

Effect of varied nutrient solution concentration of P,Mo,S,Al and Mn supply to soil on the yield nitrogen fixation of two leguminous species pigeon pea (*Cajanus cajan*) and white leadtree (*Leucaena leucocephala*) at Nyaruguru district, southern Rwanda.

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ABSTRACT: Many agriculturally important plants in the legumes family can use nitrogen (N) from atmosphere for growth through biological nitrogen fixation (BNF). Legume-nitrogen fixation is dramatically effected under mineral nutrients deficiencies or excess and other environmental constraints. However, it has yet to be established as to whether such process of nitrogen fixation is affected at which sensitivity level parameters.

A pot experiment was conducted on a tree nursery at Nyagisozi sector of Nyaruguru district, southern Rwanda in field to evaluate the effect of varied nutrient solution concentrations of phosphorus, molybdenum or sulfur adequate or limitation, and aluminum or manganese toxicities on the yield nitrogen fixation of two leguminous species pigeon pea (*Cajanus cajan*) and white leadtree (*Leucaena leucocephala*). The experiment was laid out in a randomized complete block design (RCBD) with three replications. The 50 seedlings of each species were taken as a reference and fertilized with 50 kg of triple superphosphate (TSP), Ca(H 46% /ha in order to avoid the deficit in phosphorus. Four elements Mo, S, Al and Mn were applied on soil and leaf at different level doses for each block.

In block1, soil application four elements before planting by four different levels doses of each element, Molybdenum: 0; 0.54; 1.08 and 2.16 mg/stem of Na₂MoO₄.2H₂O, 39%; Sulfur: 0; 200; 400 and 800 g/stem of K₂SO₄ 18.4%; Manganese: 0; 10; 20 and 40 mg/stem of KMnO₄, 34.8% and Aluminum: 0; 0.5; 1.5 and 3.5 mg/stem of Al₂(SO₄)₃.18H₂O, 8.12%.

In block 2, Leaf application for four elements in five factorials -Molybdenum: 0; 0.27; 0.54; 1.08 and 2.16 mg/stem of Na₂MoO₄.2H₂O, 39%; Sulfur: 0; 100; 200; 300 and 400 mg/stem of K₂SO₄, Manganese: 0; 5; 10; 20 and 40 g/stem of KMnO₄ 34.8% and Aluminum : 0; 0.5; 1,0, 1.5 and 13.5 mg/stem of Al₂(SO₄)₃.18H₂O, 8.12%.

After five weeks of applying to the soil, the N fixation was determined by measured the wet biomass weight, volume of nodule and the rate of acetylene (C₂H₂) reduction activity (ARA). The results showed that legumes differ significantly (P=0.05) in their ability to fixed nitrogen. Application of P, Mo, S, Al and Mn elements in general significantly increased wet biomass weight, volume nodulation and the rate of acetylene (C₂H₂) reduction activity (ARA) especially by sulfur application to the leaf at 200,400 and 800 mg/stem doses at second trial and the maximum effect was observed at the dose of 200 mg/stem with increased of 14% comparing to the control.

Keys words: Acetylene Reduction activity (ARA), *Cajanus cajan* and *Leucaena, leucocephala*, *Rhizobia*, *DAP*