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RELATIONSHIPS BETWEEN LANDSCAPE CONTEXT AND COFFEE RUST (*HEMILEIA VASTATRIX*), COFFEE BERRY BORER (*HYPOTHENEMUS HAMPEI*) AND THE ROOT-KNOT NEMATODES *MELOIDOGYNE SPP*.IN COSTA RICA

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The existence and severity of a disease and pest attack are mainly determined at plot level by interaction between host, noxious organism, environment (including the biological environment), and agricultural management. However, the immigration of noxious and beneficial populations from outside the plot may also affect pest and disease incidence at plot level. Successful immigration is easier for facultative pests or pathogens with high dispersal abilities (particularly in open landscapes).

We conducted a one-year survey between November 2008 through November 2009 on 50 coffee plots within a range of landscape contexts from highly fragmented to intact coffee plots. In each plot we monitored the density of three organisms with different dispersal abilities: (1) coffee rust (*Hemileia vastarix*), (2) coffee berry borer (*Hypothenemus hampei*) and the (3) root-knot nematodes (*Meloidogyne spp.*).We classified the landscape within a 1500 m radius around each plot into four land uses (coffee, sugar cane, pasture, and forest) using aerial imagery and verifying this classification on the ground. We further subdivided this 1500 m radius plot into 12 nested circular plots (0, 50, 100, 150, 250, 300, 350, 400, 450, 500, 1000, 1500 m) and calculated the proportion of each land use. Finally, we examined the correlations between plot level pest and disease densities and landscape context at each scale mentioned above.

We found diverse responses to landscape structure for each of the study organisms. There were no correlations between landscape structure and population densities of *Meloidogyne spp*. We found multiple significant positive correlations between *H. hampei* infestation and the proportion of the landscape in coffee. The significance of this relationship peaked at the 150 m radius ($r=0.28$, $P<0.05$). Similarly we found multiple significant relationships between maximum annual coffee rust incidence and the proportion of the landscape in pasture. In contrast to the borer, the significance of this relationship peaked at the 300 m radius ($r=0.35$, $P<0.05$).

These relationships indicate that fragmenting coffee farms at small scales (i.e. interspersing alternate land uses or linear barriers such as riparian corridors) may help to significantly reduce coffee berry borer movement between plots. This is probably because *H. hampei* has low dispersal ability. In contrast, fragmentation of coffee landscape, particularly by pasture, may increase coffee rust dispersal. This is probably because *H. vastatrix* is an airborne pathogen whose dispersal is favoured by open spaces. Finally, nematodes, which are nearly immobile, are not influenced by landscape context.