

Effect of some macro elements Ca N P K on the quantitative and qualitative characteristics of the fruits A Review

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Abstract: The availability of good and vigorously growing varieties is one of the most important means of spreading and developing fruit cultivation, and this requires adequate care, especially in terms of fertilization, as it drains a lot of nutrients from the ground for use in various vital activities. And the appropriate amount, due to the positive effect of the fertilization process on the growth of seedlings and trees and their early entry into the fruiting stage. Among these fertilizers are the major elements that we will talk about the importance of some of them in this article and their role in the quantitative and qualitative characteristics of fruit trees.

Introduction

Calcium is found in high amounts in the leaves, and it enters into the building of the tissues of the various plant organs, and this element contributes to the regulation of respiration processes (Al-Qutb et al., 2011). Calcium is necessary for the continuation of the processes of indirect growth and division in the plant, and it works to neutralize some of the unhelpful organic acids in the plant such as oxalic, acetic, and formic, then they are deposited in the form of calcium salts, and reduce the harmful effect of potassium, manganese, and aluminum, and calcium plays an indirect role in The transformation of starch into sugar and vice versa, and also in the nutritional transformations of nitrogenous compounds, calcium encourages phosphorylation enzymes, and some other enzymes to carry out their functions, and this is why calcium encourages the growth of roots (Jundia, 2003). And that calcium has a role in retaining moisture and reducing moisture loss in fruits through its entry into the middle layer of the cell wall in the form of calcium pectate (Al-Mayahi, 2004 and Dawood, (1986). The use of agricultural fertilizers in the world now, of the three main elements, N), P, (K) is estimated at about 180,000,000 tons, mostly in developing countries, according to the reports of the International Fertilizer Production Organization (Paris). (IFA 2013) that foliar feeding with NPK fertilizer comes as a positive reaction towards directing the composting process within a reasonable environmental balance in the soil and its surroundings. Pholsen and Suksri). Nitrogen is one of the major and basic nutrients needed by the plant, as it works to increase the speed of vegetative growth and stimulate the plant and strengthen its root group (Singh 2003 and Al-Araji et al., 2005). (Tie et al. 2002), and it helps in the formation of large-sized leaves rich in chlorophyll, and its deficiency is greatly reflected on growth by giving small leaves of pale green or yellowish-green to yellow, and in case of severe deficiency, terminal growths and bark of brown or red glossy are created. (Al-Douri and Al-Rawi, 2000). Urea is one of the most commonly used nitrogen fertilizers in plant fertilization, and it is the highest in the proportion of containing nitrogen compared to it. It is also one of the most N% forms in solid fertilizers, as it constitutes 64 nitrogen suitable for foliar application due to its rapid absorption, movement, non-polarity, low toxicity, and high solubility (Bondada, 2001 and Ali, 2012). As for potassium, it is one of the important nutrients that the plant needs in large quantities that exceed any element except nitrogen. Potassium encourages the ripening of wood and increases the plant's resistance to freezing and thus increases the plants' resistance to drought, and it is the only element found in ionic form in the juice of plant cells (K⁺), Potassium has an important role in raising the efficiency of photosynthesis and thus increases the amount of carbohydrates formed. Potassium is concentrated in the developing and meristematic peaks of the plant, which suggests that it has a relationship in the process of cell division, and activates some enzymes, reaching their maximum activity in the vital processes within the plant

such as making carbohydrates, proteins, fats and others. In addition, its physiological role in the mechanism of opening and closing stomata. (Mengel et al., 2001). Phosphorous is included in the formation of energy-carrying compounds (ADP, ATPetc), which indirectly contribute to the construction of chlorophyll molecules (Soldier, (2003), Hopkins and Hüner, (2004) and Havlin et al., (2005)), addition to That phosphorous contributes to increasing the growth and branching of roots, which may contribute to increasing the absorption of many nutrients from the soil, especially nitrogen (Chen and Chen, 2004 and Al-Araji, 2009), which enters the construction of chlorophyll molecules as mentioned above.

Literature Review:

1-The effect of some macro elements Ca N PK on the quantitative characteristics of the fruits:

(Jones) 2002 indicated that the soil has a weak ability to retain nitrogen and with continued the depletion of its organic stock becomes a limiting element for plant growth with the exception of leguminous plants. In a study conducted by (Ferrara and Papa 2003), they found that the difference in the weight of the fruits is due to the response to fertilization and the environment of the plant. There are many studies and research that confirmed that nitrogen has a significant impact on production, and citrus needs it more than any other food element. It is related to important functional processes, such as growth, leaf production, floral differentiation, knots, and fruit development, and its deficiency leads to a decrease in production. Zerkoun et al., 2003; Patil et al., 2004; Srivastava and Shyam, 2004; Mansour and Shaaban, 2007). (Mehmet et al., 2008) achieved an increase in the number of Sanlop fig fruits when they added 30 gm N, 200 gm P₂O₅, and 430 gm K₂O/plant. With 280g Ca/plant. Hernandez_Munoz et al. (2008) mentioned the effect of immersion with calcium components after harvest on the quality of strawberry (*Fragaria x ananassa*) fruits in the cooled temperature area at a temperature 10 ° roses and 70 ± 5 for a week, even if given at different concentrations (0, 0.5 and 0.75%, prolonging the life of the fruits during the storage period of the fruits at a concentration of 0.75%. In a study conducted by Juma et al., (2008) on the effect of some nutrients on the yield of figs of the black variety Diyala during the two growing seasons (2000-1999), where (0,500, 1000 g/tree) urea and (0,1 g/L) potassium were used. It was found that the use of single treatments of N and K led to a significant increase in the size of fruits and its effect increased when these elements were overlapped. The resulting increase reached (20.42% and 13.77%) for the two research seasons, respectively, and the number of fruits/branches increased and showed a significant effect in reducing the number of fruits. Falling fruits and increased yield. It was found from the experiment conducted by Abu Nuqat and Batha, (2010) that the use of potassium humate fertilization on Helwani grape trees at the age of twenty-three years old. The productivity of trees increased by 21.01%. Gill et al., (2013) indicated in their study on the effect of NPK fertilization on pomegranate trees, where they showed that the application of (300 gm K, 100 gm N, and 50 gm P/tree) increased the weight of the fruit, the yield of the fruit and the weight of the kernels. And the percentage of juice in the fruit, TA / TSS, and the percentage of total sugars. In another study conducted by Kazemi (2014) on the effect of using calcium spray with different concentrations (0, 5, 10) mg.l⁻¹ on vegetative growth and other characteristics of Pajaro strawberry. It increased the weight of the fruits treated with calcium at a concentration of 10 mg. L⁻¹ as it was 17.8 g. Al-Douri and Al-Araji, (2014) showed in an experiment they conducted on the effect of NPK fertilization on the yield of pomegranate trees of Salimi cultivar and some physical characteristics of the fruits during the research season (2011-2010) that the use of (322 gm N, 105 gm P and 168 gm K per tree) It led to an increase in the yield of the tree and the percentage of juice in the fruit and reduced the thickness of the peel during the two research seasons, respectively. In a study conducted by Mohamed et al., (2014) on the effect of nutrients in pomegranate trees during the two growing seasons of 2014-2013, it was found that the use of 400 g of N, 100 g of P₂O₅, and 100 g of K₂O/tree increased (the number of fruits/tree, yield, fruit weight, fruit length, and fruit diameter). Khalil et al. (2015) confirmed in their experiment the effect of spraying calcium on leaves at concentrations (0, 200, 300) mg-L⁻¹ on the yield of strawberry *Fragaria X ananassa* Duch., a significant increase at 300 mg.L⁻¹ of calcium in the mean The weights of the fruits are 12.69 g, and the yield of one plant is 330.0 g. Mentioned by Muhammad and Salem, (2016). In their study, the effect of 100 gm of N, 300 gm of P₂O₅, and 300 gm of K₂O/plant on the fruits of the fig variety *Ficus carica* L. led to an increase in yield, number of fruits/plant, weight, length and diameter of the fruit/plant. Mahdi (2017) showed in a study of two strawberry cultivars (Festival, Rubygem) that the Rubygem cultivar was significantly superior to Festival in the percentage of fruit weight 19.77 g and the average yield per plant 306.30 g. plant⁻¹.

2- The effect of some macro elements Ca N PK on the quantitative and qualitative characteristics of the fruits:

(Birgul et al., 2008) Noted in his study on the Sarilop fig cultivar, used nitrogen in the form of ammonium sulfate at a rate of 100, 200, 300, 400, and 500 g/plant. They found that a dose of 100 g/plant gave the highest percentage of TSS for the juice of the studied cultivar. Al-Mayahi (2008) pointed out while studying *Ziziphus Spp.* The dry matter in the fruits decreased to 19.10% in the olive cultivar and 17.50% in the bembawy cultivar when sprayed with a level of 2000 mg.L⁻¹ calcium chloride, and it led to a significant superiority in the total acidity percentage TA (0.37-0.38)% in olive and bembabian, respectively. At the same concentration of calcium, but the cause of a significant decrease in the percentage of total dissolved solids (TSS) in fruits was (17.25-16.58) %. In a study conducted by Juma et al., (2008) on the effect of some nutrients in fig trees of the black Diyala variety during the two growing seasons (2000-1999), where (0,500, 1000 g/tree) urea and (0,1 g/L) potassium were used. , where nitrogen led to reducing the percentage of total dissolved solids, and the percentage increased significantly than potassium spray.

It was found from the study conducted by Abu Nuqat and Batha, (2010) that the use of potassium humate fertilization on Helwani grape trees at the age of twenty-three years old. From the percentage of solid matter in it. Gill et al., (2013) observed in a study they conducted on the effect of NPK fertilization in pomegranate trees, where it was found that the application of (300 gm K, 100 gm N, and 50 gm P/tree) increased the percentage of juice in the fruit, TA/TSS and total sugars. In a study conducted by Mohamed et al., (2014) on the effect of nutrients in pomegranate trees during the two growing seasons of 2014-2013, it was found that the use of 400 gm N, 100 gm P₂O₅, and 100 gm K₂O/tree increased (T.S.S, TA and protein content in fruits). Seydi et al. (2016) noted in their experiment on the effect of calcium chloride on the growth and development of chicory cultivar Camarosa, where calcium chloride at a concentration of 10 mg.l⁻¹ led to an increase in TSS ratio of 10.11%, total acidity of 9.9%, and vitamin C content of 65.7 mg.100gm⁻¹ wt. mushy. (Lateef et al. 2018b) founded that in their study about pomegranate using nitrogen fertilization significant increase in the parameter total soluble solids and reducing titrability acidity. (Noori et al., 2018) indicated that in their study about Effect of phosphorus and gibberellic acid on growth and yield of grape (*Vitis vinifera* L.) using P₂O₅ with three levels (0, 5 and 10 g/l) supplied through phosphatic fertilizer containing 46% phosphorus significant increase defers in T.S.S. and reducing T.A. (Lateef, 2018a) three concentrations of potassium (0, 1, 2) gm.L⁻¹ n growth and yield of strawberry (*Fragaria x ananassa*) Duch. And conclude that the potassium affected on strawberry total soluble solids significantly.

Conclusions:

The element calcium is included in the composition of the middle layers of the cell walls in the form of calcium pectate, and it has a role in converting starch into sugar and vice versa. It was noted that nitrogen has a direct effect on vegetative growth and leaf area. It was found that potassium has a physiological role in the mechanism of opening and closing stomata, and also increases the plant's resistance to freezing and raises the plant's resistance to drought. Phosphorous is included in the composition of energy-bearing compounds and contributes to increasing the growth and branching of roots. Fertilization is one of the most important factors affecting the growth of fruit trees in general, and it has been shown that the best growth is achieved in the major and minor nutrients. The increase in vegetative growth of leaf area and chlorophyll content of leaves. Reflected on an increase in fruit growth, an increase in the rate of knots, an increase in the carbohydrate stock of trees, and an increase in the productivity of the crop.

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