Effects of environmental factors and vineyard practices on wine flora dynamic

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EFFECTS OF ENVIRONMENTAL FACTORS AND VINEYARD PRATICES ON WINE FLORA DYNAMIC

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Abstract

The intensification of t vineyard practices led to an impoverishment of the biological diversity. In vineyard management, the reflection to reduce pesticides uses concerns mainly the soil management of the vineyard, and often focuses on flora management in the inter-row. The goal of the present study is to gain more knowledge on the dynamic of vineyard flora, including relationships with environmental factors and soil practices. Assessment of floristic diversity was carried out for 5 fields of the research program PEPSVI in Alsace (France) on an area of 500 m ² within each of the fields. Soil management was either integrated or organic. Within each field, species richness was determined for the row (UR), the grassed inter-row (GIR), and the tilled inter-row (TIR) three times during each vine-growing season in 2014 and 2015. ANOVA tests were performed on data.
First we observed an average of 54 different species in the fields per year and that there are no significant differences between the different soil managements. The highest value belongs to organic soil management.
The average species richness in organic fields is the highest in GIR (respectively 21 and 22 species in 2014 and 2015) and in UR (respectively 19 and 18 species in 2014 and 2015) and there is no significant difference between GIR and UR and between 2014 and 2015. The flora developed more considerably in the GIR (22 species) than UR (19 species) and less in TIR (16 species).
The results of the study showed also that superficial tillage i.e. scraping or harrowing, helps flora emergence and increases species richness (21 species in average against 14 in average for the other soil managements). The environment has also to be taken into account. Surrounding vegetation of the field influences significantly the species richness, (30 more species in the year for the most favorable environment). Next steps of the study will be the analysis of distribution of flora families and Raunkiær's life.

Keywords: practices, landscape, environmental sustainability, botany, biodiversity

1 INTRODUCTION

The intensification of the vineyard practices led to an impoverishment of the biological diversity that entailed a loss of Eco-systematic services like biological control or pollination. Vineyard belongs now with fruit production to the biggest consumer of pesticides in France. In vineyard management, the reflection to reduce pesticides uses concerns mainly the soil management of the vineyard, and often focuses on flora management in the inter-row. The goal of the present study is to gain more knowledge on the dynamic of vineyard flora, including relationships with environmental factors and soil practices. This will help us to develop a new indicator for the decision aid tool in INDIGO® method for winegrowers (Thiollet-Scholtus and Bockstaller, 2015).

2 MATERIALS AND METHODS

Assessment of floristic diversity was carried out for 5 fields of the research program PEPSVI (Metral et al., 2015) in Alsace (France)on an area of 500 m ² within each of the fields (Clavien, 2005). Soil management was either integrated or organic. Counting the present species within the observation area assessed specific richness. Within each field, species richness was determined for the row (UR), the grassed inter-row (GIR), and the tilled inter-row (TIR) three times during each vine-growing season in 2014 and 2015. ANOVA tests were performed on data.

3 RESULTS AND DISCUSSION

3.1 Result 1: Specific richness across fields

First we observed an average of **54 different species are present** in the fields per year (Figure 1).

There is no significant difference between the different soil managements (Figure 2). The highest values of biodiversity index belong to organic (AB) soil management.

The average flora diversity in organic fields is the highest in GIR (respectively 21 and 22 species in 2014 and 2015) and in UR (respectively 19 and 18 species in 2014 and 2015) and there is no significant difference between GIR and UR and between 2014 and 2015. Species richness was higher in GIR (22 species) than in UR (19 species) and less in TIR (16 species).

One possible explanation of the higher value in organic soil management are plowing practices (Figure 3).
GIR is the less disturbed part of the plot and flora diversity is higher than in other parts of all the fields. On the contrary, TIR showed a lower species richness, because of more soil practices applied in the fields during the vine-growing season. Especially plowing buries the seeds potentially susceptible to emerge and decreases so the flora panels having for consequence lower flora diversity.
The results of the study also showed that superficial tillage of the soil i.e. scarping or harrowing, help flora seeding and increase the specific wealth (21 species in average against 14 in average for the other soil managements).

3.2 Result 2: qualitative distribution of flora species in the fields

Figure 4 shows that **surrounding vegetation of the fields** has an influence on species richness in the studied fields. Species richness is the highest for field surrounded by forest or natural area than by vineyard and hedges. The lowest richnes is for field surrounded by built or housing area. There are 30 more species in the most favorable environment.

4 CONCLUSION

Diversity of flora in the field changes during two following studies years according different factors.
One outstanding factor, that influences species richness of flora, is soil management of the field and in particular soil mechanical work. A second outstanding interesting factor is the environment of the field. A natural surrounding environment with forest is much more favorable than a cropped one or an built one.
To go further, studying in details Raunkiaer's index and recovery rate would extend knowledge about dynamic of flora in vineyard according to soil management practices.

Acknowledgments
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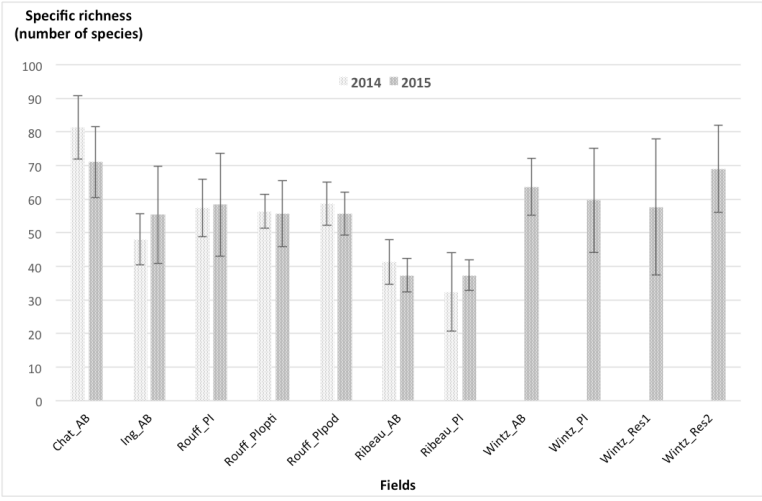

Figure 1: Average and standard deviation of species richness of flora across all studied fields, in 2014 and in 2015.

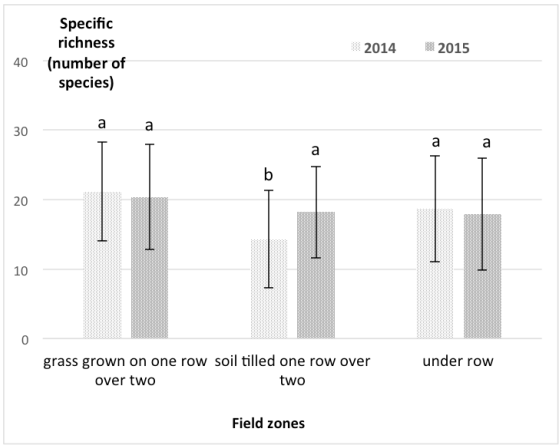

Figure 2: Average and standard deviation of species richness of flora in different parts of the studied fields i.e. inter-rows and under-rows, in 2014 and in 2015.

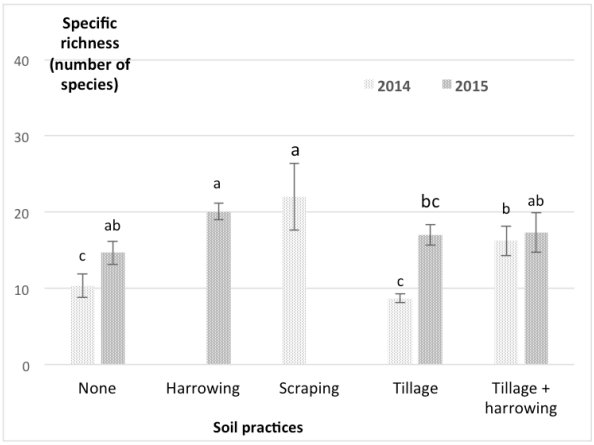

Figure 3: Average and standard deviation of soil management practices impacts on field species richness of flora, in 2014 and in 2015.

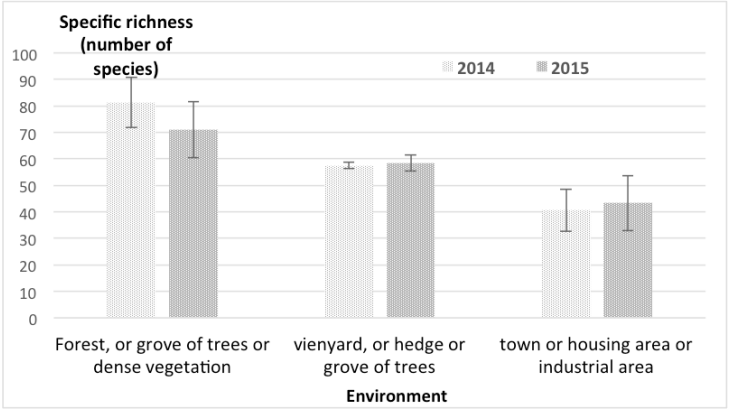

Figure 4: Average and standard deviation of species richness of flora according to the field environment, in 2014 and in 2015.

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