



# Effect of Sulfur and Spraying with Calcium Nitrate and Selenium on Response of Date Palm (*Phoenix dactylifera* L.) under Saline Water

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**Abstract:** The study was conducted at Shatt al-Arab district, Al-Zurajji area, Basrah Governorate, to determine the effect of sulfur application and calcium nitrate and selenium spraying on some chemical and physiological traits of date palm (Halawi cultivar) under the saline conditions of Basrah Governorate. The results showed that the superiority of the sulfur addition at 500 g Palm<sup>-1</sup> and selenium spraying at a 0.01% on percentage of dry matter, dissolved solids, total sugars, and reducing sugars in fruits, chlorophyll, total carbohydrates, potassium concentration and K / Na ratio in leaves as compared to control. This treatment decreased significantly percentage of sucrose and water content in the fruits, and the concentration of proline and sodium element in the leaves as compared with the control. The addition of sulfur the concentration of 500 g Palm<sup>-1</sup> and spraying with calcium nitrate at concentration of 0.150% recorded significantly high percentage of membrane stability index and calcium concentration in leaves and decreased the percentage of potassium ions leakage.

**Keywords:** Sulfur, Calcium nitrate, Selenium, Date palm (*Phoenix dactylifera* L.), Halawi cultivar, Saline conditions

The date palm (*Phoenix dactylifera* L.) belongs to the Arecaceae and is a semi-tropical fruit tree. Halawi cultivar the famous varieties in the world, comes at the forefront of the early ripening and commercial exported by Iraq as the good-flavored dates. Iraq was the most important dates producing countries in the world, but the palm productivity is declining under the unfavorable environmental conditions, one of them is the salinity problem, which the most important factors affecting the success of palm cultivation and productive. Sulfur is the fourth important element in plant nutrition synthesis of some amino acids, such as cysteine and methionine, involved in building protein. The addition of sulfur to the soil increases the readiness of nutrients, especially the trace elements and absorption by plants. Calcium element from macronutrients has many physiological functions of plant growth and development, building the cell structure of plant and the main component of the cellular plate. The calcium peptides involved the phosphotidic acid formation, which contributes to cellular membrane synthesis (Hickman 2011). Several studies shown that this element is the secondary messenger in the plant's response to plant hormones, as well as environmental stress conditions. The calcium effective in plants ability increasing to salt stress tolerate, due to the integration maintenance of cellular membranes, the regulation of selective permeability in cellular membranes, particularly the plasma membrane. Selenium was classified as a non-enzymatic antioxidant and entered as an adjunct to the enzyme antioxidant system

(Abdel Nasser 2011), especially the glutathione peroxidase (Alazzawi and Faisal 2015). It has the opposite magnetic properties, causes the magnetic field creation, opposes another external magnetic field, free radicals possess a harmful and destructive magnetic moment for electronic equilibrium, leads to a reduction in the magnetic momentum of free radicals with supernatural forces, as selenium here dampens the free radical. Recent studies show that the selenium in stress tolerance, during several mechanisms, includes being anti-oxidative and anti-hydrogen peroxide, the effect of free radicals as the main part of the action of the glutathione peroxidase (GPX) enzyme, without this element toxic hydrogen peroxide molecule that accumulates as a result of stress into water and the cell remove of the toxic hydrogen peroxide effect, turns it into absolute water molecules. Gad El-Kareem et al. (2014) observed that spraying date palms by 0.1% of silicon element with selenium with a concentration of 0.02% significantly increase total chlorophyll and potassium element concentration in control. Tolima (2015) explained that the adding sulfur at a level of 400 g palm<sup>-1</sup> to the date palm resulted a significant increased dry matter, total sugars, the ratio of total dissolved solids and a decrease in acidity compared in fruit. The added selenium with irrigation water at a concentration of 15 mg. Kg<sup>-1</sup> to date palm led to a decrease in the toxicity of the element of cadmium by increasing chlorophyll, the stability index of chlorophyll, the membrane stability index, and reducing the accumulation of proline and hydrogen peroxide and the index