Studies on fertilization of persimmon trees (diospyros sp.)

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Towards clean environment, free from pollution and to produce healthy fruits, free from chemicals and safe on human nutrition. This investigation was conducted as a trial for organic. cultivation ”clean cultivation” through satisfying the nitrogen requirement of Costata persimmon trees from organic manure and biofertilization instead of mineral nitrogen fertilization. Following a preliminary experiment conducted during 2001 season, this study was carried out during two consecutive seasons of 2002 and 2003 at persimmon orchard, Barrage Research Station, Kalubia Governorate.This study was performed on 10-year-old persimmon trees cv Costata grafted on Trabols rootstock, grown in clay loamy soil at 5 X 5 m. apart. Selected trees were nearly similar in growth vigour and fruiting, healthy and free from diseases and subjected to the ordinary horticultural practices recommended by the Ministry of Agriculture, Egypt.This study involved and evaluated three factors as follows : 1. Organic manure source In this study, three well decomposed organic manure sources were evaluated namely: cattle manure, poultry manure and rabbit manure. The three tested organic manure sources were chemically analyzed to standby on their content of nitrogen and thereupon estimating the amount of each organic manure source (kg/tree/year) required to satisfy one half of nitrogen requirement for persimmon tree.Consequently, the required amount of each organic manure source was applied as follows :(a)Cattle manure (0.72% N) was applied at the rate of 33.33 kg/tree/year.(b)Poultry manure (2.35% N) was applied at the rate of 10.21 kg/tree/year.(c) Rabbit manure (1.90 % N) was applied at the rate of 12.63 kg/tree/year. 2. Organic manure application methodTwo organic manure application methods of the three tested organic manure sources were evaluated as follows:(a)Superficial application: In late December of each season, the estimated amount of each organic manure source (cattle, poultry and rabbit manure) was digged in the soil during the hand hoeing practice (25 cm depth).(b)Trench application: In late December of both seasons two trenches (80 cm length x 25 cm width x 30 cm depth) were made along each treated tree, one meter apart from tree trunk in the direction of irrigation furrows. The calculated amount of each organic manure source was divided equally into two parts. Each part of organic manure source was added in a trench and covered with the trench soil.3. Biofertilization [N-fixing bacteria]Two sources of biofertilizers-commercial materials-containing nitrogen fixing bacteria- were chosen as a trial to satisfy at least or partially the other one half of nitrogen requirement (240 g/tree/year) of persimmon tree. The tested commercial biofertilizers were: (a) Nitrobien (40 g/tree/year) and (b) Rhizobacterien (80 g/tree/year).These biofertilizers were added in early March of each growing season in trenches (40 cm length x 20 width x 20 cm depth), 120 cm apart from tree trunk. Irrigation practice was done after biofertilizers application.Consequently, this study is considered a factorial experiment involved three factors as follows: (three organic manure sources x two organic manure application methods x two biofertilizers). The tested treatments were arranged in a completely randomized block design. Each treatment was replicated four times and each replicate was represented by two trees (plot). The obtained results of the studied parameters, evaluated for their responses to the tested treatments could be summarized as follows : 5.1. Tree growth Generally, cattle manure showed to be the best organic manure source in enhancing number of shoots per branch (growth intensity), shoot length and leaf carotene content. Moreover, rabbit manure proved to be the most effective organic manure source in exerting positive effect on number

of produced leaves per shoot and leaf chlorophyll (b) content. Besides, poultry manure gave the highest values of leaf surface area, leaf dry weight and leaf chlorophyll (a and b) content. On the other hand, the application of organic manure in trenches produced higher positive effect on shoot length and number of leaves per branch than did superficial application. Besides, the organic manure application method failed to produce a differentiated effect on growth intensity, leaf surface area, leaf dry weight and leaf chlorophyll (a&b) and carotene content. Furthermore,. Nitrobien inoculation exerted higher stimulus effect on number of produced leaves per branch, whereas Rhizobacterien inoculation gave higher positive effect on leaf carotene content. Nitrobien and Rhizobacterien exerted statistically similar effect on growth intensity, shoot length, leaf surface area, leaf dry weight and leaf chlorophyll (a&b) content.Finally, the combination of cattle manure applied in trenches and supported with Rhizobacterien proved to be the most effective interaction in enhancing growth intensity and shoot length. Moreover, rabbit manure applied in trenches and enriched with Nitrobien inoculation produced the highest number of leaves per shoot. Besides, poultry manure applied in trenches and supported with Nitrobien gave the largest leaf surface area. In addition, poultry manure applied superficially.137 5. Summary and Conclusionwhen provided with Rhizobacterien inoculation gave the highest leaf dry weight, but when it supported with Nitrobien it recorded the highest values of leaf chlorophyll (a) content, whereas, when it applied in treatments and supplemented with Rhizobacterien it produced the highest positive effect on leaf chlorophyll (b) content. On the other hand, cattle manure applied superficially and supported with Nitrobien or Rhizobacterien gave the highest values of leaf carotene content.5.2. Leaf mineral contentAbstractjy, cattle manure proved to be the most efficient organic manure source in enhancing leaf nitrogen, calcium, magnesium and zinc content, whereas poultry manure exerted the highest positive effect on leaf potassium, manganese and zinc content, meanwhile, rabbit manure recorded the highest values of leaf iron and manganese content. On the other hand, the three evaluated organic manure sources induced similar effect on leaf phosphorus and copper content. Furthermore, trench application of organic: manure enhanced leaf potassium rather than superficial application and the reverse was true with leaf iron and manganese content. Besides, the organic manure application method failed to induce a specific effect on leaf content of nitrogen, phosphorus, calcium, magnesium, zinc and copper.In addition, Rhizobacterien inoculation surpassed Nitrobien inoculation in improving leaf magnesium and manganese content, whereas the reverse was true with leaf zinc content. Moreover, the two sources of biofertilization exerted similar effect on leaf content of nitrogen, phosphorus, potassium, calcium, iron and copper. Finally, the combination of cattle manure applied in trenches and supported with Rhizobacterien inoculation gave the highest value of leaf nitrogen content, whereas the combination of rabbit manure applied superficially and supplemented with Nitrobien inoculation recorded the highest value of leaf phosphorus content, meanwhile, rabbit manure applied superficially and enriched with Rhizobacterien inoculation showed the highest value of leaf potassium and manganese content. Besides, cattle manure applied in trenches and supported with Nitrobien inoculation gave the highest value of leaf calcium content, whereas poultry manure applied in trenches and provided with Rhizobacterien inoculation recorded the highest values of leaf iron content. Moreover, cattle manure applied superficially when supplemented with Nitrobien caused high significant increase in leaf zinc content, but when enriched with Rhizobacterien inoculation it recorded the highest value of leaf copper content.Tree fruiting manure showed to be the most efficient organic manure source in enhancing fruit set percentage of Costata persimmon trees. Moreover, rabbit manure proved to be the superior organic manure source in reducing fruit DROP percentage and consequently induced the highest positive effect on tree yield either as number of fruit per tree or yield (kg) per tree. Besides, the evaluated organic manure application method (superficial and trench) and the tested biofertilizers (Nitrobien and Rhizobacterien) failed to induce a distinctive specific effect on the studied tree fruiting parameters. Lastly, cattle manure applied in trenches and enriched with Rhizobacterien showed to be the most efficient combination in increasing fruit set, percentage of Costata persimmon trees. Moreover, rabbit manure applied in trenches and enriched with Nitrobien inoculation proved to be the superior combination in reducing fruit DROP percentage and increasing number of fruit per tree, whereas when rabbit manure applied in trenches and supported with Rhizobacterien inoculation materially

enhanced tree productivity and recorded the highest value of tree fruiting as kg per tree.5.4. Fruit quality5.4.1. Fruit physical propertiesConclusively, poultry manure enhanced fruit weight and length more than the other two tested organic manure sources. While, rabbit manure showed to be the best organic manure source in improving fruit size. Besides, organic manure source failed to produce a pronounced effect on fruit diameter and fruit shape index. Moreover, organic manure application method failed to exert a noticeable effect on fruit weight, fruit length, fruit diameter and fruit shape index, but trench application' method exerted more positive effect on fruit size than superficial application. On the other hand, biofertilizer type failed to induce remarkable differences in fruit weight, fruit length, fruit diameter and fruit shape index, except for fruit size, which showed positive response to Nitrobien rather than Rhizobacterien.Finally, poultry manure applied in trenches and enriched with Nitrobien proved to be the best efficient interaction in enhancing fruit weight and fruit length, besides, rabbit manure applied in trenches and supported with Nitrobien showed the highest values of fruit size than other combinations. The interaction between the three studied factors failed to exert any remarkable effect on fruit diameter and fruit shape index.5.4.2. Fruit chemical propertiesBriefly, rabbit manure proved to be the most efficient organic manure source in enhancing fruit sugar content and total soluble solids/acid ratio. Meanwhile, poultry manure showed to be the superior organic manure source in increasing fruit content of total soluble solids, total acidity and ascorbic acid. On the other hand, the three evaluated organic manure sources exerted similar effect on fruit tannins content. Furthermore, the two tested organic manure application methods (superficial and trench) induced similar effect on the studied fruit chemical traits. In addition, the two evaluated biofertilizers i.e. Nitrobien and 140 5. Summary and ConclusionRhizobacterien induced similar effect on the studied fruit chemical properties except for ascorbic acid, hence Nitrobien inoculation surpassed Rhizobacterien inoculation in exerting more positive effect on fruit ascorbic and content. Finally, rabbit manure applied in trenches and enriched with Nitrobien inoculation proved to be the superior combination in enhancing fruit sugar content. On the other hand, poultry manure applied in trenches and supplemented with Rhizobacterien inoculation recorded the highest values of fruit total soluble solids, whereas poultry manure applied superficially and provided with Nitrobien inoculation exerted the highest positive effect on fruit ascorbic acid content. In addition, cattle manure applied' superficially and supported with Rhizobacterien inoculation gave the highest ratio of total soluble solids/acid. Lastly, fruit tannins content showed no significant response to the three tested factors lonely or in combinations.Consequently, in order to produce healthy and clean fruit and to avoid environmental pollution, it is advisable to replace mineral nitrogen fertilization with organic manures and biofertilizers. The results of the present study demonstrate that under conditions similar to the conditions of the present study, it is preferable to satisfy one half of nitrogen requirement of Costata persimmon trees in the form of rabbit manure applied in trenches and the other half through Nitrobien biofertilizer.