

Genetics of coffee wilt disease (*Gibberella xylarioides* Heim and Saccas) resistance in Arabica coffee (*Coffea arabica* L.)

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RATIONAL

Understanding the genetics control of coffee wilt disease (CWD) resistance and related traits in Arabica coffee is useful in planning breeding strategies in this economically important crop. The study was conducted to estimate combining ability, heterosis, heritability and identify the type of gene effects controlling the inheritance of CWD resistance, which are useful in designing appropriate breeding programs and CWD resistant variety development.

METHODS

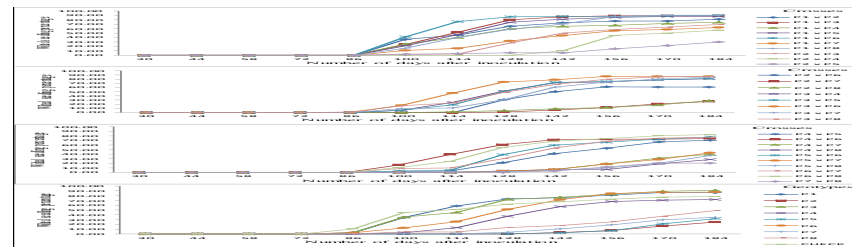
The study was conducted on eight Arabica coffee parents possessing contrasting reaction to CWD, including its 28 F1 crosses through Griffing (1956) method 2 and model I, and one susceptible check in artificial inoculation test using Girma and Mengistu (2000) method at greenhouse at Jimmy Agricultural Research Center, Ethiopia during 2015 to 2016. The reactions of inoculated seedlings measured as wilted seedling percentage, incubation period, number of yellow leaves and defoliated leaves.

RESULTS

The comparisons and CWD reactions time trend of mean performance of F1 crosses, parental lines and susceptible check for wilted seedling percentage are shown in Figure 1 and 2. Better parent heterosis (BPH) and mid parent heterosis (MPH) for wilted seedling percentage and number of defoliated leaves showed inappreciable in desirable direction. However, considerable MPH noticed for the incubation period. Both additive and non-additive gene effects are found in controlling the inheritance of CWD resistance and incubation period; additive genetic effects being predominant. Parents P2 (971), P7 (974), P8 (370) and P5 (79233) exhibited highly significant negative *gca* effects and good general combiners for resistance. Moreover, *sca* effects of crosses P7 x P8 (974 x 370) and P4 x P8 (8136 x 370) revealed good specific combiners for resistance (low mean wilted percentage) and incubation period. Wilted seedling percentage showed high broad (88.27%) and narrow (75.41%) sense heritability coupled with 68.61% genetic advance.



Figure 1. Compression of Arabica coffee genotypes (parents and crosses) to CWD under greenhouse conditions



P1 = 75227, P2 = 971, P3 = 74110, P4 = 8136, P5 = 79233, P6 = 74144A, P7 = 974 and P8 = 370

Figure 2. Wilted seedling percentage progress on time trend for coffee parental lines and their F1 crosses

CONCLUSIONS AND PERSPECTIVES

Selection and hybridization could be an effective CWD resistance breeding approach. Further research on F1, F2 and backcrossing (BC) generations, and quantitative trait locus (QTL) mapping is needed.

References

Girma A and H Mengistu. 2000. Cultural characteristics and pathogenicity of *Gibberella xylarioides* isolates on coffee. Pest management Journal of Ethiopia 4:11-18

Griffing B. 1956. Concept of general and specific combining ability in relation to diallel crossing systems. Aust. J. Biol. Sci. 9: 463-493