The influence of some growth regulators and mineral nutrients on growth and drought ”resistance of some fig varieties

Adly Farahat Mostafa Al-Khateeb

The present study was carried out duirng 1992 and 1993 seasonsat the nursery of Horticultural Research Institute, Giza - Egypt.Uniform and healthy one-year old transplants, of El-Sultani, Giziand Kadota Fig cultivrs were the plant material of this study, plasticpots of 30 cm. diameter that had been fined with constant weight ofnons aline sandy loame soil taken from a depth of 0-30 em, from thesurface soil layer of El-Kassasine, Egypt. This area is located about40 Km. west of Ismailia city. Soil wer chemically and mechanicallyanalyzed before period of equilibration. The pots were filled withabout 10 Kg of soil, then the three fig cultivar transplants wereplanted 111 early February. Irrigation was done at the rate of750mL/pot at two days intervals till 1st March when the treatments werestared and continued until October in two successive seasons. Thus,we had a three factorial experiments, each one arranged in a completerandomized design to study the following items : 1- The effect of different available soil water levels (100%, 75% ,50% and 250/0)on fig transplants, 2- Effect of some growth retardants (ccc, B9 and PP333 at 250 ppmor 500 ppm) foliar application on fig transplants grown under 25%available soil water at three time i.e., IHMay, 15th June and 1stAugust.3- Effect of (P, K and Mo) foliar spray on fig transplants grown under25% available soil water at three time i.e., 1.st May, 15th. June and1.s1 August.The obtained results could be summarized as follows : Experiment I:The effect of different available soil water levels on fig transplants:a) vegetative growth:1- With respect to the specific effect of available soil water levels onvegetative growth, the obtained data showed that, growthparameters values including stem length, number of leaves/plant,average leaf area, assimulation area, both fresh and dry weightof various plant organs (leaves, stem, roots and total plant) weregreatest when transplants were growing under low water stress(l00% available soil water). These values decreased withincreasing the soil moisture tension to reach the minimum when thesoil moisture availability were lowered to be 25%.2- Concerning the specific effect of cultivars . on vegetativegrowth, Sultani fig cultivar showed generally the highest values ofvegetative growth i.e., leaf area, both fresh and dry weight of plantorgans (leaves, stem, root and total plant) followed in decreasingorder Kadota transplants followed by Gizi plants during the twoseasons of study. On the other hand, Gizi fig cultivar showed thehighest value of number of leaves/plant, assimilation area andleaf fresh and dry weight followed In a decreasing order bothSultani and Kadota fig transplants.3- A remarkable interaction was shown between available soil waterlevel and cultivars. Meanwhile, Kadota transplants grown under100% available soil water showed the greatest values of stemlength while Gizi transplants was lowered value in this respect.In addition, Gizi transplants had the greatest value of leavesnumber/plant during the study.Moreover, Sultani fig plants showedthe greatest value of leaf area, fresh and dry weight of plant organs(leaves, stem, root and total plant) during the two seasons of study.b) Pllysiological aspects:1- Regarding the specific effect of physiological aspects. Theobtained data showed that, under severe water stress the hard leafcharacter, leaf succulence and leaf relative turigidity values of figtransplants were increased2- With respect to the specific effect of cultivars on physiologicalaspects, the obtained results showed that, Gizi fig transplants hadthe highest value of leaf relative turigidity and leaf succulenceduring the study.3- A remarkable interaction was found

between available soil waterand cultivars. Data showed that values of hard leaf character, leafsucculence and leaf relative turgidity were increased under severewater stress.c) Chemical constituents:1- With respect to the specific effect of available soil water levels onchemical constituents, the obtained results showed that the foliarchlorophyll A, Band carotenoids, stem total soluble sugars, freeaminoacids, proline acids and leaf nitrogen content increased bydecreasing the available soil moisture, while stem totalcarbohydrates and leaf (P and K) contents were exhibited oppositetrends.2- Concerning the specific effect of cultivars on chemical constituents,the obtained results clear that, both total soluble sugars and totalcarbohydrates were not significantly. On the other hand, Gizi figtransplant had the greatest value of leaf chlorophyll A, free aminoacid and proline followed in a decreasing order Sultani cultivarfollowed by Kadota transplants, while Kadota and Sultani figcultivars was the highest value of leaf chlorophyll Bandcarotenoids content during the two seasons of study, respectively.In addition, Gizi transplants showed the highest value of leaf (N ,P and K) content followed in a decreasing order Sultani figfollowed by Kadota cultivar during the study3- A considerable interaction between available soil water andcultivars on chemical constituents, data obtained that, where, thestem soluble sugars, free amino acids, proline acids and leafnitrogenvalues significantly increased as the available soil waterdecreased, on the contrary to the stern total carbohydrate leafchlorophyll (A & B) and carotenoids and leaf (P and K) valueswhich followed an opposite trend in three fig cultivars during thetwo seasons of study.d) Anatomical structure:By raising the moisture soil stress, thickness of leaf cuticleand epidermal cells and as well as the number of hairs on the lowerepiderm increased steadily, while in reverse to the thickness ofmesophyll tissue and rnidvein, average area of palisade and spongycells decreased. from the above mentioned results it could beconcluded that fig transplants, adapted itself to stress conditionsthrough increasing the thickness of the cuticle and the epidermalcells and increasing number and length of leaves hairs on both ofleaves surface .Experiment II: Effect of ccc, B9 and PP333 foliar spray on fig transplants under25% available soil water:a} Vegetative growth:1- Concerning the specific effect of concentration level on vegetativegrowth - the obtained data showed that, both low and high levelssignificantly increased vegetative growth including stem length,number of leaves/plant assimilation area, fresh and dry weight ofplant organs (leaves, stem, root and total plant) except stem dryweight. In addition, low level was more effective than high levelduring the two seasons of study.2- With respect to the specific effect of growth retardants kind onvegetative growth, data revealed that, growth retardants increasedsignificantly growth parameters values as compared with controlexcept stem dry weight, the effect was not significant. In addition,leaf area was reduced by foliar application with any kind of growthretardants used.3- Concerning the specific effect of cultivars on vegetative growth,the obtained results showed that, Sultani fig transplants hadsignificantly the greatest value of fresh and dry weight of plantorgans i.e. stem, root and total plant followed in a decreasing orderKadota followed by Gizi cultivar.4- A significant interaction between concentration, growthretardants kind and cultivars was noticed. In this respect, datashowed that, either ccc or B9 or PP333 foliar application increasedsignificantly their stem length, number of leaves/plant, assimilationarea, fresh and dry weight of various plant organs (leaves, stem,roots and total plant). On the contrary, leaf area was decreasedsignificantly during the study.b) Physiologtcat aspects:I-Regarding the specific effect of concentration level on physiologicalaspects. The obtained data showed that, treating such figtransplanting with low or high concentration of growth retardantsincreased significantly hard leaf character, succulence grade andleaf relative turgidity during the two seasons of study.2- With respect to the specifid effect of growth retardant kind, theobtained results showed that growth retardants (ccc, B9 andPP333) increased significantly hard leaf character, succulencegrade and leaf relative turgidity. In addition ccc more effective,followed in a decreasing order B9 followed by PP333 .3- Regarding the specific effect of cultivars on physiological aspects,the obtained results showed that Gizi fig transplants hadsignificantly the greatest value of hard leaf character, leafsucculence grade and leaf relative turigidity, followed in adecreasing order Sultani followed by Kadota.4- A remarkable interaction was found between, concentration, growthretardant kind and cultivar. However, fig transplants treating withgrowth retardants (ccc, B9 and PP333) at 250 or 500 ppm raisedthe values of, hard leaf character, leaf succulence grade and leafrelative turigidity during 1992 and 1993 seasons.c)

Chemical constituents:1- With respect to the specific effect of concentration level onchemical constituents. The obtained data showed that, treatingsuch fig transplanting with low or high concentration of growthretardants increased significantly foliar pigments chlorophyll (A, Band carotenoids) stem total carbohydrates, free amino acids, leaf(N, P and K) content, while leaf prolin content and stemcarbohydrates content were reduced as compared with controlduring 1992 and 1993 seasons.2- Concerning the specificf effect of growth retardants kind onchemical constituents, the obtained results showed that increasedccc, B9 and PP333 the values of foliar chlorophyll (A & B),carotenoids stem total carbohydrate, leaf (P and K) content, whilesoluble sugars, free amino acid, proline and leaf (N) contents werereduced during the study.3- Regarding the specific effect of cultivars on chemical constituents,the obtained results clear that, Gizi fig transplants had significantlythe greatest value leaf chlorophyll A and carotenoids of solublesugars, free amino acid, prolin content, leaf (N, P and K) contentsfollowed in a decreasing order Sultani followed by Kadotacultivar. On the other contrary, stem carbohydrate content was noteffected during 1992 and 1993 seasons.4- A considerable interaction between concentration and growthretardant kind as well as cultivars on chemical constituents, dataobtained that, where, the three fig cultivar sprayed with ccc at 250ppm increased stem carbohydrate content, Free amino acid, Prolinecontent, leaf chlorophyll (A, Band carotenoids) content and leaf(N, P and K) contents. While the soluble sugars was not affectedduring the two seasons of study.from the above mentioned results, it could be concluded that,lowering soil moisture level to be 25%) available soil water had anadverse effect on the fig transplants growth. Moreover, one mayrecommended that the 50% available soil water level to be promissmg for normal growth. Other alternative is to maintain the transplants at the 25% available soil water level and spray them with ccc at the concentration of 500 ppm, such treatment wouldseems to enable the transplants to stand the conditions of high soilmoisture stress.Experiment III.Effect of (P, K and Mo) foliar spray on fig transplants under 250/0available water : a) Vegetative growth:1- Spraying the fig transplants which survived under high water stress(250/0 A.W.) with (P or K) at either 250 ppm or 500 ppm or Mo at25 ppm or 50 ppm were significantly increased their stem length,the number of leaves/plant, leaf area, assimulation area, fresh anddry weight of various plant organs (leaves, stem and roots) as wellas total plant. In addition high concentration more effective ascompared with the two concentration or control plants.2- Concerning the specific effect of mineral nutrient kind onvegetative growth data revealed that mineral nutrient increasedgrowth parameters values as compared with control. Moreover,potassium foliar application produced the highest value for growthparameters followed in a decreasing order by phosphorusapplication followed by (Mo) foliar spray regardless concentration and cultivars,3- With respect to the specific effect of cultivars on vegetativegrowth, the obtained data showed that Sultani fig transplant hadsignificantly the greatest value of vegetativ growth i.e. stemlength, leaf area ., fresh and dry weight of stem roots and totalplant followed in a decreasing order Kadota cultivars followed byGizi fig transplant during 1992 and 1993 seasons.4- A considerable interaction between concentration and kind mineral nutrient as well as cultivars on vegetative growth., where, Sultani fig transplants sprayed with (K) at 500 ppm showed the highestvalue of stem length, leaf area, fresh and dry weight of variousplant organs except leaves fresh and dry weight whereas Gizitransplants sprayed with (K) at 250 ppm showd the highest valueof number of leaves/plant and assimulation area.In addition, assimulation leaf area and leaves fresh and dryweight were no definit trend in this respect.b) Physiological aspects:1- Regarding the specific effect of concentration level on phsiologicalaspects, the obtained data showed that low concentration levelraised the values of hard leaf character and leaf succulence gradewhile leaf relative turgidity percentage was not affected duirng theboth seasons of studyincreased with high level of concentration.2- Concerning the specific effect of mineral nutrient kind on physiological aspects, treating such fig transplants with potassiumfoliar application hard leaf character and leaf relative turgidityfollowed in a decreasing order phosphorus application followed by(Mo) foliar spray during the study.3- With respect to the specific effect of cultivars on physiologicalaspects, the obtained results showed that Sultani fig transplantswas not affected hard leaf character, leaf succulence grade and leafrelative turigidity was not affected.4- A significant interaction was found between concentration level,kind of mineral nutrient and cultivars was detacted where, Gizi figtransplants sprayed with phosphorous at 500 ppm showed thegreatest value

of the three cultivars sprayed with (K) foliarapplication at 500 ppm caused the highest value of hard leafcharacter, leaf succulence grade and leaf relative turgidity ascompared with other treatments during the study.c) Chemical constituents:1- With respect to the specific effect of concentration level onchemical constituents, the obtained data showed that, solublesugars, free amino acid and prolein were significantly decrease ascompared with control. In addition, stem total carbohydratecontent, leaf carotenoids content, leaf (N, P and K) contents weresignificantly increase than control while leaf chlorophyll (A & B)was not affected during 1992 and 1993 seasons.2- Concerning the specific effect of mineral nutrient kind on chemicalconstituents data showed that either (P or K) foliar applicationsignificantly reduced total soluble sugars, free amino acid, Prolineand leaf nitrogen content, while it increase carbohydrate contentand leaf (P) as well as leaf (K) contents during the study.In addition, (Mo) foliar application reduced stem total solublesugars, leaf free amino acids, leaf (N and K) contents. Moreover,stem carbohydrate, proline content and leaf (P) contents wasincreased during the study.3- Regarding the specific effect of cultivars on chemical constituents,the obtained results showed that Gizi fig trnsplants hadsignificantly the greatest value leaf chlorophyull A of free aminoacid, leaf (N, P and K) contents followed in a decreasing orderSultani followed by Kadota a fig transplants. In addition leafchlorophyll B, and carotenoids was nof affected during the twoseasons of study.4- A significant interaction was found between concentration levels,mineral nutrient kind and cultivars was detacted, where Gizitransplants sprayed with phosphorous at 500 ppm showed thegreatest value of leaf carotenoids contents as compared with othertreatments while chlorophyll A and B was not affected. Moreover,plants sprayed with (P or K or Mo) at any levels of concentrationshowed a lowest value of soluble sugars, free amino acids,proline. In addition, it increased leaf (P and K) contents, whilestem carbohydrate content and leaf (N) contents no definit trendduring the two seasons.