Introductions:

The « brûlé » area, where the truffles tend to grow to a mature stage, is commonly characterized by a drastic drop in the plant cover around those trees whose root systems host Tuber melanosporum. Although « brûlés » are indicative of the mycelium network development of this symbiont, they are not systematically associated with the production of ascorcarps.

To date, understanding how truffle grounds function has been puzzling task, especially with regard to the spatio-temporal dynamics of the colonization process, and the identification of factors influencing the intensity of the « brûlés » and their truffle yield. The emphasis is put here on the microbial specificity of truffle grounds.

Fig. 1. (a) Quercus ilex in the Uzès orchard with the « Brûlé » phenomenon and (b) selected companion plants sampled for the Glomeromycota diversity analysis.

Material and Methods:

- Two forest margins, at Tourbes and Pézilla, and two orchards, at Beaulieu and Uzès, were sampled during November 2010 (ascocarp maturation stage) in the Languedoc-Roussillon region (France). These truffle grounds are composed of the holm oak (Quercus ilex) and are managed without soil tilling.

- Samples included the soil (bacteria diversity) and the companion plants roots (Glomeromycota diversity), both surrounding the oaks. Three oaks were sampled per productive status and per site of 36 oaks.

- Environmental DNA was extracted with the MoBio PowerSoil™ Kit for the 36 soil samples in triplicate and with FastDNA SPIN™ Kit for the 84 plant roots. Microbial diversity was studied by means of 16S pyrosequencing with universal eubacteria primers targeting the V3-V4 region of the bacterial 16S DNA and with specific primers targeting the arbuscular mycorrhizal 18S DNA gene.

- Are there bacterial and mycorrhizal (Glomeromycota) markers specific to the productive status of the « brûlés »?
- Do the community structures of these microbial groups differ in relation to the productive status of the host tree (productive and non-productive « brûlés », « no-brûlés » trees)?

Results:

- Preliminary statistical analyses of the soil bacterial diversity suggest a certain level of specificity in 3 out of 4 truffle grounds enabling the distinction of the productive "brûlés" from the non-productive "no-brûlés". Further analysis is needed to confirm this interpretation and identify the bacterial taxa underlying these specificities. In contrast, the diversity of the arbuscular mycorrhizal fungi associated to the companion plants does not seem to be sensitive to the productive status of the oaks. Glomeromycota OTUs ranked by abundance failed to reveal specific groupings related to a given productive status as exemplified with the analysis performed on the 4 sites.

Conclusions:

This work is funded by the French National Research Agency, project n° SYSTRUF 09-STR-10-02. All truffle growers who kindly granted their permission to sample on their properties are heartily acknowledged.