Studies growth and flowering papaya

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This study was carried out during two consecutive seasons of 1995 and 1996 at the nursery of Plant Research Department, Nuclear Research Center, Anshas, Egypt. It included two parts :Partl: Effect of some chemical substances and gamma irradiation on seed germination, growth and blooming of emerged papaya plants .Mature papaya seeds cv. Fairchild were extracted from the fruits of one tree grown at the Experimental Farm of Barrage Horticultural Research Station, Qalyoubia Governorate. The seeds were collected in May of both 1994 and 1995 seasons and kept at room temperature up to the planting date. However, These seeds were subjected to one of the following treatments:5.1.1. Seeds were left without treatment (dry seeds) ”control” .5.1.2. Seeds were soaked in tap water for 24 hours. 5.1.3. Seeds were soaked for 24 hours in one of the following solutions :gibberellic acid (GA3) at { 500 & 1000 ppm}, naphthalene acetic acid (NAA) at {100 & 200 ppm}, paclobutrazol (PP333) at {100 & 200 ppm}, Thiourea (NH2CSNH2), at {50 & 100 ppm}, ethephon (CEPA) at {100 & 200 ppm}, sodium thiosulphate (Na2S2O3) at {50 & 100 ppm}, and zinc sulphate(ZnSO4) at { 1000 & 2000 PPni}•On the other hand , to study the effect of gamma irradiation on germination of papaya seeds , the previously collected seeds were subjected to one of the following treatments: seeds were left without treatment ”dry seeds”, other were soaked in tap water for 24 hours. Both dry seeds and water- soaked seeds were irradiated with gamma rays at 0, 1, 2, 4, 6, 8 and 10 Gray (1 Gray = 100 rad).Moreover , in 1995 and 1996 seasons, chemical treated seeds and gamma- irradiated seeds as well as untreated seeds ”control” were sown on April, 10 th in plastic bags {20 cm in diameter} filled with a mixture of sandy and clay soil { 1:1 by volume}, then the plastic bags were kept under greenhouse conditions. The treatments were arranged in a completely randomized design with ten replicate and each replicate was represented by a plastic bag sown with ten seeds. The effect of tested chemical substances and irradiation treatments on seed germination was evaluated through the following germination parameters: germination percentage, time {days} required to attain 50% germination, germination rate and germination value. Anyhow, the obtained results could be summarized as follows :5.1.1. Effect of some chemical substances on germination of papaya seeds .705.1.1.1. Germination percentage .All tested treatments except for 100 and 200 ppm PP333 enhanced germination percentage as compared with untreated seeds ”control”. The most promising treatments in enhancing germination percentage of papaya seeds in descending order were: 200 ppm ”CEPA”, 200 & 100 ppm ”GA3”, 100 ppm ”CEPA”, 100 and 200 ppm ”NAA” and 100 & 50 ”Na2S203” .5.1.1.2. Time required for 50% germination .Soaking papaya seeds in all tested chemical solutions caused highly significant reduction in the time {days} required to attain 50% germination as compared with those soaked in 100 & 200 ppm ”PP333” solutions and untreated seeds ”control”. Generally, seeds soaked in 500 &1000 ppm ”GA3” solutions required the shortest time to attain 50% germination . Besides, 1000 & 2000 ppm ”ZnSO4” solutions occupied the third and fourth positions in shortening the time required to attain 50% germination .5.1.1.3. Germination rate .Germination rate was greatly enhanced due to soaking seeds in different chemical solutions as compared with ”PP333”, untreated seeds ”control” and water- soaked seeds. The highest germination rates were obtained when seeds were soaked in solutions of 2000 & 1000 ppm ”ZnSO4”, 200 & 100 ppm ”CEPA” .715.1.1.4. Germination value .All tested treatments (except for PP333) enhanced germination value as compared with the control . Briefly, the most effective treatments in this respect were 2000 ppm Zinc sulphate ,(500 & 1000 ppm) GA3 and 200 ppm NAA treatments .5.1.2. Effect of gamma irradiation on germination of

papaya seeds.5.1.2.1. Germination percentage.Dry seeds and water- soaked seeds, irradiated with 1, 2, 4, 6, 8 and 10 Gray had higher germination percentage than unirradiated seeds, whether seeds were soaked or not in water . Generally, water- soaked seeds, irradiated with different doses of gamma rays gave higher germination percentage as compared with dry seeds, irradiated by the same doses of gamma rays. Briefly, the most promising treatments in enhancing germination percentage could be arranged in descending order as follows: water- soaked seeds, irradiated with 8, 10 , 2 or 6 Gray.5.1.2.2. Time required for 50% germination.Dry seeds and water- soaked seeds, irradiated with different doses of gamma rays shortened the time required to attain 50% germination as compared with unirradiated seeds. Generally, water- soaked seeds, irradiated with different doses of gamma rays induced higher position effect in this respect than did dry seeds, irradiated with the same doses of gamma rays. Shortly,72water- soaked seeds, irradiated with 8, 10, 4, 2, and 1 Gray gave the highest values in this concern .5.1.2.3. Germination rate .Dry seeds and water-soaked seeds, irradiated with gamma rays had higher germination rate as compared with untreated ones ”control”. Moreover, water- soaked seeds, irradiated with different doses of gamma rays induced higher values of germination rate as compared with analogous ones ”dry seeds” , irradiated with the same doses of gamma rays. Briefly, water- soaked seeds, irradiated with 8 or 10 Gray had the highest germinationrate .5.1.2.4. Germination value .Dry and water- soaked seeds , irradiated with different doses of gamma rays improved germination value as compared with unirradiated ones . Briefly , water- soaked seeds , irradiated with 8 or 10 Gray exerted the highest stimulative effect on germinationvalue .feet of =solute eliffeatinbst-- irradiation-on rowth and bloomm - _ o emergesTen weeks after seeds germination, the emerged plants of the previously treatments {chemical substances and gamma irradiation}, ten plants per each treatment, healthy and nearly similar in growth vigour were transplanted into orchard and planted at {2X2 ml apart in sandy loamy soil. The treatments were arranged in a73completely randomized block design with ten replicates for each treatment and each replicate was represented by one plant. Furthermore, as soon as the plants ,)f the different treatments reached the blooming stage, the following data were recorded: plant height, stem diameter{cm} at 5cm above the soil, number of leaves per plant, time {in days} required to attain b)oining stage, sex in plant i.e female or male and sex ratio,number of female flowers per plant and number of male inflorescences per plant. The obtained results could be summarized as follows:5.2.1. Effect of seeds soaking in some chemical solutions on growth and blooming of papaya plants.5.2.1.1. Plant height .Papaya plants arised from 2000 ppm ZnSO4- soaked seeds had the tallest stems at blooming stage. Also, 1000 ppm GA3, 100 ppm NAA and 1000 ppm ZnSO4- soaked seeds gave comparatively taller plants. On the contrary, the higher concentrations of CEPA and PP333 {200 ppm} produced the shortest plants, when attained blooming date.5.2.1.2. Stem diameter .Generally, 500 and 1000 ppm GA3 soaked seeds produced plants with the thickest stems at blooming stage. Also, soaking seeds in 100 and 200 ppm CEPA treatments enhanced stem diameter of emerged plants. On the contrary, 100 and 200 ppm PP333- soaked seeds74and untreated seeds ”control” produced plants with comparatively thinner stems .5.2.1.3. No. of leaves / plant .The highest number of leaves borne on papaya plants at blooming stage were obtained from 1000 ppm GA3, 1000 ppm ZnSO4, 100 ppm NAA, 500 ppm GA3 and 200 ppm NAA- soaked seeds. On the other hand, PP333, thiourea , untreated seeds ”control” and water-soaked seeds produced plants with comparatively the lowest number of leaves .5.2.1.4. Time required to attain blooming stage .Briefly, plants arised from 200 ppm PP333, 500 & 1000 ppm GA3, 200 ppm NAA, 100 ppm PP333, 100 ppm Na2S2O3, and 2000 ppm ZnSO4- soaked seeds, reached to blooming stage at shorter time compared with those arised from untreated seeds ”control” .5.2.1.5. Percentage of female plants .Higher percentage of female plants were resulted when the seeds were soaked in 100 ppm Na2S2O3, 200 ppm ”CEPA”, 1000 & 2000 ppm ZnSO4 and 50 ppm Na2S2O3 solutions.5.2.1.6. Percentage of male plants.Generally, untreated seeds ”control” and water-soaked seeds gave higher percentage of male plants. On the contrary, the percentage of male plants arised from Na2S2O3- soaked seeds was nil.755.2.1.7. No. of female flowers / plants .The highest number of female flowers per plant were borne on plants arised from 100 ppm Na2S2O3, 2000 ppm ZnSO4, 500 ppm GA3, 200 ppm CEPA, 100 ppm NAA, 1000 ppm GA3 and 200 ppm NAA- soaked seeds .5.2.1.8. No. of male inforescences / plant .The highest number of male inflorescences per plant

arised from untreated seeds ”control” and water-soaked seeds. On the contrary, 100 ppm Na2S203-soaked did not produce any staminate plants .)5.2.2. Effect of seed irradiated on growth and blooming of papaya plants .5.2.2.1. Plant height .The tallest plant were arised from water- soaked seeds and untreated seeds ”control” . On the contrary, water- soaked seeds, irradiated with gamma rays at different doses produced shorter plants .5.2.2.2. Stem diameter .Plants arised from water-soaked seeds produced plants with comparatively thicker stems . On the contrary plants resulted from dry seeds , irradiated with 4 Gray had comparatively thinner stems .5.2.2.3. No. of leaves per plant.At blooming stage, plants arised from water-soaked seeds, irradiated with 6 or 8 Gray as well as dry76seeds, irradiated with 2 Gray had the highesr number of leaves per plant. Other treatments induced statistically similar effect in this respect .5.2.2.4. Time required to attain blooming stage .Plants arsied from {water- soaked seeds. irradiated with 10 Gray}, {dry seeds, irradiated with 8, 10 or 6 Gray} and {dry seeds ”control”} required comparatively longer time to attain blooming stage. Other treatments required nearly similar time to attain blooming stage .5.2.2.5 Percentage of female plants .The highest percentage of pistillate plants were arised from water- soaked seeds, irradiated with S Gray. Other treatments included dry or water- soaked seeds, irradiated with different doses of gamma rays induced statistically similar effect in this respect .5.2.2.6. Percentage of male plants .All test treatments exerted statistically similar effect on the percentage of male plants, except for water-soaked seeds, irradiated with 10 or 8 Gray decreased the percentage of male plants .5.2.2.7. No. of female flowers / plants .The highest of number of female flowers per plant was noticed on plants arised from water- soaked seeds, irradiated with 8 or 10 Gray. Other treatments induced more or less similar effect in this sphere .775.2.2.8. No. of male inflorescences / plant .The highest number of male inflorescences per plants were observed on plants arised from {untreated seeds ”control”}, {water- soaked seeds, irradiated with 2 Gray}, {water- soaked seeds, irradiated with 6 Gray}, {dry seeds, irradiated with 2 Gray}, {water- soaked seeds} and {water- soaked seeds, irradiated with 1 Gray}. On the contaray, the lowest number of male inflorescences were borne on plants arised from water-soaked seeds, irradiated with 10 Gray .Part 11: Sex expression of papaya plants in relation to some leaf chemical constituents.Ten weeks after seeds germination , twenty emerged plants arised from water- soaked seeds ”control” were transplanted into sandy loamy soil and planted at {2x2m} apart. Thereafter, four weeks later, the third leaf from the base of 3- month old of these plants were detached and subjected to the following analyses: chlorophyll content, total soluble solids, acidity, leaf dry matter, ash, silicon, total phenols, total indoles, free amino acid, free proline, peroxidase activity and total carbohydrate . The obtained resulted could be summarized as follows :No significant differences could be noticed between male and female plants regarding leaf blade content of chlorophyll and leaf blade and petiole content of total soluble solids and total acidity .78On the other hand , leaf blade and petiole content of dry matter in pistillate plants were significantly higher than the analogous ones of staminate ones. On the contrary, leaf and petiole of staminate plants had higher content of ash than the corresponding ones of psitillateplants.Furthermore, leaf blade and petiole of female plants were richer in their silicon content as compared with the corresponding ones of staminate plants .Regarding leaf blade and petiole content of total phenols, no significant differences were detected between male and female plants in this respect. On the other hand, leaf blade and petiole content of total indoles of pistillate plants surpassed the analogous ones of male plants.As for amino acids , pistillate plants could be predicted from staminate ones through higher leaf blade content of free amino acids .Moreover, leaf blades content of free proline emphasized that the higher values of free amino acids were recorded with pistillate plants, rather than staminate ones. The reverse was true with leaf petiole content of free amino acids, where leaf petiole of male plants surpassed the corresponding ones of female plants in this respect .In addition, staminate plants could be predetected from pistillate plants through leaf blade and petiole79content of peroxidase, since the formers were richer in their content of peroxidase than the latersOn the other hand, pistillate plants can be early detected through the higher content of leaf blade and petiole of total carbohydrates as compared with staminate ones .