



Tropentag, October 11-13, 2006, Bonn

“Prosperity and Poverty in a Globalised World—
Challenges for Agricultural Research”

Rock-phosphate Alleviates Detrimental Effects of Aluminium in Tomato (*Lycopersicon esculentum* L.) Production on Acid Soils

JOSEPH PATRICK GWEYI-ONYANGO, VOLKER RÖMHELD, GÜNTER NEUMANN

University of Hohenheim, Institute of Plant Nutrition, Germany

Abstract

Application of rock-phosphates is considered as an economically cheaper alternative for chemically processed P fertilisers on tropical soils, promoting rock phosphate solubilisation but limited information exists on secondary effects of rock-phosphates. In this study we provide evidence for beneficial effects of rock-phosphate (RP) on growth and yield of tomato (*Lycopersicon esculentum* L. var Moneymaker), grown on a field site at Maseno, Kenya (Oxisol, pHH₂O 4.2; PCAL 90 mg/kg soil). Treatments comprised NO₃, NH₄⁺ and 2:1 NH₄NO₃ (100mg N kg⁻¹ soil with NH₄⁺ and NH₄NO₃N being supplied together with nitrification inhibitor) in combination of with Ca(H₂PO₄)₂; (80mg P Kg⁻¹ soil), rock P (Hyperphos: 200mg P kg⁻¹ soil) and no P. Rock P treatment was either band or deep-placed. The result revealed a clear increase in yield at 46 days after transplanting (DAT) with RP treatments, particularly after rock-phosphate placement close to the roots. This could not be attributed to differences in P-, Ca-, or Mg-nutritional status. However, Al accumulation in shoots was significantly reduced by rock-phosphate treatments between 29 and 46 DAT as compared to either soluble P treatments or when P was omitted, suggesting an alleviatory effect on Al toxicity. This was confirmed by experiments under controlled conditions with tomato seedlings grown in rhizoboxes with quartz sand irrigated with modified Hogland nutrient solution. Rock P was either homogeneously distributed over whole rhizobox, or localised to the upper or lower half of rhizobox. The inhibition of root growth by Al (3.2mM AlCl₃ after pH adjustment to 4.5) was ameliorated by RP, which was accompanied by increase in the pH at rhizoplane of the Al-sensitive apical root zones, demonstrating prevention of Al-induced inhibition of root elongation by local or homogenous application of rock-phosphates.

Keywords: Acid soils, Al toxicity alleviation, key words. Rock phosphate, *Lycopersicon esculentum* L, rhizoplane pH and RP placement.