

Weed communities in conservation agriculture: what really changes?

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Conservation agriculture (CA) has been identified as one of the farming systems likely to deliver sustainable agriculture but its effects over time on the diversity and composition of weed communities are still discussed. For ten years, different studies were carried out in East of France in cropping system with short rotations essentially composed with winter crops. The objective of these different studies was to identify, focusing on the transition period, the changes in the composition of communities and the consequences in terms of agronomic risk in CA systems. Using networks of 100 winter wheat fields selected to encompass a gradient of years in CA (1 to 20 years), the changes that occurred in the diversity of weed communities were analysed over several years. For each field, weed communities were surveyed on a 50 × 40 m area. Weed data were collected at three periods: in early March, in mid-June and in early September during the intercropping period. All the observed weed communities were rich (average species richness of 23.9 species), diverse (average Shannon diversity of 2.15) and equitably composed of low-density species. The results showed an increase in species richness, total weed abundance and α -functional diversity but no change in species diversity and species evenness over time. Heterogeneity and average values of β -taxonomic and β -functional diversity between communities were high in the early years following the adoption of conservation agriculture. Nevertheless, heterogeneity decreased over time, leading to a homogenization of weed community assemblages. Furthermore, ten response traits were selected to highlight changes in the functional composition of communities. Out of the ten traits, four were impacted by the time following the adoption of CA significantly, whereas two only showed trends. Phanerophyte and geophyte life forms, summer-germinating and spring-and summer-flowering species increased with time. Some functional shifts occurred quicker than others, as for example summer-germinating species which increased after at least 10 years of continuous application of CA principles. Changes in weed community functional composition could potentially worsen current weed management efficacy. These results could therefore provide knowledge to farmers moving towards CA to redesign the management strategy to avoid to lost the control of the weed community.

Keywords: *No-tillage, assemblage of weed communities, life forms, heterogeneity, diversity*

Acknowledgements: The authors thank all the farmers who their permission to access the fields. This work was made possible thanks to funding from European Union's Horizon 2020 research (no. 727321 - IWMPraise) and the agreement (no.2017-9201AA0048S01305) of the Bourgog.



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