28th Conference Asic 2021
From 28 June to 1 July 2021

Crossings compatibility on *Coffea canephora* aiming multiple resistances in clones and full-sib progenies to *Meloidogyne exigua*, *M. incognita* and *M. paranaensis*

S2-PO-07

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Introduction

Coffee can be cultivated in root knot nematodes (RKN)-infested areas by planting resistant rootstocks of *Coffea canephora*. However, the only currently available rootstock cultivar in Brazil has a segregation rate close to 20% for susceptibility. In this study, we checked the resistance of clones to *Meloidogyne exigua*, *M. incognita* and *M. paranaensis*, investigated the genetic compatibility between them in controlled crosses and detected multiple resistance of interclonal F_1 hybrids, with a view to developing new rootstock cultivars of *C. canephora* with simultaneous RKN resistance.

Materials/Methods

Clone parents: CcK1, CcR2, CcR3, CcR4, CcR5, CcR6, CcR7, CcR8, Cc9R , CcR10, all selected in field studies, during approximately **30 years**, in different coffee regions of the country.
F_1 Hybrids. Interclonal hybrids from reciprocal crosses among clones
Cross compatibility. evaluated by the fruiting rate (FR=fruits/flowers) and the fertility index (FI=seeds/ovules)
Nematode populations. *M. exigua* EstE2 race 1,*M. incognita* EstI2 race 1and *M. paranaensis* EstP2 confirmed by the esterase enzyme profile and SCAR markers.
Production and inoculation of F1 hybrids and clonal seedlings F1 and clones seedlings were inoculated with variable population of eggs+J2.
Evaluation procedures of clones and hybrids. Reactions evaluated by the number of eggs + J2 per gram of roots (NO g^{-1}), reproduction factor (RF) and reduction of the reproduction factor (RRF),
Genetic dissimilarity of parent clones. based on SSR markers derived from EST from the Brazilian coffee genome project.

Nematode	Hybrids	Clone										Mean
		CcK1	CcR2	CcR3	CcR4	CcR5	CcR6	CcR7	CcR8	CcR9	CcR10	
	n	%										
M. paranaensis	748	88	92	90	87	83	86	88	95	94	94	89.6
M. incognita	817	99	100	100	100	100	99	100	100	100	100	99.8
M. exigua	410	100	100	100	100	100	100	100	-	100	100	100

Table 1. Resistant hybrids (%) derived from crosses where each of the clones was male or female parent, calculated from the nematode reproduction factor *Meloidogyne paranaensis*, *M. incognita* and *M. exigua.*

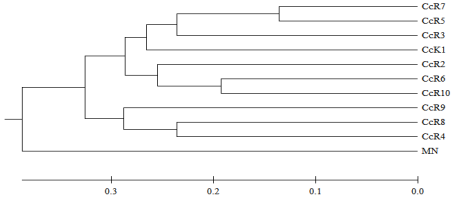

Figure 1. Dendrogram of *C. canephora* clones and *C. arabica* Mundo Novo IAC 376-4 (MN) revealed by the UPGMA cluster analysis based on the Sokal dissimilarity index estimated from 12 microsatellite loci.

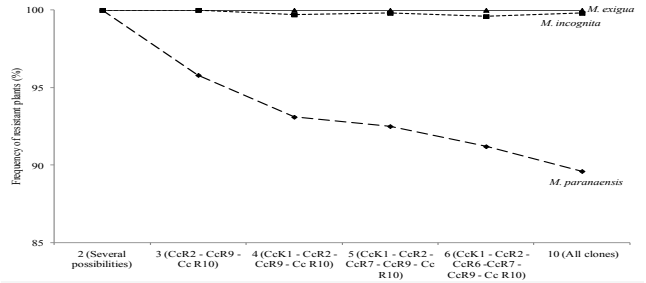

Figure 2 Frequency of resistant hybrids to *Meloidogyne paranaensis*, *M. incognita* and *M. exigua*, of cultivars composed of a variable number of clones, according to the nematode reproduction factor

Results/Discussion

The genetic compatibility analysis of the clones detected only one incompatible combination (CcK1xCcR5 and its reciprocal).
Almost all F_1 hybrids resulting from the cross between the selected clones were resistant to *M. exigua* and *M. incognita*. According to the reproduction factor, 77% of the evaluated F_1 hybrids proved resistant to *M. paranaensis*, and those classified as susceptible had variable segregation rates within the progeny, generally lower than 25%.

Conclusion/Perspectives

Based on these data, different hybrid combinations can be suggested for the development of new rootstock cultivars of *C. canephora* with simultaneous resistance to coffee RKN.
This approach has immediate practical applications in grafting Arabica coffee scion cultivars in areas where nematodes restrict cultivation.

References

Gonçalves et al. 2021. European Journal of Plant Pathology - https://doi.org/10.1007/s10658-021-02225-8