



The trade-off between density marker panels size and the predictive ability of genomic prediction for leaf rust resistance in *Coffea canephora*

Cynthia Aparecida Valiati Barreto¹, Ithalo Coelho de Sousa², Jackson Tavela da Silva¹, Matheus Massariol Suela¹, Talita Estéfani Zunino Santana³, Emilly Ruas Alkimim⁴, Letícia de Faria Silva¹, Eveline Teixeira Caixeta⁵, Moysés Nascimento²

Abstract

Coffee leaf rust is one of the main diseases of coffee. This disease causes significant losses in production and also affects the quality of the coffee. In breeding programs, the interest is to select cultivars tolerant to leaf rust, minimizing losses and avoiding chemical control with fungicides. This study aimed to evaluate the trade-off between density marker panels size and the predictive ability (PA) of genomic prediction for leaf rust resistance in Coffea canephora using machine learning algorithms. The data used composes the breeding program of the Empresa de Pesquisa Agropecuária de Minas Gerais in partnership with Universidade Federal de Viçosa and Empresa Brasileira de Pesquisa Agropecuária-Café. This data consisted of 165 genotypes of Coffea canephora and 14387 markers after quality control. The phenotypic data is composed of the leaf rust resistance trait. To evaluate the dimensionality reduction by PA, we selected some sets of markers (from 25 to 14387), using Random Forest (RF) to select them according to their importance. In general, as the number of SNPs increased, the PA decreases, which can be explained by the fact that the tree-building process is greedy. The average of the PA varied from 54.87% (14387 markers) to 70.91% (200 markers). The results show that the SNP's reduction improves the PA for leaf rust resistance in Coffea canephora. Keywords: Coffee; Predictive ability; Machine Learning.

¹ Department of General Biology, Federal University of Viçosa, Viçosa, Minas Gerais, Brazil

² Department of Statistics, Federal University of Viçosa, Viçosa, Minas Gerais, Brazil

³ Department of Animal Science, Federal University of Viçosa, Viçosa, Minas Gerais, Brazil

⁴ Federal University of Triangulo Mineiro, Iturama, Minas Gerais, Brazil

⁵ Brazilian Agricultural Research Corporation, Embrapa Coffee, Brasília, DF-Brazil