.3. Oil yield and chemical contents :1. Protein percentage was significantly affected by phosphorus fertilizeronly in the first season. Protein % significantly increased by using thetwo mineral phosphorus as well as (PDP) as compared with controltreatment, but the difference between these three treatments were notsignificant.2. Phosphorus percentage was significantly increased by phosphorusfertilizer in both growth seasons. The high value of phosphorus wasrecorded by using (PDB).3. Oil percentage was not significantly affected by different treatments ofphosphorus fertilizer under the two growth seasons. -4. Oil yield kg/fed was not significantly affected by different treatments ofphosphorus fertilizer under the two growth seasons.N. 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, whereasthe 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 ofleaves/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 t1e first season,whereas the highest was recorded when using N-fixation with Giza 1.S. Protein percentage of safilower seed in the first season was higherwhen 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 P20s/fed withAceitera.2. Dry weight of leaves at 120 days from sowing in the second seasonwas higher when using 15.5 kg P20S/fed with Giza 1.3. Fresh weight of petal yield in the first season was higher when using15.5 kg P20s/fed with Giza 1.4. Dry weight of petal yield was recorded by Aceitera variety withcontrol. 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 P20S1fed. 2. Stem frish weight at age 120 days from sowing in the first season wasobserved whereas nil nitrogen applied with 15.5 kg P205 kg/fed.3. Number of leaves/plant at 90 days from sowing in the first season,when used N-fixation with 31 kg P20S/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 15.5kg P20S/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 leafweight at age 120 days from sowing in th,e.- 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.