EFFECT OF SOIL NUTRIENTS AND INTERCROPPING ON SOIL BORNE DISEASES AND SEED QUALITY OF COMMON BEAN IN BUSIA COUNTY

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A THESIS SUBMITTED IN PARTIAL FULFILMENT OF THE REQUIREMENT FOR THE AWARD OF DEGREE OF MASTER OF SCIENCE IN CROP PROTECTION

DEPARTMENT OF PLANT SCIENCE AND CROP PROTECTION

FACULTY OF AGRICULTURE

UNIVERSITY OF NAIROBI

2017

DECLARATION

This Thesis is my original work and has not been presented for award of a degree in any other University

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GENERAL ABSTRACT

High occurrence of bean root rots is attributed to continuous and inappropriate cropping systems, low soil fertility, use of low quality seed and use of susceptible varieties. Intercropping system is important in a sustainable agricultural production, thereby contributing to improved soil fertility and disease management. This study evaluated the effect of soil nutrients and cropping systems on soil borne diseases and seed quality of severed common bean varieties. The field experiments were set up in Alupe, Busire and Butula of Busia County with two farmer saved bean varieties KK8 and GLP2 in pure stand, intercropped with maize and applied with and without fertilizer. Soil samples were collected to determine the soil nutrients status and population of soil borne fungal pathogens. The pathogens population was determined as the number of colony forming units after isolation on Potato dextrose agar medium by dilution plate method. Data on crop emergence stand count, bean fly incidence, disease distribution, incidence and severity was also collected. Root rot and bean fly damage incidences were assessed at second and fourth week after emergence while foliar diseases were assessed at the fourth and sixth week after planting. Fungal infections on bean stem bases were determined by isolation on agar medium while plant biomass, numbers of pods per plant and grain yield were determined at harvest. Quality of the bean seed was assessed based on physical purity, seed discoloration, seed shrivelling and germination. Bacterial contamination of seeds was determined as the number of bacterial colony forming units in seed washings plated on nutrient agar medium. Soil nutrient levels varied significantly ($P \leq 0.05$) between sites, where soil from Alupe was sufficient in most elements than soils from Butula and Busire. The fungal soil borne pathogens isolated from soil and stem bases were *Fusarium oxysporum, F. solani, Pythium* spp., *Macrophomina* spp. and *Rhizoctonia* spp. There was significant variation ($P \leq 0.05$) in

the levels of inoculum in soil and stem bases between sites. The highest population was observed in soil sample from Butula (Mean = 8000 CFU/g), with *Fusarium* spp. being the most predominant with a mean population of 3000 CFU/g and incidence of 40%. There was a significant variation ($P \leq 0.05$) on the incidence of root rot pathogens isolated from stem bases between sites and treatments. The stem bases from Butula had the highest incidence of root rot (Mean = 50%). Beans intercropped with maize and applied with fertilizer had significantly lower ($P \leq 0.05$) intensity of root rot of about 20% compared to pure stand. Foliar diseases observed in the field were common bacterial blight, angular leaf spot, bean anthracnose, web blight, bean rust and *Aschochyta* leaf spot. Disease intensity varied significantly ($P \leq 0.05$) among the different treatments. Bean seed yield was below the potential yield of 1400 to 2000Kg/Ha. However, the KK8 variety intercropped with maize and applied with fertilizer had a higher yield of 1040 Kg/Ha. The bean seed samples did not meet the 95% recommended purity level; however samples from the intercrop plots had higher purity levels and recommended germination level of 85%. Bean seeds from sole crop plots had higher levels of *Xanthomonas axonopodis* pv. *phaseoli* at 1091 CFU/seed and *Pseudomonas savastanoi* pv *phaseolicola* at 776 CFU/seed. Results from this study indicated that low soil fertility, use of low quality seed and high inoculum levels of soil borne pathogens in the soil contribute to the high incidences of bean diseases. The study concluded that Low soil fertility increase the severity of soil borne diseases. Intercropping system prevents buildup of soil borne pathogens, thereby lowering insect pest incidences, diseases thus improving soil fertility, growth and yield of the crop. The study recommended that there should be an incorporation of intercropping system, crop rotation and field sanitation as common bean disease management and soil fertility improvement measures. Price reduction of bean certified seed for affordability by small scale farmers and farmer training on improved post-harvest and storage practices.