Influence of habitat heterogeneity on the pearl millet head miner biocontrol in Senegal.

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Scientific context

**Bamby area**

This area is characterized by an agroforestry system where *Februehbus albicus* occurs and legumes (*cowpea* and *groundnut*).

**Insect pest: Heliocheilus albipunctella**

- The millet head miner (MMH), *Heliocheilus albipunctella* is the most damaging pest in West Africa.
- One year life cycle and larval stage has three instars.
- Adult emerge one month after the first useful rains and after mating, the females will lay eggs.
- After hatching, larvae start feeding millet head.
- Then the larvae pupate in the soil throughout the dry season.

**A high spatial heterogeneity of MMH natural regulation**

- No insecticide treatment
- Same cultural practices
- Same millet variety

**Goal -> Study the effect of landscape elements on the natural regulation of the Heliocheilus albipunctella**

Methodology

**Image satellite Geoeyes**

**Entomological data**

- *Heliocheilus albipunctella*

**5 explanatory variables**

1. Millet Patch-Patch Abundance Index (MPAI)
2. Millet Patch-Probability Index (MPPI)
3. Millet Patch-Patch Abundance Index (MPA)
4. Shannon Diversity Index (SHDI)
5. Tree Density Index (TDI)

**Variable to explain**

Biocontrol Service Index (BSI)

**Statistical analysis (GLM Backward)**

**Key landscape variables**

- TDI, MPPI, and SHDI correlate with the BSI value
- BSI increases with the SHDI and the tree density index (TDI)
- BSI values decrease when the Mil Patch Proximity Index (MPAI) decrease

Conclusion and perspectives

The result of the study confirms our hypothesis based on the effect of natural vegetation and more specifically of trees and landscape diversity as potential landscape elements promoting *Heliocheilus albipunctella* natural regulation. Conversely, natural regulation of *Heliocheilus albipunctella* populations decreases in areas with a higher density millet.

The study show also the contribution of satellite images for land cover mapping at a finer scale and more specifically for landscape variable calculation on larger area. In spite of these positive points, the results of the statistical analysis could be improve.

Therefore, in perspectives:

- First, we propose to identify tree species that have a direct impact on the natural regulation of the millet pest.
- Secondly, we suggest to test other models such as linear mixed effect in order to capture the year effect and also to take into account all possible variables combinations.
- Finally, if these results are confirmed, a risk map using a model inversion method could be useful to identify favorable areas for MMH biocontrol.