Response Of Olive Trees To Fertilition Under Rainfed Conditions

Ahmed EMAD Mahrous Abd El- Rhman

This study was conducted during three successive seasons of 1999,2000 and 2001 at Raas El-Hekma area, Matroh Governorate as a trial to study the effect of different nitrogen sources i.e slow release and fast release nitrogen fertilizers on growth, leaf mineral content, fruiting and fruit quality of olive trees cv. Manzanillo.Thirty—year—old olive trees, nearly similar in growth vigour, healthy, planted at 7 x 7 m. apart and received regularly the recommended horticultural practices were devoted for this study. The rainfall in the experimental region recorded 92.0, 115.0 and 85.6 mm in 1999, 2000 and 2001, respectively according to Matroh Resource Manegment Project (Adaptive Research Center).Moreover,the following treatments were assigned for application on the selected trees under investigation according to their expected blooming condition in the following season (”On” or ”Off” years). The trees were in the ”On” year and were going to an expected ”Off” year. In other words, some of the tested treatments were applied during an expected ”Of’ year (1999&2001) and the others were applied during an expected ”On” year (2000).The trees were subjected to one of the following fertilizer treatments:1-Trees were fertilized with 200 and 300 g actual nitrogen/tree/year ammonium nitrate (NH4NO3 — 33.5%N) as fast release N fertilizer source in mid-February and mid-May (1999&2001) during an’ • •’ ’ ”1285-SUMMARY AND CONCLUSION4 A 4’ * A x.1’ A 41 ,• * 41 A A A AA A 41 A 1 ”1 Ak A A. A * A A A * A A A.* * A A Akexpected ”Off” years and supplemented with 400 and 600 g actual nitrogen/tree/year in the form of ammonium nitrate in mid-February and mid-May (2000) during an expected ”On” year.2-Trees were fertilized with 200 and 300 g actual nitrogen / tree / year ammonium sulphate ((NH4) 2SO4 — 20.5%N) as fast release N fertilizer source in mid-February and mid-May (1999&2001) during an expected ”Off” years and supplemented with 400 and 600 g actual nitrogen / tree / year in the form of ammonium sulphate in mid-February and mid-May (2000) during an expected ”On” year.3-Trees were fertilized with 200 and 300 g actual nitrogen / tree / year urea((NH2 —CO- NH2 — 46%N) as fast release N fertilizer source in mid-February and mid-May (1999 & 2001) during an expected ”Off” years and supplemented with 400 and 600 g actual nitrogen / tree / year in the form of urea in mid-February and mid-May (2000) during an expected ”On” year.4-Trees were fertilized with 200 and 300 g actual nitrogen/tree/year in the form of phosphorus coated urea (PCU 37% N) as slow release fertilizer in mid-February (1999 & 2001) during an expected ”Off” years (1999 & 2001) and fertilized with 400 and 600 g actual nitrogen / tree / year in mid-February (2000) during an expected ”On” year.5-Trees were fertilized with 200 and 300 g actual nitrogen / tree / year in the form of formaldehyde coated urea (UF 37% N) as slow release fertilizer in mid-February (1999 & 2001) during an expected ”Off” years (1999 & 2001) and fertilized with 400 and 6001295-SUMMARY AND CONCLUSIONg actual nitrogen tree / year in mid-February (2000) during anexpected ”On” year.6-Trees were fertilized with 200 and 300 g actual nitrogen / tree / year in the form of Bentonite coated urea (BCU 37% N) as slow release fertilizer in mid-February (1999 & 2001) during an expected ”Off” years (1999 & 2001) and fertilized with 400 and 600 g actual nitrogen / tree / year in mid-February (2000) during an expected ”On” year.Generally, this investigation included two experiments ”Off” year fertilizer treatments and ”On” year fertilizer treatments. Each experiments is a factorial experiment (2 N fertilizer sources (fast & slow) x3 N forms [(ammonium nitrate, ammonium sulphate and urea) and (phosphorus coated urea, formaldehyde coated urea and bentonite coated urea)].The tested

treatments of each experiment (On & Off years) were arranged in a completely randomized block design with four replicates for each treatment and each replicate was represented byone tree.The obtained results could be summarized as follow:.. ..1305-SUMMARY AND CONCLUSION4.§.-t•JP A *AA A ..0-k•A A *AA .§,..t..A4 *AA A A A 4,[Experiment IEffect of nitrogen fertilizer source and rate on tree growth, leaf nutrient content, fruiting and fruit quality of Manzanillo olive trees duringOff" years.5.1.1. Tree growthGenerally, slow release N. fertilized trees produced longer shoots, higher number of leaves per shoot, larger leaf surface area, leaves richer in their chlorophyll (a&b) content and heavier leaf dry weight than the analogous ones fertilized with fast release N. fertilizers. Besides, the studied vegetative growth parameters responded significantly to the increase in nitrogen fertilizer rate, hence the higher N. fertilizer rate (300g N/tree/year) recorded the highest values of the previously mentioned vegetative growth parameters than did the lower nitrogen fertilizer rate (200g N/tree/year). Furthermore, the tested forms of slow release nitrogen fertilizers (PCU, UF and BCU) surpassed the tested forms of fast release N. fertilizers (ammonium sulphate, ammonium nitrate and urea) in exerting higher positive effect on the studied vegetative growth parameters. Briefly, PCU proved to be the superior slow release N. fertilizer form, followed descendingly by UF and BCU. On the contrary, urea showed to be the least efficient fast release N.A -,k,AA1315-SUMMARY AND CONCLUSION• - : : , ' • ;. •fertilizer form in this respect. On the other hand leaf shape index showed meaningless response to nitrogen fertilizer source, form andrate as well as their interactions.5.1.2. Leaf mineral contentGenerally, leaves of slow release N. fertilized trees had higher values of nitrogen, phosphorus, potasium, calcium, mangnesium, zinc, iron, manganese and cupper than those of fast release N. fertilized ones. Besides, increasing nitrogen fertilizer rate enhanced the previously mentioned leaf mineral content. Furthermore, the tested forms of slow release N. fertilizers particularly PCU followed by UF and finally BCU exerted higher positive on the aforementioned leaf mineral content than did the tested forms of fast release N. fertilizer forms (ammonium sulphate, ammonium nitrate and urea). On the centrary, urea form induced the least positiveeffect in this concern.5.1.3. Tree bloomingIn summary, slow release N. fertilized trees produced higher number of inflorescences per meter, higher number of flowers per inflorescence and higher perfedt flowers percentage than the analogous ones fertilized with fast release N. fertilizers. Besides, the studied blooming parameters responded significantly to the increase in nitrogen fertilizer rate, hence the higher N. fertilizer rate (300g N/tree/year) recorded the highest values of the previously mentioned blooming parameters than did the lower nitrogen fertilizer rate (200g N/tree/year). Furthermore, the tested forms of slow release nitrogen fertilizers (PCU, UF and BCU) surpassed the tested forms1325—SUMMARY AND CONCLUSIONss,.<of fast release N. fertilizers (ammonium sulphate, ammonium nitrate and urea) in exerting higher positive effect on the studied tree blooming parameters. Briefly, PCU proved to be the superior slow release N. fertilizer form, followed descendingly by UF and BCU. On the contrary, urea showed to be the least efficient fast release N. fertilizer form in this respect.5.1.4. Tree fruitingslow release N. fertilized trees gave the highest percentage of fruit set, the louest fruit shedding percentage, the highest yield (Kg/tree or number of fruits/tree) and less tendency to alternate bearing as compared with those fertilized with fast N. fertilizers. Besides, high rate of nitrogen fertilizers surpassed the low rate of nitrogen application in enhancing the aforementioned tree fruiting parameters.On the other hand, the combination between slow release N. fertilizers and high rate of nitrogen application exerted the highest positive effect on the studied tree fruiting parameters.Shortly, out of all interactions between nitrogen fertilizer forms and rate of application Phosphorus coated urea and high rate of nitrogen fertilization proved to the most promising treatment in enhancing the previously mentioned tree fruiting parameters.Shortly slow release N. fertilizers succeeded in enhancing fruit set percentage and tree yield (kg)/tree and reduced fruit shedding percentage. Besides, fast release N. fertilizers increased number of produced fruits per tree. Increasing nitrogen fertilization rate from 200g to 300g/tree/year induced to the wanted effects on tree fruiting1335-SUMMARY AND CONCLUSIONparameters. In addition, the different forms of slow release N. fertilizers particularly PCU and OF enhanced the previously mentioned fruiting parameters except for number of fruits per tree, which responded positively to fast release N. fertilizers particularly ammonium sulphate combinations.5.1.5.Fruit qualityFruit quality parameters i.e fruit weight, fruit dimentions, palp weight,

palp weight/seed ratio and oil percentage respnded positively to slow release N. fertilizers rather than fast release N. fertilizers. Besids, the high rate of nitrogen fertilizers surpassed the low rate in enhancing the aforementioned fruit quality parameters.On the other hand, fruit quality parameters was greatly increased than slow release nitrogen fertilizers interacted with high rate of nitrogen application.Briefly, the result of interaction between the different nitrogen fertilizer forms and rate of application indicated that Phosphorus coated urea applied at high rate proved to be the supprier interaction in enhancing the aforementioned fruit quality parameters.5.1.6. Fruit chemical properiesBriefly, slow release N. fertilizers succeeded in enhancing fruit weight, fruit size and flesh weight (in both seasons), fruit length and shape index (in 1999 season, only) and failed to affect stone weight. On the contrary, fruit diameter responded positively to fast release N. fertilizer rather than slow release N. fertilizers. On the other hand, the previously mentioned fruit physical properties1345-SUMMARY AND CONCLUSION.2...*.4.,:..k.*.;,k 4...b....:*,..:,..2.,..:44c,..7..4.4.4..7....4,6..b.4.::::..p..i...:::.,. n ;•.,..,:i...§..7..4 4 4...;:..4.4.4...:. 4 .....;;;,:,b4.4.,:,...2,....; 4,..b...?:. 4 4 4 ,:;...b.showed meaningless response to nitrogen fertilizer rate. The different combinations of slow release N. fertilizer forms (particularly those of UF and PCU) enhanced the aforementioned fruit physical parameters particularly in 1999 season except for fruit diameter which responded positively to the combinations of fast release N. fertilizers especially the higher rate of ammonium sulphate.5.1.6.1. Fruit moisture and oil content and fatty acid fractionsThe studied fruit chemical properties i.e Moisture, oil content and fatty acid fractions i.e Oleic acid (18:1), Palmitic acid (16:1), Linolenic acid (18:3), Linoleic acid (18:2) and Arachidic acid (20:1) slow meaningless response to nitrogen fertilizer source (slow or fast release N. fertilizers), nitrogen fertilizer form i.e PCU, UF and BCU of slow release N. fertilizers and ammonium sulphate, ammonium nitrate and urea of fast release N. fertilizers and nitrogen fertilizer rate (200 or 300g N/tree/year in ”Off” years) as well their combinations.Consequently, upon the results of this experiment it is preferable to fertilize Manzanillo olive trees with slow release nitrogen fertilizers particularly Phosphorus coated urea or bentonite coated urea at 300g N/tree/year during an expected ”Off” years.1355-SUMMARY AND CONCLUSION;$: ;4.44 .Z..4 A .k..4 4 4 4 4 .4Experiment IIEffect of nitrogen fertilizer source, form and rate on tree growth, leaf nutrient content, fruiting and fruit quality of Manzanillo olive trees during ”On” year.5.2.1. Tree growthGenerally, slow release N. fertilized trees produced longer shoots, higher number of leaves per shoot, larger leaf surface area, leaves richer in their chlorophyll (a&b) content and heavier leaf dry weight than the analogous ones fertilized with fast release N. fertilizers. Besides, the studied vegetative growth parameters responded significantly to the increase in nitrogen fertilizer rate, hence the higher N. fertilizer rate (600g N/tree/year) recorded the highest values of the previously mentioned vegetative growth parameters than did the lower nitrogen fertilizer rate (400g N/tree/year). Furthermore, the tested forms of slow release nitrogen fertilizers (PCU, UF and BCU) surpassed the tested forms of fast release N. fertilizers (ammonium sulphate, ammonium nitrate and urea) in exerting higher positive effect on the studied vegetative growth parameters. Briefly, PCU proved to be the superior slow release N. fertilizer form, followed descendingly by UF and BCU. On1365-SUMMARY AND CONCLUSIONthe contrary, urea showed to be the least efficient fast release N. fertilizer form in this respect. On the other hand leaf shape index showed meaningless response to nitrogen fertilizer source, form and rate as well as their interactions.5.2.2. Leaf mineral contentAbstractly, the application of nitrogen fertilizer as slow release N. fertilizers showed a remarkable increment in leaf nitrogen, phosphorus, potassium, calcium, magnesium, iron, zinc, manganese and cupper content rather than fast release N. fertilizers. Besides, olive trees received higher rate of nitrogen fertilizer (600g N/tree/year) in ”On” year) exerted higher enhancing effect on leaf N, P, K, Ca, Mg, S, Fe, Mn, Zn and Cu the lower rate of nitrogen ferilizer (400g N/tree/year). Furthermore, the tested forms of slow release N. fertilizers particularly PCU increased leaf content of the aforementioned minerals as compared with the tested forms of fast release N. fertilizers. Briefly Pcu, the slow release N. fertilizer form applied at 600g N/tree/year in ”On” year, proved to be the superior treatment in enriching leaf N, P, K, Ca, Mg, S, Fe, Mn, Zn and Cu content.5.2.3. Tree bloomingAbstractly, the studied tree blooming parameters i.e number of inflorescences per meter, number of flowers per inflorescences and perfect flowers percentage responded positively to slow release N. fertilizers rather than to fast

release nitrogen fertilizers. Besides, the higher nitrogen fertilizer rate (600g N/tree/year) induced higher positive effect on the aforementioned blooming parameters than didz 6,Z 6 6 ks44 , Z,4Z (Z a.:k ,• a, . a..1375-SUMMARY AND CONCLUSIONlower nitrogen fertilizer (400g N/tree/year). Moreover, the tested forms of slow release nitrogen fertilizers (PCU, UF and BCU) and in particular, PCU showed superiority in enhancing the previously mentioned tree blooming parameters than those of fast release N. fertilizers. Thereupon, PCU the slow release nitrogen fertilizer form applied at 600g N/tree/year in ”On” year proved to be the superior treatment in enhancing the studied tree blooming parameters.5.2.4. Tree fruitingBriefly, slow release N. fertilizers increased fruit set percentage and tree yield (kg)/tree and reduced fruit shedding percentage. On the other hand, fast release N. fertilizers increased number of produced fruits per tree. Increasing nitrogen fertilization rate from 400 to 600g/tree/year induced the prospective effect on tree fruiting parameters. In addition, the different forms of slow release N. fertilizers particularly PCU and UF enhanced the previously mentioned fruiting parameters except for number of fruits per tree which showed better response to fast release N. fertilizersparticularly urea combinations.5.2.5. Fruit physical propertiesConclusively, slow release N. fertilizers enhanced fruit weight, flesh weight and stone weight , but failed to affect fruit length, diameter and 0a.pe index in comparison with fast release N. fertilizers. On the other hand, nitrogen fertilizer rate failed to affect the previously mentioned fruit physical parameters. Briefly, the higher rate of PCU, UF and BCU induced the highest positive effect on t4f gcorgn)ent)gited fruit physical properties, followed1385-SUMMARY AND CONCLUSIONdescendingly by the lower rate of the previously mentioned slow release N. fertilizer forms. The combinations of fast release N. fertilizer forms particularly those of lower nitrogen fertilizer rate exerted the lowest positive effect in this respect.5.2.6. Fruit chemical properies5.2.6.1. Fruit moisture and oil content and fatty acid fractionsConclusively, nitrogen fertilizer source (slow or fast release N. fertilizers), nitrogen fertilizer form i.e PCU, OF and BCU of slow release N. fertilizers and ammonium sulphate, ammonium nitrate and urea of fast release N. fertilizers and nitrogen fertilizer rate (400 or 600g N/tree/year) in ”On” year failed to induce any remarkable or pronounced effect on the studied fruit chemical properties namely Fruit moisture and oil content and fatty acid fractions namely Oleic acid (18:1), Palmatic acid (16:0), Linoleic acid (18:2), Linolenic acid (18:3) and Arachidic acid (20:1).139