



926/E2/Poster

**Effect of addition of EDTA on calcium absorption by mung plants (*Vigna radiata*)**

M P Ranhoti and R C L De Silva\*

*Department of Chemistry, Faculty of Science, University of Kelaniya, Kelaniya*

Soil is capable of supporting plant life by supplying various factors including water and nutrients. Soil contains various mineral species such as  $H^+$ ,  $Ca^{2+}$ ,  $Mg^{2+}$ ,  $K^+$ ,  $Na^+$ ,  $Fe^{2+}$ ,  $Mn^{2+}$  that adhere to the soil particles and most are present as free ions in the aqueous portion of soil. Calcium is a unique and essential macronutrient for plants. It is required for physiological and biochemical processes and is a defensive agent as well. Insufficient calcium leads to deterioration of the cell membrane. Hence calcium is an important structural component of plants. It acts as a secondary messenger and regulates functions inside the plant cells. Availability of  $Ca^{2+}$  for plants is reduced due to the formation of stable, insoluble complexes with  $PO_4^{3-}$  or other ions present in soil. Chelation of  $Ca^{2+}$  with EDTA to form the Ca-EDTA complex increases its solubility and mobility, thus increasing the availability for crops. It is a currently used technique in large scale agricultural fields. However an in-depth study of the effect of addition of excess EDTA has not been reported.

An EDTA concentration series with the combination of several  $Ca^{2+}$  concentrations were used for the study to investigate the effect caused by EDTA on calcium absorption, using pot experiments with mung bean (*Vigna radiata*) as the experimental plant. Planted soil after 10, 20 and 30 days of plantation was tested for conductivity, water soluble and exchangeable  $Ca^{2+}$  in soil.

The maximum tolerable EDTA concentration for the selected mung plants was 1.00 mmol/kg and tolerable  $Ca^{2+}$  concentration was less than 0.025 mol/kg, under experimental conditions. Higher soil conductivity was shown for the 0.50, 0.75 and 1.00 mmol/kg EDTA concentrations with the combination of 12.50 and 18.75 mmol/kg  $Ca^{2+}$ . The highest value was recorded for the 1.00 mmol/kg EDTA- 18.75 mmol/kg  $Ca^{2+}$  combination. The increased water solubility of  $Ca^{2+}$  was recorded with the increased EDTA concentrations and the maximum value was shown in the 1.00 mmol/kg EDTA- 18.75 mmol/kg  $Ca^{2+}$  combination. Similarly the maximum exchangeable  $Ca^{2+}$  was also found in the same combination. A higher deposition of  $Ca^{2+}$  was found in plant shoots than in roots and the maximum absorption was shown in 1.00 mmol/kg EDTA, with each  $Ca^{2+}$  series. The overall results showed higher availability of  $Ca^{2+}$  in soil due to the addition of EDTA. However, the addition of excess EDTA can reduce the available  $Ca^{2+}$  under field conditions due to leaching. Increased EDTA concentrations increased the availability of the  $Ca^{2+}$  but very high levels were toxic.

Keywords: Calcium, chelation, EDTA, mung plants