Impacts of weed management on the floristic composition and abundance of the cover in citrus orchards: a step to conservation biological control

M. Rothé[1], Rose-My Payet[1], F. Le Bellec[1] and C. Bockstaller[2]

[1] CIRAD, UPR Hortsys, Station de Bassin-Plat, 97410, Saint-Pierre, Réunion, France
[2] INRA, UMR 1121 Nancy-Université - INRA, IFR, 110, BP 20507, 68021 Colmar, France

Marie Rothé

▪ Objective

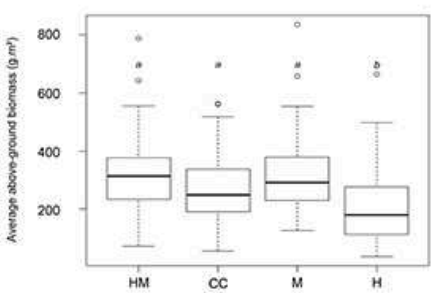
We aim to understand vegetal communities behaviour after weed management, thus helping to develop ground covers favourable to natural pest control. We hypothesized that pluriannual ground cover management methods could influence the floristic abundance and composition of the cover.

▪ Material and methods

- Aerial plant parts samplings were taken every three months from march 2014 to march 2016 for different pluriannual weed management: Hammermill (**HM**), Cover-crop (**CC**), Mowing (**M**), Herbicide (**H**).
- Vegetal species are sorted and their dry weight mesured after 48h at 80°C.
- Statistical analyses were computed with R software using Kruskal-Wallis test to compare biomasses and principal component analysis to evaluate the meaningful variables among response traits.

Fig 1. Photo and plan of the experimental set-up with 6 repetitions of each weed management modality : Cover-crop (CC), Hammermill (HM), Mowing (M) and Herbicide (H).

▪ Results



	HM	CC	M	H	CBC
Amaranthus viridis Mart. ex Thell.	X	X	X	X	++
Argemone mexicana L.	-	X	-	X	+
Bidens pilosa L.	X	X	X	X	+++
Boerhavia diffusa L.	-	X	X	X	++
Chloris barbata (L.) Sw.	X	X	X	X	+
Conyza sumatrensis (Retz.) E.Walker	X	-	-	X	++
Desmanthus virgatus (L.) Willd	X	X	X	X	+++

Fig2: On the left, average above-ground biomass of the vegetal cover on 8 samples for two years given the management modality hammer mill (HM), Cover-crop (CC), mowing (M) or herbicide (H). Differences between ground cover management followed by different letters are significant at the 0.05 level. On the right, example of presence (X) and absence (-) of vegetal species in the ground cover of the citrus orchard after the two-year period of distinct ground management and the estimated potential in conservation biological control (CBC).

The average biomass from herbicide modality is significantly lower compared to the other weed management methods.

The floristic composition of the vegetal communities differs between weed management modalities.

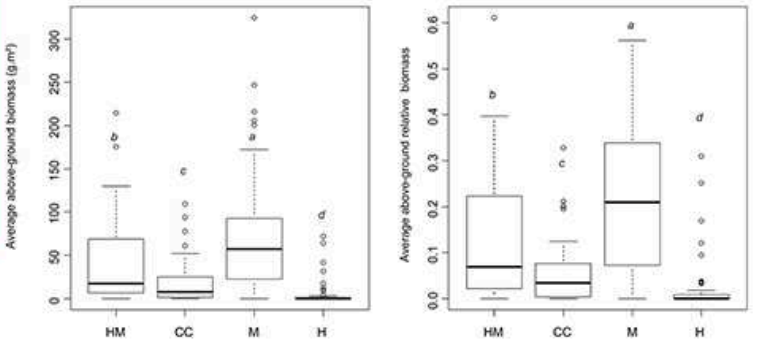


Fig3: Average biomass for the different modalities (on the left) and average relative biomass (on the right) for *Desmanthus virgatus*. Differences between ground cover management followed by different letters are significant at the 0.05 level

Depending on the modality, species biomasses and relative biomasses were different: for example, *Desmanthus virgatus* (estimated high potential for conservation biological control) is more present for M and HM modalities compared to CC and H.

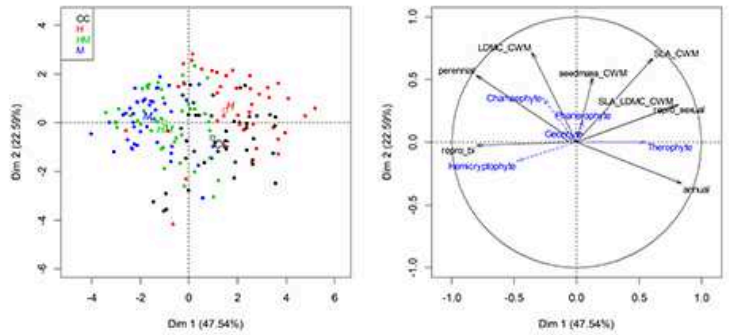


Fig4: Plot of the two first axes of a principal component analysis on the proportion of response trait attributes in the average relative above-ground biomass of the vegetal cover on 8 samples for two years. The meaningful variables are the community weighted mean (CWM)[1] values of SLA (specific leaf area) and LDMC (leaf dry matter content), type of reproduction (vegetative and sexual: repro_bi and sexual: repro_sexual) and longevity of plants (annual, perennial). Individuals are elementary plots at each sampling time. Management modality hammer mill (HM), Cover-crop (CC), mowing (M) or herbicide (H) and Raunkiaer life forms[2] (Chamaephyte, Therophyte, Geophyte, Phanerophyte and Hemicryptophyte) are set as supplementary variables.

Long-term use of H or CC tends to favor annual species with a high SLA (specific leaf area)**:LDMC** (leaf dry matter content) **ratio that is representative of acquisition strategy linked to high disturbance level whereas M and HM, less destructive methods, lead to more perennial community with a low SLA:LDMC ratio that reflect a more conservative strategy[3,4].**

▪ Conclusion

Weed management influences the floristic composition and abundance of vegetal communities over time. Herbicide modality decreases vegetal above-ground biomass compared to other modalities.

Functional response traits of the vegetal species determined by an initial floristic survey can help predicting their survival and spread in a cover after long-term weed management methods.

References

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