Marker-assisted introgression of the anthracnose (ANT) resistance gene to common bean (*Phaseolus vulgaris* L.)

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Abstract

Bean anthracnose is one of the major constraint for the production of common bean in Ethiopia. Therefore, this experiment was with the objective of to introgress anthracnose R gene (Co-1⁴) in common bean line and identify introgressed lines with better agronomic traits. Marker-assisted backcross breeding was used to introgress Co-1⁴ R-genetagged by CV542014 marker from the donor parent (KT-RWA77) to the recurrent parent (KT-IBMV4). Progenies in each generation were selected using sequence tagged site marker (CV542014). Three separate yet interrelated experiments were conducted – R-gene tracing of MASB lines, disease severity evaluation lines for three different races using detached leaf techniques in factorial CRD, and evaluation of lines for agronomic performance using pot experiments in screen house. Data on eight quantitative traits including anthracnose severity using three tested races of 2047, 1716 & 2342were collected from eight BC2F2 lines, parental lines and two released varieties. Analysis of variance showed that highly significant difference (p<0.01) among BC2F2 lines, races and interactions for disease severity. Among the developed lines, four BC2F2 lines (Plant-3, Plant-5, Plant-9 and Plant-15) showed the lowest mean severity to the three tested races than others lines studied. Again, highly significant difference (p<0.001) was found among BC2F2 lines for the agronomic traits evaluated under the screen house condition. Interestingly, four BC2F2 lines (Plant-3, Plant-5, Plant-9 and Plant 15) showed statistically better performance to the most important agronomic traits than the remaining studied plant materials. The results indicated anthracnose R gene (Co-1⁴) was successfully introgressed and traced with the MAS. Two lines that were identified with resistance reaction and marker+ as well as better agronomic performance (Plant-3 &Plant-15) were selected and promoted for next crossing purpose.

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Bean leaf showing the symptoms of ANT infection (i); the detached leaf methods for assessing disease susceptibility to ANT phenotypically: after artificial inoculation with the pathogen, the leaves from resistant plats remain green, while leaves from susceptible plants turn yellow and then brown (ii); BC2F2 populations in the greenhouse (iii). Only the plants identified as resistant to ANT in the detached leaf assay and containing the CV542014 ANT marker were selected for advancement to the next stage of the breeding programme.