Physiological studies on coffea arabica seedling

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(This study was carried out in the experimental station at the Faculty of Agriculture, Moshtohor, Kaliobia Governorate during two successive seasons of 1989 and 1990.The purpose aimed to investigate the effect of some pre-sowing treatments on seed germination and the response of yaung Coffea arabica seedlings to mineral nutrition as well as GA foliar spray. Thus three experiments were conducted as follows : Experiment I:Pre-sowing seed treatments either by soaking in some growth regulators and chemical solutions as well as ash dusting in relation to seed germination of Coffea arabica. The experiment was conducted in a green house and the following pre-sowing seed treat-ments were applied as follows : 1-Check treatment (control).2-Ash dusting3-Soaking in tap water for 24 hours.4-Soaking in warm water (40°C) for 2 hours. 5-Soaking in 100 ppm GA for 24 hours.6-Soaking in 50 ppm BA for 24 hours.-Soaking in 15 ppm citric acid for 24 hours.8-Soaking in 100 ppm EDTA for 24 hours.9-Soaking in 50 ppm MnSO4 for 24 hours.10-Soaking in 50 ppm ZnSO4 for 24 hours.11-Soaking in 5 ppm Borax for 24 hours.The above mentioned treatments, were arranged in a complete randomized design, each was replicated four times, where every replicate was represented by 25 seeds. Time required to start emergence, germi-nation %, germination rate, germination value and time required for 50% germination as affected by different treatments were studied Experiment II : The response of Coffea arabica seedlings to GA, N, Zn and Mn foliar sprays either solely or in combination, accordingly the following treatments were investigated as follows : 1-Tap water foliar spray (control).2-GA3 at 100 ppm foliar spray.3-Urea at it foliar spray.4-(NH4)2SO4 at it foliar spray.5-ZnSO4 at 500 ppm foliar spray.6-MnSO4 at 500 ppm foliar spray.7-ZnSO4 at 500 ppm + MnSO4 at 500 ppm foliar spray.8-Urea at 1% + GA3 at 100 ppm foliar spray.9-Urea at 1% + ZnSO4 at 500 ppm foliar srpay.10-Urea at 1% + MnSO4 at 500 ppm foliar spray.Spraying was done 4 times on Arpil 15112, May 15112, June 15112 and July 15112 during each season by covering the whole foliage of each seedling and Tween-20 at 0.1% was added to all spray solutions as a surfactant.Experiment III:This experiment dealing with the response of Coffea arabica seedlings to the N,P,K and Zn soil fertilization each at two rates, thus the treatment used were fertilization as follows:1-Control ”No fertlizer”.2-(NH4)2SO4 at 2.0 gm actual N/seedling.3-(NH4)2SO4 at 4.0 gm actual N/seedling.4-Superphosphate at 2.0 gm P205/seedling5-Superphosphate at 4.0 gm P205/seedling.6-Potassium sulphate at 2.0 gm K20/seedling.7-Potassium sulphate at 4.0 gm K20/seedling.8-ZnSO4 at 0.5 gm/seedling.9-ZnSO4 at 1.0 gm/seedling.Treatments were arranged in a complete randomized design and replicated five times each on a double seedlings.Soil application was done 4 times one forth the dose was added on April 15112, May 15112, June 1511.1 and July 151.12 during each season. Vegetative growth and nutritional status of Coffea arabica seed-lings as affected by either foliar or soil application treatments were studied. Thus, the obtained results could be summarized as follow : A- Germination: Experiment 11-Soaking in tap water, gibberellin at 1500 pm, citric acid at 15 ppm and MnSO4 at 50 ppm as well as ash dusting took the same period (70 days) required for start emergence. 2-Soaking Coffea arabica seeds in either EDTA at 100 ppm or BA at 50 ppm or Borax at 5 ppm enhanced the start of emergence about (6-7 days) and shortened the time required for 50% germination in both seasons. 3-Soaking Coffea arabica seeds in water or any of the chemical solution as well as ash dusting resulted in shorten the time for 50% germination and improved germination percentage, rate and value.4- Soaking Coffea arabica seeds in MnSO4 at 50ppm or ZnSO4 solutions at 50 ppm gave highest germination

percentage and improved germination rate and value while GA at 1500 ppm and BA at 50 ppm showed the reverse.B- Vegetative growth : Experiment II:1-Foliar sprays with GA or any of the different nutrient solutions used increased number of leaves, stem length, root length, leaves, stem, root and total plant dry weights as compared with control. Since, the lowest value of number of leaves/plant, stem length, root length and dry weight of the different plant organs i.e. (leaves, stem, root and total plant) were those of check treatment. On the contrary, the highest values were that of (ZnSO4 + MnSO4) and (urea + ZnSO4) sprayed Coffea arabica seedlings during the study.2-The different foliar spray treatments caused significant increase in top/root ratio except ZnSO4 foliar spray treatment where the increase was slight. On the other hand; the highest value of top/root ratio was that of (ZnSO4 (173)+ MnSO4), (urea + GA) and (urea + ZnSO4) treat-ments.Experiment III : 1-Soil application with ammonium sulphate, super-phosphate and potassium sulphate at the rates of (2.0 gm - 4.0 gm/plant) as well as ZnSO4 at the rate of (0.5 gm - 1.0 gm/plant) resulted in increasing number of leaves/plant, stem length, root length as well as plant organs dry weights (leaves, stem, root and total plant dry weight) as compared with control during the study. Since, the lowest value number of leaves/plant, stem length, root length and plant organs dry weights were those of check treatment. On the contrary, the highest value was that of ZnSO4 soil application either at the rate of 0.5 gm or 1.0 gm/plant.2-The different soil application treatments caused significant increase in top/root ratio over the control except with potassium sulphate at the rate of (2.0 gm or 4.0 gm) treatment resulted in slight increase. On the other hand, the lowest value of top/root ratio was that of check treatment while ZnSO4 soil applicationtreatments either at the rate of (0.5 gm or 1.0 gm/plant) resulted in the highest value. Moreover; all other treatments fell in between during the study. C-Leaf, stem and root mineral content : Experiment II:1-Spraying seedlings with GA solution decreased significantly leaf, stem and root nitrogen and iron contents while it increased signifi-cantly P,K,Ca,Mg and Mn in leaf, stem and root contents over the control in both seasons.2-There was a significant increase in leaf, stem and root-N, Mg, Fe and Mn contents as a result of spraying seedlings either with urea or (NH4)2SO4 but the reverse was true with P,K,Ca and Zn contents in both seasons. In addition, (NH4)2SO4 foliar spray treatment decreased significantly leaf, stem and root N,P,K,Ca,Mg, Fe,Mn and Zn contents as compared with urea treatment. 3-ZnSO4 at 500 ppm foliar spray treatment decreased significantly N,Ca and Mn while it caused highly significant increase in P,K and Zn leaf, stem and root of Coffea arabica seedlings. Moreover ,Mg and Fe were not affected as compared with the control during the study.4-Spraying seedlings with MnSO4 at concentration of 500 ppm caused highly significant increase in leaf, stem and root-K and Ca contents, while Mn and Zn contents were decreased significantly in all plant organs. Moreover, it failed to show a considerable effect on leaf, stem and root N,P,Mg and Fe contents. 5-Spraying Coffee arabica seedlings with ZnSO4 at 500 ppm combined with MnSO4 at 500 ppm increa-sed significantly P,K,Mn and Zn contents in leaf, stem and root while Ca and Mg were signifi-cantly decreased. Meanwhile, N and Fe were not affected considerably.6-Urea at 1% + GA at 100 ppm foliar spray increased significantly N,Ca,Mg,Fe and Mn contents in plant organs during both seasons. Moreover, P,K and Zn contents in leaf, stem and root were significantly decreased in all plant organs.7-Spraying seedlings with (urea + ZnSO4) increased significantly leaf, stem and root N,P,Fe and Zn contents while Ca and Mg contents were significantly decreased. Moreover, K and Mn contents in all plant organs were not affected during the study.8- Leaf, stem and root N,K,Mg,Fe,Mn and Zn contentsshowed a significant increase in the Coffea arabica seedlings sprayed with urea + MnSO4 while Ca content was significantly decreased. However, P content was not responsed.Experiment III : 1-Ammonium sulphate soil application (2.0 gm or 4.0 gm N/seedling) increased significantly leaf, stem and root N,Fe and Mn contents during the study. Moreover, P,K,Ca and Mg contents in plant organs were significantly decreased in Coffee arabica seedlings. Meanwhile, raising the supply of (NH4)2SO4 from (2.0 gm to 4.0 gm/seedling) decreased significantly leaf, stem and root N,P,K,Mn and Zn contents while Ca was slightly decreased. In addition Fe content was slightly increased in all plant organs during 1989 and 1990 seasons.2-Superphosphate soil fertilizer at the rate of (2.0 gm or 4.0 gm P205/seedling) caused highly significant increase in P,Ca,Mg,Fe,Mn and Zn contents in all plant organs of Coffea arabica seedlings while N and K were signifi-cantly decreased in all plant organs duringleaf, stem and root

were not affect during the study.In addition, raising the supply of $ZnSO_4$ from (0.5 gm to 1.0 gm/seedling) increased P,Fe,Mn and Zn contents significantly in all part of plant organs while Ca content was significantly decreased. Moreover, leaf, stem and root N,K and Mg content showed no definites trend in this respect.