

**BEAN DISEASES INOCULUM IN SOIL AND SEEDS IN NANDI COUNTY AND
MANAGEMENT OF BEAN ROOT BY SEED DRESSING**

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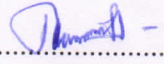
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DECLARATION

I declare that this thesis is my original work and has not been presented for the award of a degree in any other university

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GENERAL ABSTRACT

The incidence and severity of bean root rot and seed borne disease has continued to increase causing yield losses of up to 70%. The increase is partly due to continuous cropping and use of uncertified farm-saved seeds. This study was carried out to determine the levels of bean disease inoculum in soils and seed and to evaluate the efficacy of seed dressing in managing root rot. Soil and bean seed samples were collected from farmer fields of Nandi County in a survey carried out in 2013. The farm saved seed samples were subjected to physical purity, germination and disease pathogen isolation. The amount of root rot pathogen inoculum in the soil samples was also determined by plating on agar medium. Efficacy of seed treatment in managing root rot was determined by conducting on-farm experiments at Koibem (high fertility area) and Kapkarer (low fertility area) in Nandi South during 2013 short rain season and also undergreen house conditions. Seed treatment options evaluated were Seed plus® (10% Imidacloprid, 10% Metalaxyl, 10% Carbendazim), Murtano super® (20% Lindane, 26% Thiram), Rootgard® (*Trichoderma* spp., *Bacillus* spp., *Pseudomonas* spp., *Aspergillus* spp., *Chaetomium* spp., *Esherichia* spp., *Azorobacter* spp.), Funguran – OH 50WP® (50g/l Copper hydroxide), Click 20SL (imidacloprid 200g/l) and Monceren® 125 DS (Imidacloprid 233g/l, Pencycuron 50g/l, Thiram107g/l). Botanical product Neemraj (azadiractin 0.30%EC) was included in the greenhouse experiments.

The study showed that majority of farmers in Nandi County are small holders growing beans in plots of less than one acre and use own farm-saved seeds or buy the seeds from local markets and KALRO. Major root rot pathogens isolated from soils included species of *Rhizoctonia*, *Fusarium solani*, *F. oxysporum*, *Pythium* and *Macrophomina* and the soils contained inoculum levels of up to 20,000 CFU/g soil in some of the agro-ecological zones. The seed samples had low purity of less than the recommended 95%, most had germination of less than 85% and had high levels of

infection and contamination with other bean varieties. The bean seed samples contained bacterial blight pathogen inoculum levels of up to 456 colony forming units per seed for common bacterial blight (*Xanthomonas axonopodis* pv. *phaseoli*) and up to 132 colony forming units per seed for halo blight (*Pseudomonas savastanoi* pv. *phaseolicola*) pathogen. Seed samples showed symptoms of infection including shrivelling and discolouration, mouldiness and infection on incubation between paper towels. The agro ecological zones differed in level of seed borne disease pathogen inoculum with *X. axonopodis* pv. *phaseoli* being highly isolated in seeds from agro-ecological zone LH1 and *P. savastanoi* pv. *phaseolicola* being more isolated in seed samples from agro-ecological zone UM1-2. Seed dressing options significantly differed in their efficacy in reducing incidence of bean root rot infection. Seed treatments with Monceren® 125 DS and Click 20sl significantly improved emergence, plant stand, and nodulation, but reduced incidence of root rot, bean fly (*Ophiomyia* Spp.) and aphid (*Aphis* Spp.) infestation.

The results showed that soils and farm saved bean seeds in Nandi are infected with significant levels of root rot and bacterial blight disease-causing pathogens, respectively. This indicates that farmers start their bean crops with high inoculum levels which is likely to result in severe disease infections and low yields. However, dressing the farm saved seeds with appropriate chemical formulations can drastically reduce the diseases and improve yields. Seed treatment offers a cheap and environmentally friendly management approach and there is need to sensitize farmers on usage of seed treatment in bean production.

Key words: Farm-saved seed, *Phaseolus vulgaris*, root rot, seed quality, soil and seed borne inoculum, seed dressing.