

**EFFECT OF SEED QUALITY AND SOIL BORNE PATHOGEN INOCULUM ON  
DISEASE PRESSURE IN COMMON BEAN**

**KOSGEI BENADATTE JEROTICH**

**B.Sc. Agriculture, University of Nairobi**


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

**DEPARTMENT OF PLANT SCIENCE AND CROP PROTECTION  
FACULTY OF AGRICULTURE  
UNIVERSITY OF NAIROBI**

**2016**


## DECLARATION

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

Signature..........Date.....27/09/2016.....

Kosgei Benadatte Jerotich

This Thesis is submitted with our approval as University supervisors:

Signature..........Date.....27/9/2016.....

Prof. James W. Muthomi

Department of Plant Science and Crop Protection

University of Nairobi

Signature..........Date.....27/09/2016.....

Dr. Maina Wagacha

School of Biological sciences

University of Nairobi

Signature..........Date.....27. 9. 2016.....

Prof. Ramah D. Narla

Department of Plant Science and Crop Protection

University of Nairobi

## ABSTRACT

Build-up of pathogen inoculum in seed and soil due to recycling of seed and continuous cropping by farmers contribute to high bean disease pressure and low yields. This study was carried out to determine the effect of seed quality and soil borne pathogen inoculum on fungal and bacterial disease pressure in common bean. Field experiments were carried out in two agro-ecological zones (AEZs) LM1 (Busia) and LM4 (Bondo). Seeds of four bean varieties, KATX56, KATX69, KK8 and GLP2, sourced from market, farmers and agro-chemical outlets were evaluated for quality before planting and at harvest. During crop growth, data on emergence, stand count, incidence and severity of root rots and foliar diseases was taken at emergence, second, fourth, sixth, and eighth weeks after emergence. Inoculum of soil borne pathogens and soil fertility levels were determined at planting and infections on bean stem bases determined by isolation on agar medium. Plant biomass, number of pods per plant and grain yield was determined at harvest.

Soil nutrient levels varied between AEZ, but all soil samples had below recommended levels in N and C. The soil borne pathogens isolated from soil were *Fusarium solani*, *F. oxysporum*, *Rhizoctonia solani*, *Pythium ultimum* and *Macrophomina phaseolina*. There were variations in the level of root rots inoculum between the two AEZs and sites, with higher populations in soils from LM1 of up to 24,000 CFU/g. Incidence of root rots diseases, infection on stem bases and stand count varied significantly ( $p \leq 0.05$ ) across sites and among seed sources. High disease incidence was in beans grown in LM4 (71%) compared to LM1 (37%). Bean crops planted from certified GLP2 and KK8 had lower root rot disease intensity and infections on stem bases of as low as 15% and 34%, respectively and higher stand count of up to 97%. However, stand count of below 25% was recorded on bean crops raised from farmer saved, market sourced GLP2 and KATX69 with higher disease intensities of up to

90% and infection levels up to 75%. Seed purity, germination and bacterial contamination varied depending on seed source. All seeds except of certified GLP2 and KK8 had purity below the recommended 95% and more than 15% discoloured and shrivelled seeds. Germination of farm saved and market sourced seeds was less than 85%, with high proportions of mouldy seeds and seedling infection of up to 70%. Higher bacterial pathogen inoculum levels of up to 3,187 CFU/seed for *Xanthomonas axonopodis* pv. *phaseoli* and 1,634 CFU/seed for *Pseudomonas savastanoi* pv. *phaseolicola* were detected in farm saved and market sourced seeds compared to certified seeds. Disease intensity and yield varied significantly ( $P \leq 0.05$ ) among crops planted from seed from different sources. Crops raised from farm saved and market sourced GLP2 had higher disease intensity of above 70% and low yields of less than 400kg/Ha compared to 30% disease intensity and 1100kg/Ha for certified seeds. The study showed that high disease inoculum levels and poor quality seed are the contributing factors to high disease levels and low yields. Therefore use of certified seeds of tolerant varieties and agricultural practices that improve soil fertility and prevent build-up of inoculum, should be promoted among farmers to achieve optimum bean yields.

**Key words:** Common beans, farm saved, seed quality, root rots, soil nutrients.