Productivity of sun flower crop helianthus annus,l under irrigation with salilized water conditions

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Two pot experiments were conducte III the green-house of theNational Research Centre, Dokki, Giza it 1996 and 1997 growingseasons to study the effect of some growth r gulators and irrigating withdifferent levels of salinized water on growth, orne physiological aspects.yield and seed constituents of sunflower cv, y-sun,Each experiment included 21 tr atments which were thecombinations of three levels of salinized wate (0, 3000, 6000 ppm) in theform of chloride type and seven growth r gulator treatments as seedsoaking in 10, 20 % Polyethylene glycole (smotic stress) for 24 hours,Paclobutrazol (PBZ) and Uniconazole (Uni .) (growth retardants) of 10,20 ppm for each for 5 hours. in addition to ontrol treatment (untreated)seeds.Treatments were arranged in rando ’zed complete block designsystem in 10 replicates. The obtained res ts could be summarized asfollows:I. Effect of salinity:1. Germination percentage:Salinity significantly decreased ermination percentage ofsunflower seeds. The reduction was more su stantial under 6000 ppm andthe percentage of depression was 24.3 % as c mpared with the control.2. Vegetative growth characters:Salinity tended to decrease signific ntly different characteristicsof plant growth represented in plant heig t, number and area of green103leaves as well as dry weight of leaves, stern, head and the whole plantcompared with control treatment (irrigation ith normal water). Salinitycaused an increase in leaf thickness repres uting in decreasing S.L.A.(cmvg.)3. Photosynthetic pigments content:Salinity tended to increase photosyntl etic pigments slightly aschlorophyll a, chlorophyll b and carotenoid content in sunflower plantleaves under both 3000 and 6000 ppm sa inity level. Also, salinityincreased tile ratio of total chlorophyll a + b carotenoids, but decreasedtile ratio of chlorophyll alb.4. Stability of chlorophyll-protein-lipid co plex:Increasing salinity level up to 300 ppm tended to decreasestability of chlorophyll in tile tissues of s nflower plant leaves. Thedecrease was much more when salinity lev I increased to 6000 ppmcompared with control treatment.5. Cell sap concentration and proline con ent :Cell sap concentration (T.S.S.) and 0 motic potential as well asproline content were increased by increasin salinity level. The rate oftheir increase was according to the level of sali ity in water of irrigation.6. Yield and its components:Irrigating sunflower plants with s line water significantlydecreased head diameter, head weight, seed yi Id/plant, shelling %, 1000seed weight (seed index) as well as oil yield/pi- t. Salinity reduced headweight by 20.3 and 40.2 %, seed yield/plant y 33.3 and 51.1 % and oilyield by 48.5 and 65.3 % under 3000 and 6000 ppm salinity level,respectively as compared with the control.l(l~7. Oil, Protein and carbohydrates content:Saline water decreased the concentration 01 oil percentage as wellas protein % in sunflower seed tissues com ared to irrigation withnOllnal water. However, soluble and total -arbohydrates % wereincreased by increasing salinity level and the ·ate of increasing wassubstantace as salinity level raised up to 6000 ppt8. Nitrogen, potassium and sodium contentsTotal nitrogen in sunflower seeds dec eased as salinity levelincreased in water of irrigation up to 6000 pp . potassium and sodiumconcentrations as well as NaiK eased in sunflower seedtissues as salinity level increased in root mediu9. Fatty acids concentration:Increasing salinity level in the water irrigation to 3000 ppmdecreased palmitic acid concentration in sunflo er oil, but it increased assalinity level increased up to 6000 ppm. Oleic id, however, behaved inan opposite manner, where it increased by increasing salinity level.Linoleic acid concentration linearly decreased a salinity level increased.n. Effect of growth regulators:1. Germination percentage:Paclobutrazol

(PBZ) and Uniconazole (nic.) under the two testedconcentrations (10 and 20 ppm) as well as 20 % polyethylene glycole(PEG) as osmotic stress significantly nhibited the germinationpercentage. However, soaking seeds in 10% 'EG significantly increasedgennination percentage.2. Vegetative growth characters:Soaking sunflower seeds pre-sowing in ei ier uniconazole (Uuic.)or paclobutrazol (PBZ) at both concentrations exhibited remarkeable.effect on decreasing plant height as well as dry eight of different plantorgans. The effect was significant for all of th studied developmentalplant stages. The rate of. decreasing was incr ased as concentl'ation ofgrowdl retardants increased. However, Polyethy ene glycole (PEG) at theconcentration of 10 and 20 % significantly i reased plant height andtotal dry weight at all of the studied plant stages.Generally all seed soaking treatments aused an increase in leafthickness representing in decreasing S.L.A. and af area/plant.3. Photosynthetic pigments content:Soaking sunflower seeds pre-sowing ill either PBZ or Unic.solutions tended to increase photosynilietic p gments as chlorophyll a,chlorophyll b and conseqeuntly total chlorop yll as well as carotenoidscontent in plant leaves. However, the highe t concentration (20 %) ofPEG decreased both green and orange pigment .4. Stability of chlorophyll-proteiD-lipid co plex:Both PBZ and Unic. growth r tardants with their twoconcentrations tended to increase stability , f chlorophyll-protein-lipidcomplex in sunflwoer plant leaves. Treatm nt with 20 % PEG gave thelowest value of chlorophyll stability.5. Cell sap concentration and proline con ent :Soaking sunflower seeds pre-sowin' in any of tested growthregulator tended to inc;;reasethe accumulatio of proline in leaf tissues aswell as the cell sap concentration and osmoti potential.6. Yield and its components:All soaking treatments in growth regula rs solutions recordedhigher values 111 yield and its components than untreated one.Uniconazole at 20 ppm surpassed all of the ther treatments as forincreasing head diameter, head weight and see yield/plant followed by10% PEG and 10 ppm Unic. treatments.7. Oil, Protein and Carbohydrates content:Soaking sunflower seeds pre-sown in eith riO % PEG or 10 or 20ppm Unic. tented to increase oil percentage sightly. However, proteinpercentage as well as soluble and total carbo ydrates increased due tosoaking seeds in all of the tested growth reg lator solutions comparedwith those of untreated ones.8. Nitrogen, potassium and sodium contents:Growth regulators tended to increase nitrogen, potassium andsodium in seed tissues. However, they caus reduction in Na/K ratiocompared with untreated seeds.9. Fatty acids concentration:The lowest ratio of oleic/linoleic was recorded when using20% PEG (the best one). Also the lowest ra io of saturated/unsaturatedfatty acid ratio was obtained from soaking see in 10% PEG.III. Effect of the interaction between salnity levels and growthregulators:J. Germination percentageSoaking seeds in J 0 % PEG solu ion tended to increasegennination percentage significantly under i igation with normal wateror 3000ppm salinity level. However, the inc 'ease was not significantunder 6000 ppm level of salinity. Generally, a Itested growth retardantsas PBZ and Unic. reduced germination per entage under all salinitylevels.2. Vegetative grwoth characters:All growth retardant treatments d reased plant height, dryweight of all plant parts as well as the area f leaves, except that of 20ppm Unic. which surpassed control treatme t. These results were hueunder 3000 and 6000 ppm levels of salinity at oth budding and floweringstages, while soaking seeds in 10% PEG si ificantly increased plantheight and dry weight of whole plant under 000 and 6000 ppm salinitylevel and insignificantly increased leaves ea under both levels ofsalinity at flowering stage.3. Photosynthetic pigments content:At vegetative growth stage, soaking eeds in either 10 or 20 %Unic. and irrigated with 3000 or 6000 ppi salinized water formed thehighest photosynthetic pigments content. H wever, at budding stage, 20ppm Unic. combined .with 6000 ppm salin ty level surpassed all of theother interactions as for increasing chl.a, cl I. a+b and carets. comparedwith the other interactions. AI flowering slag soaking seeds in any of thetested growth regulators as PEG. PBZ and Unic. increased totalchlorophyll (a+b) compared with untreated sods.lOX4. Stability of chlorophyll-protcin-lipid COl plex:The most promising interaction for increasing stability ofchlorophyll was when seeds soaked in 10 pp Unic. and irrigated withnormal water. 20 % PEG tended to decrease s ch paramters under 3000and 6000 ppm level of salinity.5. Cell sap concentration and proline cont nt:Soaking seeds in any of the tested gro regulator as PEG, PBZand Unic. solution at the two concentra ions increased cell sapconcentration as well as prolien content in leav s under all salinity levels.Proline content increased with increasing bo salinity level and growthregulator concentrations.6. Yield and its

components :Under irrigation with normal water, soaking seeds in 20 ppmUnic. significantly increased both seed and 0 I yield/plant. The treatmentof 10 % PEG recorded the highest seed inde . Under 3000 ppm salinitylevel, 10 % PEG recorded the highest seed d oil yield/plant as welI asseed index. However, under irrigation with 6 00 ppm salinized water, 20ppm Unic. gave the highest seed and oil y eld, but seed index was thehighest due to 10 ppm Unic. treatment under t e same salinity level.7. Oil, Protein and Carbohydrates contenGenerally 1soaking seeds in any of e tested growth regulatortended to increase oil percentage slightly un er irrigation with 3000 and6000 ppm salinity level. Such increase was nore obvious as for protein.soluble and total carbohydrates percentage co pared with untreacd seeds.8. Nitrogen, sodium and potassium cnnc ntrations :Under saline condition, soaking see s in solutions of the testedgrowth regulators increased nitrogen, sodinm and potassiumconcentrations. However, it decreased the rati of Na/K compared withthe untreated seeds.9. Fatty acids concentration:Soaking seeds in 20 % PEG gave the higl est value of linoleic acidunder 3000 ppm salinity level. However, 10% PEG treatment increasedthe unsaturated fatty acids: Under 6000 ppm Ie el of salinity, 10% PEGrecorded the highest value of linoleic acid, while 10 ppm Unic. caused thehighest concentration of the unsaturated fatty aci .