SCREENING INDIGENOUS *RHIZOBIUM* ISOLATES FOR TOLERANCE TO ACIDITY, NODULATION AND IMPROVED DEVELOPMENT OF COMMON BEANS UNDER LOW SOIL pH IN UASIN GISHU DISTRICT, KENYA.

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A Thesis submitted to the School of Graduate Studies in partial fulfilment for the requirement of the degree of Master of Philosophy in Botany (Plant Physiology)

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August, 2003

ABSTRACT

The presence of effective *Rhizobium* in soils can improve the yield of common beans. Effective *Rhizobium* can also be introduced by inoculation with selected strains. A study was carried out to investigate the density, infectiveness, effectiveness, and acid and aluminium tolerance of rhizobia in soils from different parts of Kenya. The objective was to identity effective, acid and aluminium tolerant local *Rhizobium* populations that could be used to improve common bean production in the acid soils of Uasin Gishu district, Kenya.

Mackinnon Road (MT), Shariani (SK), Mwangani (MM), Kavutiri (KE1, KE2), Kahuro (KM), Kasaka (KB), Mondoi (MB), Boito (BK), Kuinet (KU), Chepkoilel Campus farm (CU1, CU2), Nyatieko (NK1, NK2) and Ogembo (OG) rhizobia were isolated from common bean nodules collected *in situ* or nodules obtained from the greenhouse grown bean plants treated with soil suspensions. Their response to varying pH (4, 5 and 6) and aluminium (0.0, 50.0, 100.0, 150.0 and 200.0μM) levels were tested in pour plate agar cultures, and the number of colonies formed after 72 hours was used as a measure of tolerance to acidity and Al stress. Broth cultures of the isolates were used to inoculate GLP24 in a field experiment. Leaf chlorophyll concentration, plant height, root and shoot weight, number and weight of nodules, number of branches, number and length of pods, weight of seeds/pod or plant were assessed using standard techniques. The data were analysed statistically and differences of the means among treatments taken as significant at $P \leq 0.05$.

Soils from Kavutiri, Kahuro, Mondoi, Nyatieko, Kuinet, Chepkoilel and Kasaka were very acidic (pH<5.5), those from Ogembo and Boito were moderately acidic (pH 5.6 – 6.2), and those from Shariani, Mackinnon Road and Mwangani were slightest to neutral (pH > 6.2). The acid soils had low concentration of total and Olsen P, and had significantly lower *Rhizobium* populations (1.55×10^2 cells/gram of soil) than moderately acidic or neutral soils (2.5×10^5 cells /gram of soil). Decreasing pH or increasing Al significantly reduced *Rhizobium* growth and final colony count. Eleven isolates (NK1, KB, MT, KE1, KE2, KU, KM, OG, MB, CU1 and SK) were tolerant to pH 4.0 and 200μM Al concentration. The OG and NK2 produced significantly heavier nodules. The NK1, KE2, KM, OG and MT produced significantly higher leaf chlorophyll concentration, and KB and CU1 significantly increased shoot branching than the commercial inoculant. Only KB induced a significant increase in number of pods per plant and none of the isolates increased the number of seeds/pod in comparison to the commercial inoculant. NK2, KB, CU1 and KU induced significant increase in seed dry weight/plant compared to the commercial inoculant. All the isolates did not nodulate *Leucaena spp,* hence they were most probably *R. etli* and not *R. tropici*.

It was concluded that acid soils had lower indigenous *Rhizobium* population than moderately acidic or neutral soils. *Rhizobium* isolates from acidic soils were acid tolerant. KB, KU, CU1 and NK2 were acid tolerant and signifcantly improved GLP24 growth or seed dry weight/plant in Chepkoilel Campus farm soils and should be tested further to establish their stability in improving development and yield of common bean.