Plant Archives Vol. 20, Supplement 1, 2020 pp. 2855-2857 **e-ISSN:2581-6063 (online), ISSN:0972-5210**

DETERMINATION OF THE READINESS OF CALCIUM ION FOR PLANTS IN IRAQI SOIL

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Abstract

The research for the cause of calcium fertilization is summarized in most of the Iraqi soils with calcium soils and a high content of this ion. The results indicated that the ready-made calcium ion content in the studied soil does not contain a available calcium ion, as the concentration of this ion ranged in most soils and average (7.8, 4.2, 6.9) mmol charge. Kg^{-1} for the study soil areas which are (Najaf, Basra, and Baghdad), respectively, which is higher than the critical limit for the available of this ion as it reached a very available concentration. The results also indicated a high content of $CaCO_3$, which reached (245, 230 and 175) g. Kg^{-1}, but these soils were using calcium fertilized.

The results indicated that the main reason for fertilization with calcium ion in calcareous soils in Iraq that this ion is a major of the plant and needs it very much to carry out metabolic and other processes as well as its relationship to organic matter and irrigation method and the extent of its effect on its readiness and that the amount of calcium ion concentration in the root zone in spite of its higher concentration, it does not meet the need of this plant from the element of calcium, so this element must be fertilized to the soil.

Keyword **:** Calcium ion, fertilization, calcareous soils.

Introduction

Calcium ion is one of the main and important ions, as it enters the synthesis of cell walls, their permeability, the formation of plant proteins, the formation of root nodes and the work of stimulant and auxiliary in the work of enzymes and its deficiency encourages the spread of plant diseases and prevents the separation of parts of the plant and its deficiency affects the growth of pollen (Al-Naimi, 1987). The average content of the earth's crust is approximately 36.4 g. Kg^{-1}, and this indicates that this content is higher than the content of most nutrients, as there is calcium in the soil, most of the primary minerals, and this includes feldspar, calcium phosphate, and calcium carbonate, as calcium carbonate is of Calcium soil and $CaCO_3$. $MgCO_3$ (Mengal and Kirkaby, 1982) Calcium is distributed in Iraqi water and soil with high concentrations, as most of the Iraqi soil is calcareous soil (Buringh, 1960), which is a major source of calcium ion in Iraqi is $CaCO_3$ and $CaSO_4.2H_2O$.

The results indicate that the calcium content of the Iraqi soil is good as soils are calcareous, and the calcium ion is one of the main elements scattered in water and soil, as it reaches 3.64%, and this is good from increasing its concentration above the critical limit for the available of this element, but research and studies indicate that researchers The peasants are permanently to fertilize the soil with this element, meaning that it is added to the soil through fertilizers despite its presence and with high concentrations in Iraqi soil, as he indicated (Al-Naimi, 1989) that calcium deficiency in mineral soils is rare and relative, because mineral soils are rich in ready calcium, Therefore, the study aims to find out the real reason for the deficiency in calcium concentration found in plants.

Materials and Methods

Samples were collected from different tissues of soil from several locations in the governorates of Najaf, Basra and Baghdad, and by 9 samples and six replicates were brought to the laboratory and after the analysis some soil samples were excluded for the purpose of not being compatible with the objectives of the research as samples of different tissues of soil were taken from different locations in the governorates Iraq Table (1) for three samples from each site 3 and six replicates for each sample.

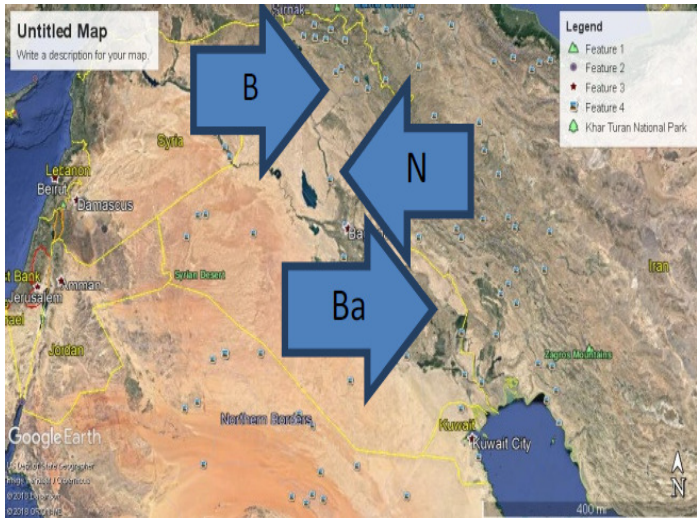

Fig. 1 : Map showing sampling locations

Table 1 : The sampling location and symbol type.

Texture	Symbol	Location	No.
sandy soil	N1	Najaf 1	1
loamy soil	N2	Najaf 2	2
Clay soil	N3	Najaf 3	3
sandy soil	Ba1	Basra 1	4
loam soil	Ba2	Basra 2	5
clay soil	Ba3	Basra 3	6
sandy soil	B1	Baghdad 1	7
loamy soil	B2	Baghdad 2	8
clay soil	B3	Baghdad 3	9

Laboratory analyzes were performed to estimate the soil tissue according to the aforementioned (Bavailable, 1965), the degree of soil reaction, the degree of salinity, calcium and calcium carbonate according to (Page *et al*. 1982).

Results and Discussion

The results in Figure (2) indicate a relative decrease in the degree of interaction in the soil of Baghdad region compared to other soils, as the lowest percentage was recorded in the site of B1 compared to the highest recorded in the soil of Ba1 in the Basra region and this is due to the nature of the soil in terms of its containment of ions and the prevailing salts in general, the Iraqi neutral soils it tilted to the basic because it contains a high percentage of $CaCO_3$, which ranges between 18 - 41%.

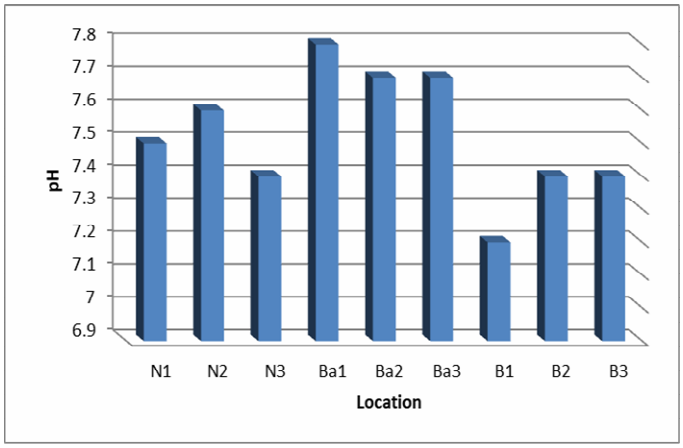

Fig. 2 : Values of the degree of interaction in the study sites

The results showed in Figure (3) that the soil recorded a decrease in the degree of salinity values in the Baghdad region, and the average rate was 2.8 $dS.m^{-1}$, while in the Najaf area it reached 5.8 $dS.m^{-1}$, while the highest recorded in the Basra region was 7.5 $dS.m^{-1}$ This is consistent with each of (Buringh, 1960; AL-Agidi, 1976). This is due to the influence of the Tigris and Euphrates rivers on the source side, as the salinity values increase as we move away from the sources of these two rivers and get closer to their convergence region in the Qurna area in Basra.

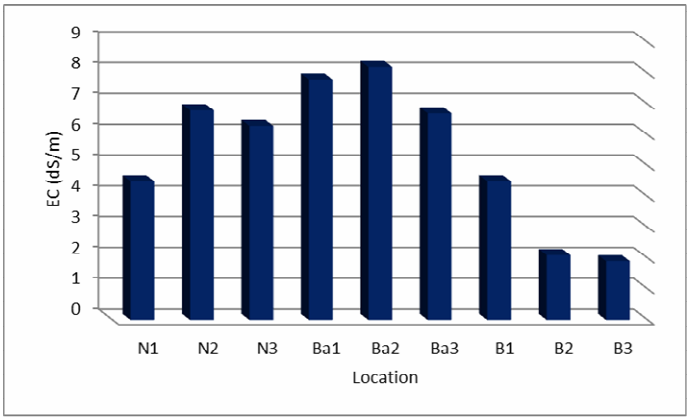

Fig. 3 : Values of the degree of salinity in the study sites

From Figure (4), it is clear that the readiness of calcium does not have a direct relationship with salinity in absolute terms, but rather relative, as we note a decrease in the value in the Baghdad region, which averaged 4.1 mmol per charge. Kg^{-1}, while in Basra, it reached 6.7 mmol charge. Kg^{-1} The highest values were recorded in the Najaf region and amounted to 7.6 mmol charge. Kg^{-1}, and this indicates that the nature of Iraqi soil has a significant role in increasing calcium readiness because it contains calcium carbonate mineral, which reached as follows (245, 230 and 175) g. Kg^{-1} for each of the Najaf, Basra, and Baghdad sites, respectively.

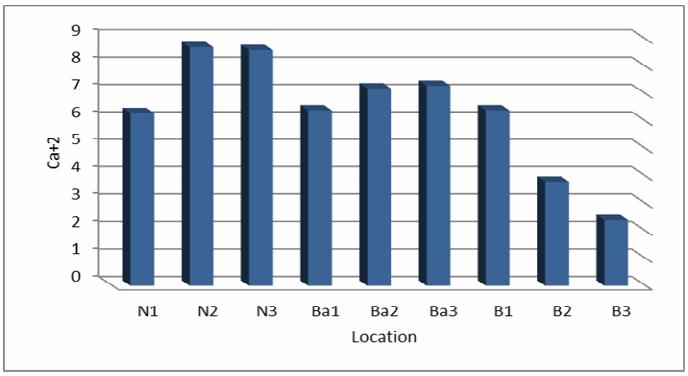

Fig. 4 : Ready-made calcium concentration values in the study sites

The results in Figure 4 and the calcium carbonate values indicated that the soil of the study areas contained enough calcium, and this is indicated by many studies and research in the study sites in particular and in the regions of Iraq and the dry and semi-dry areas in general, but what requires observation is the use of large quantities Calcium fertilizer in these areas. The reason is that the calcium content of the plant differs according to the type and age of the plant, as the two-leaf plant absorbs more calcium than a single-leaf plant due to the high reciprocal capacity of its roots as well as the permeability of the biological membranes of calcium in terms of the effect of plant age as it increases with increasing plant life (Al-Nuaimi, 1987) .Also, there is another reason, and this is what preliminary research (Charbi, 1997) indicated to him that clay minerals, especially montmorillonite, have a great influence on the readiness of calcium ion by adsorption on clay surfaces.

As a result of the use of tourist irrigation methods for a very long period of time in most agricultural soils, this was caused by calcium wash from the top layer of the soil, as it was found (Pavinato *et al*., 2008) that the rate of calcium ion wash increases with increased rainfall and irrigation periods.

The method of cultivation in most Iraqi regions is the use of large quantities of animal waste as a source of organic matter due to the low soil content of them, which ranges from (0.2 to 1.4%) in most regions of Iraq as a result of dry and semi-arid regions and high temperatures that cause loss of organic matter (This process, due to the addition of organic matter, especially non-decomposing, which leads to an increase in the activity of microorganisms, which performs the process of analyzing the organic materials, thus increasing the secretion of CO_2 gas, which increases the solubility of $CaCO_3$ and the formation of the Ca $(HCO_3)_2$ compound, which is more soluble. In the water, as it is shown by the following equation:

$$CaCO_3 + CO_2 + H_2O \rightarrow Ca\ (HCO_3)_2$$

Ca $(HCO_3)_2$ in soil containing $CaCO_3$ is an important means of obtaining calcium wash from the root zone. Research and sources indicate that NO_3 nitrates are sourced from organic matter by mining, which is an oxidation process according to the following formula:

$$NH_4 + 4O_2 \rightarrow 2NO_3 + 4H + 2H_2O$$

Consequently, the hydrogen ion formed in this way can release calcium by exchanging in colloidal soils, and this condition causes a decrease in the storage of calcium ion present on the exchange surfaces of soil minutes, especially in sandy soils, since nitrates work on the process of washing

calcium from the root zone. The results showed that sandy soils are among the most that suffer from a available of calcium ion despite the abundance of $CaCO_3$ minerals and therefore need to increase fertilizer with calcium-containing fertilizers as a result of the calcium ion moving from the soil as well as the low exchange capacity of sandy soils and this indicates that the capacity Cation exchange of soil has a major role in the readiness of calcium ions for the plant.

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