Effect of agroforestry microclimate over spiders and ground beetles daily-activity

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PROJECT CONTEXT

- Part of the ARBRATATOUILLE project:
  AGROOF + INRA PSH & ECODEV + 3 Farmers

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- Agroforestry microclimate: effects over organic vegetable crops (I) and associated biodiversity (II)
ISSUES

- Chemicals use reduction; Organic pests management
- Agroforestry potential for biodiversity conservation (Burgess 1999; Malézieux et al. 2009)
- Trees create new habitats and alter various microclimatic factors (shade, $T^\circ$, rH) → indirect impact on biotic interactions, such as trophic interactions (Batish 2008)

*Predatory arthropods play major role in pests biocontrol, but how are they affected by agroforestry microclimate?*
What we know: daily-activity is mainly influenced by site openness (Thiele 1977, Tuf 2012) and temperature (Thiele 1977). Daily activity patterns provide information on habitats suitability and can also influence predation potential (Edgar 1969).

How agroforestry microclimates could affect the daily-activity of major predatory arthropods in organic vegetable crops?
Playing field:

The study site is part of the « Terres de Roummassouze » organic farm owned by Denis and Virginie Flores, in Vézénobres (30 – France).

Vegetables crops are conducted in a north-south axe.
Samplings: Arachnids and ground beetles, 5 times a day, 10 days in July and 10 days in September

30 pitfalls traps by treatment, to monitor grass strips (2 x 5 pitfalls traps), lettuces (10 pitfalls traps) and tomatoes (10 pitfalls traps)

Microclimatic measurements: hemispherical photographs, temperature and hygrometry continuous acquisition (iButtons)
Canopy openness at three periods in the three agroforestry plots. Leaves appeared after the April assessment, and fall later in November.
Average temperature (°C) in July

**35°C**

Average temperature deviation (°C) in July

**+2°C**

**-2.5°C**

Average temperature (°C) in September

**25°C**

Average temperature deviation (°C) in September

**+2°C**

**-2.5°C**
Results

Pardosa hortensis daily abundance in July

Significant difference between AF++, Af+ vs AF- and control

Significant difference at mid day period (10h-14h) between AF-, CONTROL and AF++ (the shadiest vs the less shaded plots, ANOVA + TukeyHSD tests)
Results

Pseudoophonus rufipes daily abundance in July

Similar abundance in AF- and control, less individuals in AF++ and AF+

Pseudoophonus rufipes daily activity in July

No significant difference (ANOVA), but no point were made during night
Effects seem to be less important during September. Activity is similar in each treatment. Differences between treatments are non significatives (ANOVA).
Results

Significant differences between AF++ and others at midday, between AF++ and control at dusk and night.

Great differences between treatments occurred in September.
**DISCUSSION**

- Trees buffered temperatures

- Agroforestry enhanced wolf spiders global activity at the warmer period: sun protection? (Edgar 1969)

- *P. rufipes* daily-activity seems not to be affected, but abundances are affected in July -> functional effect?

- In September, « disorganized » differences
CONCLUSION

- Agroforestry buffering general climate (Chen et al. 1999)
- Impacts on species depending on their respective ecology
- Potentially affect predation rate at the day and season scale.
- Interest of low dispersion hability fauna for agroforestry
Thank you for your attention, and see you tomorrow at the study site!
REFERENCES

- Burgess PJ (1999) Effects of agroforestry on farm biodiversity in the UK.