Infestation dynamics of mealybug vectors of the Cocoa swollen shoot virus (CSSV) in young cocoa plots surrounded by barrier crops

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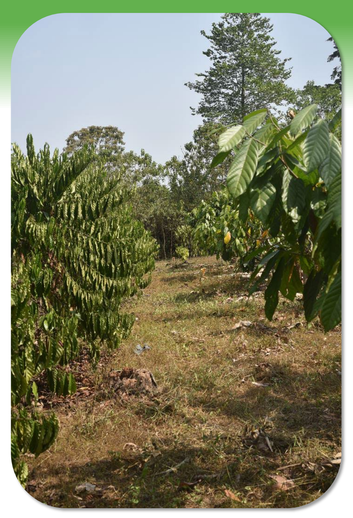

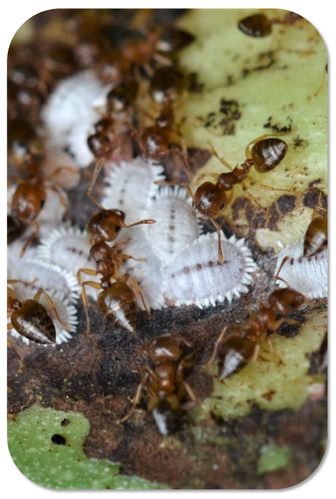

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Propagation of CSSV outbreaks is closely related to mealybug dispersal behaviors. The ability of barrier crops to stop the disease spread has been demonstrated in Togo and Ghana, yet mechanisms involved are still not elucidated. This study aims at better understanding these mechanisms by studying mealybug population dynamics in young plantations surrounded by barrier crops.

Materials and methods

A set of twelve 0.25 ha cocoa plots surrounded by 10 m large barriers of coffee (*Coffea robusta*) or acacia (*Acacia mangium*) (Figure 1), or without barriers (control plots), was implemented within large CSSV outbreaks in mature cacao plantations, in July and August 2019, near Soubré (South-West Côte d'Ivoire). First counts of mealybug colonies on cocoa were done in September 2019 and February, March and May 2020. From November 2020 to August 2022, populations were assessed monthly using a scoring scale.

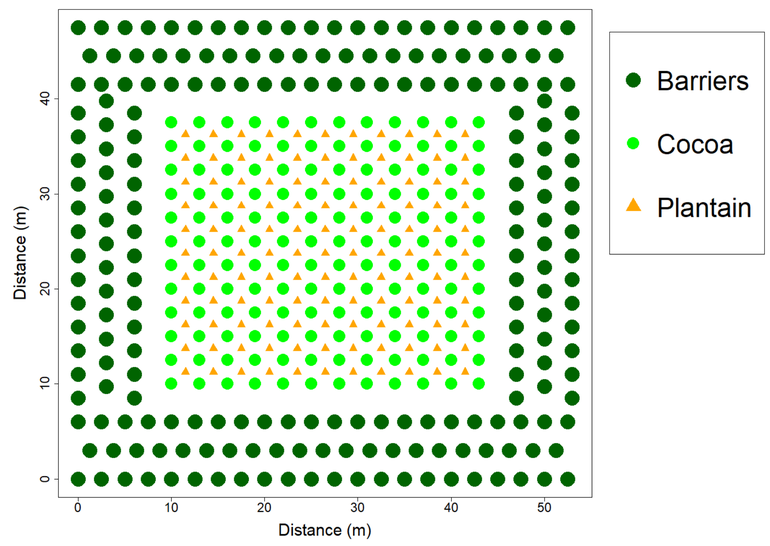

Figure 1: Experimental design of the study

Results

Results are presented for the most infested plot, which is surrounded by a barrier of coffee. *Pseudococcus longispinus* and *Ferrisia virgata* were early present on cocoa, but populations remained small. Although very common in neighboring mature plantations, *Formicococcus njalensis* was first recorded in new plot in November 2020. Since then and until August 2022, *F. njalensis* was the very dominant species on cocoa with infestation rate reaching 7.1% and 11.0%, in September 2021 and August 2022, respectively (Figure 2).

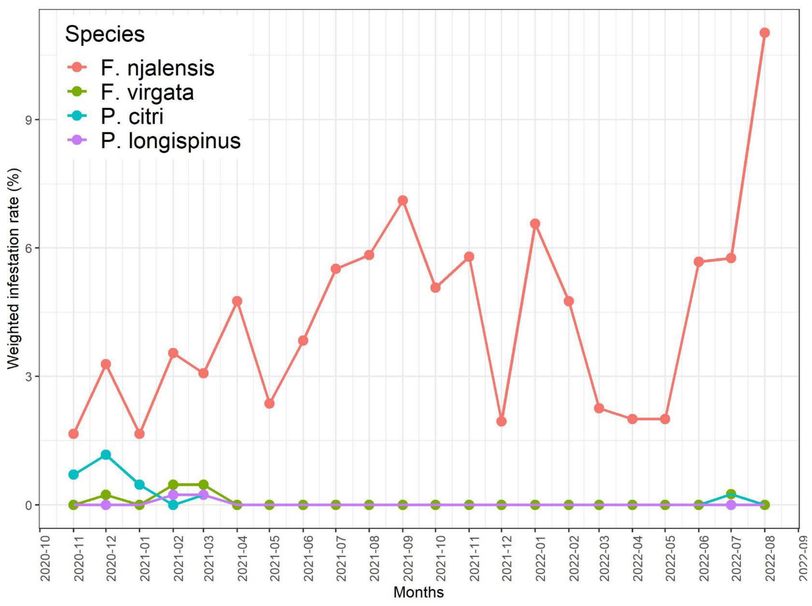

Figure 2: Variation of cocoa infestation by mealybug species

Distribution maps and related semivariograms obtained for *F. njalensis* in the selected plot reveal that the population was first aggregated in a restricted area located on the border of the plot (Figure 3). Later, aggregation was not so clear as population spread over time to reach the whole plot. This suggests a progressive invasion of the plot by *F. njalensis* population from an area in contact with the coffee barrier.

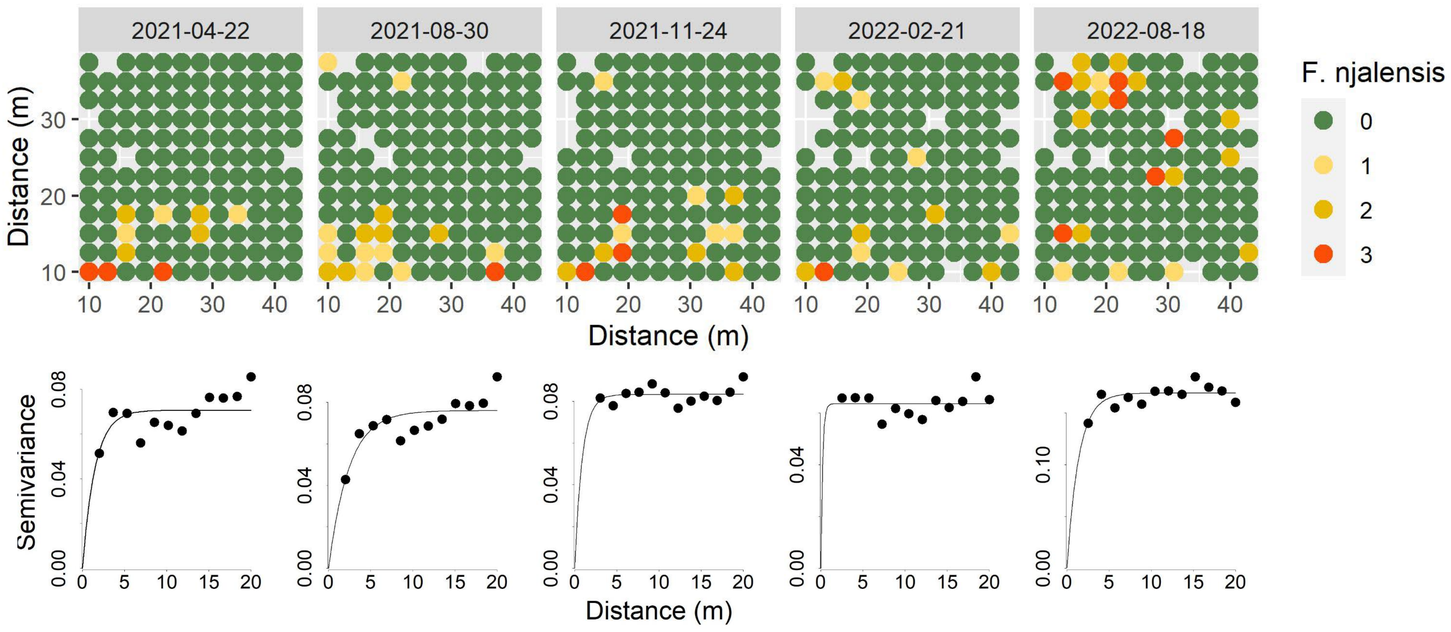

Figure 3: Distribution maps and related semivariograms obtained for the population of *F. njalensis* in the most infested plot (surrounded by a barrier of coffee) for selected dates of observation (empty spaces on maps represent cocoa trees apparently dead at the date of observation).

Conclusion and perspectives

- ✓ Coffee barriers do not prevent cocoa from being invaded by mealybugs, especially by the species *Formicococcus njalensis*
- ✓ *F. njalensis* population gradually invaded the whole plot from a restricted cocoa area in contact with coffee barrier, which raises the question of the role of coffee, as an alternative host plant, in plot invasion
- ✓ These preliminary results will help develop models to better understand the impact of barrier crops on mealybug and CSSV epidemics in cocoa plantations