PATHOGENIC CHARACTERIZATION AND DISTRIBUTION OF BEAN COMMON MOSAIC VIRUS (BCMV) AND BEAN COMMON MOSAIC NECROSIS VIRUS (BCMNV) IN WESTERN KENYA

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A Thesis Submitted in Partial Fulfillment for the Requirements of the Award of the Degree of Master of Science in Crop Protection of Masinde Muliro University of Science and Technology

March 2015

DECLARATION

This thesis is my original work prepared with no other than the indicated sources and support and has not been presented elsewhere for a degree or any other award.

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APPROVAL

The undersigned certify that they have read and hereby recommend for acceptance of Masinde Muliro University of Science and Technology a thesis entitled "*Pathogenic characterization and distribution of Bean common mosaic virus (BCMV) and Bean common mosaic necrosis virus (BCMNV) in western Kenya*".

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ABSTRACT

Common bean (*Phaseolus vulgaris* L) is an important food legume crop in Kenya. It is a major source of protein in human diet. The average yield is 530 kg ha^{-1} and the country production is estimated at 529,265 tons. Bean production is declining in Kenya due to various abiotic and biotic factors. Virus diseases are a major yield reduction factor in bean production. Among the diseases infecting beans, Bean common mosaic disease (BCMD) caused by *Bean common mosaic virus* (BCMV) and *Bean common mosaic necrosis virus* (BCMNV) is most widespread. Yield loss due to BCMV and BCMNV ranging between 6 and 98% in some fields has been reported. Much work has not been done on the status of BCMV and BCMNV in Kenyan agro ecological zones (AEZs). This study intended to carry out a diagnostic survey for BCMD in major bean growing areas of western Kenya and characterize its causal agents BCMV and BCMNV. The specific objectives were to survey for incidence and severity of BCMD in bean growing areas of western Kenya, characterize BCMV and BCMNV isolates using differential cultivars, and to screen for resistance of popular bean varieties to the virus isolates. Two surveys were conducted during the short and the long rain seasons in 15 sub counties of western Kenya covering the following AEZS: Lower Midland 1, Lower Midland 2, Lower Midland 3, Lower Midland 4, Upper Midland 1, Upper Midland 3, and Lower Highland 1. Symptomatic leaf samples were collected for serological and pathogenic analysis. Three virus isolates X, Y and Z were characterized using 7 differential cultivars. BCMD mean incidence varied across the agro ecological zones (AEZ), it was highest in Lower Midland 2 (17.90%) and lowest in Lower Midland 3 (3.75%). However, the incidences were not statistically different across AEZ ($p=0.36$). There was a strong significant positive correlation between BCMD incidence and severity ($r=0.883$; $p<0.001$). Results revealed the presence of three pathogroups PG IV, PG VI and Pathogroup VII. Two new pathogroups IV and VII are shown to occur for the first time in the region. The presence of two SCAR DNA markers, SW13 and SBD5, associated with dominant *I* gene and recessive *bc-1*^{2} resistant genes to BCMV and BCMNV in the popular Andean diversity panel lines from western Kenya confirmed the presence of *bc-1*^{2} gene in twenty out of twenty four varieties screened, three had *I* gene while one had neither of the two resistance genes. In conclusion, viral disease is widespread in bean growing areas of western Kenya. Integrated management of BCMD is highly recommended.