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A REVIEW ON MACRONUTRIENTS EFFECT ON GROWTH AND YIELD OF STONE FRUIT

Mohammed Abdul Aziz LATEEF[1]
Ali Mohammed NOORI[1]
Najlaa Aswad ABID[2]
Yusra Mohammed SALEH[2]
mahammedazyz@uokirkuk.edu.iq
[1]Department of Horticulture and Landscape Design, College of Agriculture, University of Kirkuk – Iraq.
[2] Department of Horticulture and Landscape Design, College of Agriculture and Forestry, University of Mosul – Iraq.

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Abstract:

Macronutrients are important to get the best Growth, yield, and quality in plants. It is partially satisfied by the soil or by chemicals fertilizer or through other sources. Proper nutrition of plants is essential Successful production of fruit crops fruit crops. The presence of macronutrients in sufficient quantity and in appropriate proportions is one of the most important factors that control plant growth in fruit crops. Macronutrients are involved in all metabolic and cellular functions. The plants differ in their need for macronutrients. In this review, we focus on the specialty Functions of mineral macronutrients in fruit growth and production.

Keywords: Macronutrients, fruit crops

INTRODUCTION:

The stone fruit fruits belong to the genus Prunus in Rosaceae and produce fruits called drupe, whose seeds are covered by a woody endocarp which is in turn covered by an endocarp.In most cultivated Prunus species, the edible part of the fruit is the endocarp, which includes the flesh.pulp (mesocarp) and skin (exocarp) such as apricot (P. armeniaca L.), European plum (P. domestica L.),Japanese apricot (P. mume Siebold and Zucc.), Japanese plum (P. salicina Lindl.), plum (P. persica L. Batsch, sour cherry (P. cerasus L.) and sweet cherry (P. avium L.). (Badenes, 2012).moreover, in the almond (P. dulcis (Mill.) D.A. Webb), the edible part of the fruit is the seeds. annual world stone fruit Production in 2017 was more than 47 million tons in 7.3 million hectares, Most cultivated speciesare peaches (P. persica L. Batsch) (24.6 million tons in 1.5 million hectares), plum (including European and Japanese plum) (11.7 million tons in 2.6 million hectares), apricot (4.2 million tons in 0.5 million hectares), sweet cherry (2.4 million tons in 0.4 million hectares), almonds (2.2 million tons in 1.9 million hectares) and sour cherry (1.2 million tons in 0.2 million hectares) **(Fao, 2019)**. Stone core fruit trees, like other temperate woody species, need to group their own varieties Amount of cold during the winter to get stillness and then experience warm temperatures to finally open in the spring **(perry, 1971; Guerra and Rodrigo, 2015**). These conditions adapt species and varieties to each Area **(Fadón and Rodrigo, 2018).** Stone core fruit trees are well suited to temperate regions by creating dormancy during the winterthat allow living at lower temperatures **(Rohde and Bhalerao, 2007**).

Potassium is one of the positive ions (monovalent) that higher plants need in large quantities, although it does not enter into any organic compound except for organic acids, as it combines with them to form organic salts. It is a highly mobile element in the plant that goes to where it is needed within the plant tissues; therefore, the symptoms of its deficiency appear first on the lower or aged leaves than on the newer leaves **(Al-Sahhaf, 1989). Johnson and Uriu (1989)** mentioned that poor coloration and bad appearance were observed when potassium was deficient in peach fruits and that an increase in potassium increases the acidity of the fruits (**Kader and Rolle, 2004**), and in many cases, the interaction between the mineral elements in the plant and the balance in the use of Fertilizer is more important than the effect of the element alone. The effect of nitrogen and potassium use for stone core trees depends on several factors, including cultivar, tree condition, soil properties, and irrigation method **(Johnson and Uriu, 1989).** Potassium works on regulating the water content in the plant cells, as it is found in the form of easily soluble organic or mineral salts, which leads to raising the osmotic pressure of the cellular juice and keeping the cell at swollen pressure, so it does not become obligate, and its ratio ranges between 0.3-0.6% of the dry matter, and that It is involved in the enzymatic reaction of converting sugar into starch **(Abu Dahi and Younes, 1988; Heikal and Omar, 1988).** It also plays the role of an assistant in many biological processes such as photosynthesis, formation of proteins, chlorophyll, carbohydrate metabolism, and regulation of the mechanism of opening and closing stomata **(Mohamed and Al-Younes, 1991),** and **Poni et al. (2003)** indicated that potassium affects meristematic growth, increases

photosynthesis, and helps in transporting representative materials; This is due to its high mobility in the bark, as it moves from the old adult leaves to the young new leaves. Based on the foregoing, many types of research indicated its role in growth and production. Calcium is one of the macronutrients that have many physiological functions in plant growth and development. Calcium is included in the construction of the plant skeleton, where it is combined with pectic acid with calcium pectate, which is one of the components of the middle plate of plant cells. It is believed that calcium is important in the formation of Cell membranes Therefore, calcium is necessary for the normal functions of both the cell wall and the plasma membranes. It is also an important calcium element as it controls the cracking of fruits, although it is a relatively slow-moving element, its results proved that the content of fruits increases when spraying or immersing fruits with calcium. Divalent increases the strength of the cell walls inside the fruits by forming pectates that bind with calcium and increase the resistance of the fruits to internal pressure **(Siddiqui, 2004 & Bangerth).** The aim of cultivating any plant is to obtain the highest economic yield, the best quality, and the lowest costs, and in order to achieve this, it is necessary to create appropriate conditions and pay attention to the factors that affect the plant. As and qualitatively. Nutrients have an important role in plant growth, detection, and development and are part of the basic components of the cell or its metabolic processes. Therefore, the plant needs to be constantly equipped with nutrients in order to grow, develop and complete its life cycle perfectly. Nitrogen is one of the major nutrients that the plant needs and has very important functions, including the formation of amino and nucleic acids and proteins Enzymes, energy compounds, cell membranes, chlorophyll production, and nitrogen plays an important role in the production of the amino acid tryptophan, which eventually leads to the formation of auxin (IAA), which helps in increasing the number of female flowers, which is reflected in an increase in the sex ratio, which in turn leads to increased production. **(Al-Moussawi, 2008).** Although nitrogen is one of the elements that plants need in large quantities, excess amounts of nitrogen can lead to negative effects on the quality of fruits with stone core, including a lack of firmness and sweetness of fruits **(Rettke et al., 2006).** Phosphorous is one of the necessary nutrients for plants, as it comes in second place after nitrogen in terms of the amount it needs **(Havlin et al., 2005),** and phosphate fertilizers are widely used in fruit nurseries **(Al-Rawi and Ali, 1991),** due to the importance of this element in increased vegetative growth The root of seedlings is due to its participation in several functions within the plant, as it is included in the synthesis of important phospholipids in cellular membranes, in the synthesis of nucleic acids (RNA and DNA), nucleoproteins, energy-carrying compounds, enzyme coenzymes (Coenzyme A, NAD, and NADP) and the organophosphorus compound Phytic acid, which is rich in phosphorous that The plant uses it when needed **(Mohamed, 1985 and Marschner, 1996, Havlin et al.,2005).**

LITERATURE REVIEW:

Effect of nitrogen on growth characteristics and qualitative and quantitative characteristics of the yield:

Peach trees respond to nitrogen fertilization. Nitrogen is one of the important nutrients for the plant as it is included in the composition of most active cell components. It enters the formation of chlorophyll, nucleic and amino acids, proteins, and enzymes important in the vital processes of the plant, in addition to its role in the formation of some plant hormones, especially indole acetic acid, (**Barker and Pilbeam, 2015).** And that its deficiency leads to a small size of the leaves and a low content of chlorophyll, which causes a decrease in the rate of photosynthesis hydrates in the leaves **(Diop, 2004). Asma et al. (2007)** found a significant increase in the quantitative characteristics of the yield when fertilizing apricot trees of 15-year-old cultivar Hacihaliloglu with NPK compound compared to the control treatment.

Muhammad (2011) indicated in his findings that spraying apricot trees of the Royal cultivar with urea at concentrations zero, 1000, and 2000 mg. Liter-1, with three different dates, and the period between one spraying and the other was one month. The first spray date was January 26, 2005, which led to an increase in the yield and the average weight of the fruit. **Radi et al. (2003)** showed that the effect of NPK fertilization on the virulence of apricot fruits. (Canino), and it was found in the treatment of 20 kg of nitrogen/hectare that the fruits contained a high percentage of fibrotic compounds and sugars and a low percentage of organic acids. The treatment of fertilized trees with 920 kg of nitrogen/hectare, where the size of the fruits was greater in this case. On the contrary, it was found that the treatment With 60 kg of nitrogen/ha, resulted in fruits containing the lowest fats of phytochemicals and sugars compared to the fruits fertilized with the highest amount of nitrogen (980 kg of nitrogen/ha). **(Saleh and Younes, 2020)**showed in a study of nitrogen use at three levels (0, 10, and 20) g. of seedlings concluded that the added nitrogen caused a significant increase in the diameter of the main stem, the area of one leaf, and the total leaf area of the seedling. **(Al-Alam, 2020)** found a significant superiority in total chlorophyll in leaves, leaf area, and dry weight of rooted leaves when using DAB fertilizer based on nitrogen. **Chatzitheodorou et al. (2004)** found in their study on Spring Time and Red Haven peach fruits that nitrogen fertilization 40 days before flowering and twice after leaf emergence increased fruit firmness and TDS content. **AL-ALAM (2009)** confirmed in his study on the peach trees variety Dixie Red using three levels of nitrogen (zero, 50, and 100 g of N. Tree-1) using urea as a source of nitrogen, which was added in two equal batches in terms of quantity, the first was added in the first week of the month April and the second month after that date, that there was a significant increase in the concentration of nitrogen in the leaves and a significant decrease in the concentration of phosphorous in the leaves, while the concentration of potassium in the leaves was not significantly affected by the addition of nitrogen. **Al-Rawi and Al-Zibari (2006)** found that all fertilization treatments with nitrogen fertilizer (urea 46% N) to Myrobalan pear seedlings at concentrations zero, 10, 20, and 30 kg.dunum-1 in two batches after dividing the amount of nitrogen into two parts, the first at the beginning of

March and the second at the beginning of June Significantly superior to the comparison treatment in the percentage of nitrogen in the leaves.

Effect of potassium on growth characteristics and qualitative and quantitative characteristics of the yield:

Despite potassium is not included in the structure of any organic or plant molecule, it is involved in many biochemical and physiological processes that are vital for plant growth, yield, quality, and stress**. (Marchner 2012).** Potassium is determined as a quality element and plays an important role in optimizing the quality of the agricultural product **(Mitra and Dhaliwal 2009).**Affects quality features such as size,The color, appearance, TDS, acidity, and vitamin contents of the fruit vitamins **(Marschner , 2012).** High k concentrate in leaves andFruit, similar to N, negatively affects the quality and storage of fruit Properties due to antagonistic effects between K and Ca-Mg **(Bergmann, 1992).** In the study conducted by Bathha and Al-Husseini (2009) to find out the effect of different concentrations of potassium sulfate (0, 120, 180, 240, 300, and 360 kg.ha^{-1}) which were added to the soil in the second half of November. They found that the treatment 240 kg/ha-1 was significantly superior to the rest of the treatments in the average fruit weight.

Al-Bamrny et al. (2010) showed when spraying early Coronet peach trees with potassium nitrate (0, 0.1, and 0.2%) on April 24 and May 25 that the treatments were effective in increasing the weight of the fruit. **Chatzitheodorou et al. (2004)** found in their study of fertilizing Spring Time and Red Haven peach trees with potassium in early winter that potassium fertilization reduced fruit hardness and increased its total soluble solids content. **Ben Mimoun et al. (2009)** sprayed 15-year-old pear trees with potassium sulfate at a concentration of 3% on May 1, May 19, and June 1, and found that the spray increased the fruit weight and the percentage of soluble solids, while no significant differences were found in the firmness of the fruits. **(Bybordi, 2013)** founded that potassium treatment to apricot tree significant increase on Quantitative and Qualitative effect as (leaf area, total chlorophyll, fruit length, fruit diameter, texture hardness, sugar content, TDS compare with the control treatment.

Effect of Calcium on growth characteristics and qualitative and quantitative characteristics of the yield:

The calcium element participates in the process of transporting carbohydrates from the places where they are formed in the leaves to the places where they are collected in the fruits, and it also works to raise the efficiency of the plant in the representation of CO2 gas. The calcium content of leaves increases with the increase in the concentrations used, and the calcium content of fruits increases as the calcium concentration used in spraying increases. The lack of calcium in the fruits does not mean its deficiency in the leaves or in the soil, but rather the deficiency is localized, and the weather conditions and the irrigation system have a direct relationship on the distribution of calcium between the leaves and fruits or on the plants and fruits together. It is an important way to avoid calcium deficiency **(Abu Dahi and Younis, 1988). While Irfan et al., (2012)** found in their study a physiological response of the fruits of the peach *Prunus Persica* (L.) cultivar of the King of Florida to calcium chloride using concentrations of 1, 2, and 3 mmol per liter. It was found through the results that the concentration of 2 and 3 outperformed in the weight of the fruits and the diameter of the fruits and the ratio between the pulp and the stone core, and the yield compared with the comparison treatment. In another study carried out by **Ali et al., (2014)** on the effect of spraying with calcium chloride on peach trees at two levels, which are 1 and 2%, it was found that the concentration of 1% was significantly superior in the studied characteristics, which are fruit weight and fruit diameter and reduced the percentage of falling, while the chemical properties of the fruits were not found. Significant differences between the concentration of total sugars %, soluble solids, and total acidity**. Antunes et al., (2003)** obtain that the apricot is a stone climacteric fruit that is rapidly perishable after harvest limiting marketing time. The transport of calcium from the xylem to the plant depends on the environmental plants and their interaction, which is often undesirable and reduces the accumulation of calcium in fruits extensively (White, 2003). In another study conducted by **Manganaris et al., (2005)** it was reported that spraying with calcium has a beneficial effect on fruit durability of peach cultivars (*Prunus Persica* L.) on a large scale.

Effect of phosphors on growth characteristics and qualitative and quantitative characteristics of the yield:

Several researchers confirmed that fertilization with macronutrients caused a clear increase in the growth and development of seedlings and fruit trees. The results of the experiment conducted by **Taylor and Ende (1970**) on peach seedlings, Golden Queen variety, at different levels of nitrogen, phosphate, and animal fertilizers, showed that the lengths of The new growths have increased significantly in all interactions between the fertilizers, and it appeared that the nitrogen fertilization at a rate of 6,453 g. Seedling^{-1} gave the largest significant increase in growth lengths, while nitrogen fertilization increased by 1360 g. Seedling-1 resulted in a significant decrease in the average length of new growths, and it was also noted that phosphate fertilization alone did not give significant differences between the lengths of growths. **Al-Araji (2012)** reached a significant increase in the vegetative growth characteristics (one leaf area, chlorophyll percentage, and dry matter percentage) when using NPK fertilizer on young peach trees, cultivar Dixie Red, to start fruiting.

(Hussein et al., 2016) in a study of the effect of the chemical fertilizer ammonium phosphate (DAP) on the growth of seedlings of apricot *Prunus armenica* L. resulted in a significant increase in the studied characteristics of plant height, a number of leaves, leaf area, percentage of chlorophyll, and leaf content of mineral elements. Phosphate fertilization led to a significant increase in the total chlorophyll content of leaves, the concentration of total sugars (except in Coronet cultivar for the 2006 growing season), the number of leaves formed on seedlings (except for Coronet cultivar for the 2007 growing season), the leaf area of seedlings, the height of seedlings, the diameter of the rootstock and the main stem. The number of branches formed on the seedlings and their lengths and the dry weight of the vegetative total (except in the cultivar Dixie Reed for the 2007 growing season), the number of main roots formed on

the seedlings, and their lengths in both cultivars and the two seasons, and the dry weight of the root system (for the first season only) in both cultivars and two seasons in studying the effect of sulfur, phosphorous and gibberellin on growth And the mineral content of seedlings of two cultivars of peach **(Al-Zebari, 2008).** (**Rettke et al., 2006**) reported that vaccination700 g of potassium and 500 g of phosphorous in the root area from each apricot tree, the yield increased by 35% analyzed to the control treat. It was concluded that the application of 1 kg of N. 600 g of P and 500 g of K in an orchard by nature Also contains 0.5% soluble organic matter 8 mg/kg and 120 mg/kg soluble phosphorous and Potassium, respectively, the yield increased by 28% and Fruit size increased by 20% compared to the control (**Khamis et al., 1994). (Bybordi, 2013**) founded that phosphorus treatment to apricot tree significant increase on Quantitative and Qualitative effect as (leaf area, total chlorophyll, fruit length, fruit diameter, texture hardness, sugar content, TDS compare with the control treatment.

CONCLUSIONS:

From the above-mentioned research, the use of major nutrients by foliar spraying or soil addition affects the vegetative growth of stone fruit trees, which is positively reflected in the quantitative and qualitative characteristics of the crop, but Appropriate concentrations should be used, excessive concentrations should be used, and high concentrations should be used because they lead to counterproductive results that lead to damage to trees.

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