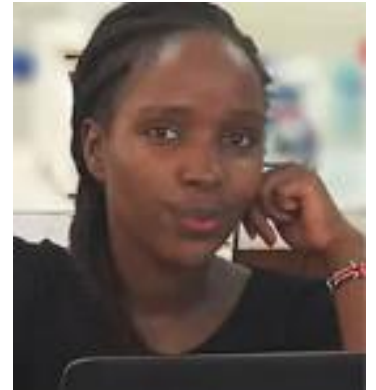


Marker-assisted selection for resistance to bean common mosaic necrosis virus (BCMNV) in French bean cultivars in Kenya

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Abstract

Worldwide, commercial production of French bean (*Phaseolus vulgaris* L.) is constrained by diseases, key among them being the bean common mosaic virus (BCMNV) and bean common mosaic necrosis virus (BCMNV). These potyviruses are the most devastating to common bean farmers and can cause total yield loss under heavy infestation. The objective of this study was to characterize the BCMNV resistance in commercial French bean cultivars and initiate a breeding program against the disease. A set of 32 entries, comprising 27 French bean genotypes together with 5 dry bean varieties were evaluated for resistance under field conditions. All the 29 French bean genotypes showed susceptibility to BCMNV but the 3 dry bean resistant checks (MCM 2001, MCM 5001 and MCM 1015) were resistant to the disease. The French bean cultivars displayed varied reactions to BCMNV pathotypes III and VI under greenhouse conditions ranging from top necrosis, mosaics, mottling, and deformed leaves to stunted growth. In this study, molecular marker SW13 and SBD5 were used to detect the presence of the I gene and the bc-12 gene, respectively. ROC11 and CAPS eIF4E that are linked to BCMNV bc-3 gene, were also used to detect specific resistance genes. Molecular analyses showed that only SW13 and eIF4E markers were consistent in identifying the presence/absence of the I and bc-3 gene, respectively. The two molecular markers and ROC-11 were successfully utilized in the introgression of bc-3 gene into three commercial French bean cultivars (Amy, Serengeti and Vanilla) in a backcross breeding program involving MCM 2001, MCM 5001 and MCM 1015 as donor parents. From the breeding program, 19 breeding lines combining field resistance against both BCMNV and BCMV were developed. The selected lines were further phenotypically evaluated for quality and yield traits such as pod length, pod quality, pod suture string, pod wall fiber, pod yield and the number of pods per plant. The results confirmed significant maintenance of the yields and quality traits among the 19 selections. The developed breeding lines will be further screened and

improved for release as new French bean cultivars thus enabling the production of this valuable vegetable in areas where these potyviruses are prevalent. In addition, the developed lines can be utilized as sources of BCMNV resistance in future breeding programs. Availability of reliable sources of BCMNV resistance within French bean gene pool will simplify the future breeding programs.

Publication

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BCMNV symptoms on leaves (i); French bean breeding lines in the greenhouse (ii); field trials in KALRO Kakamega 2019 (iii).