

Characterization of traditional glue paste recipes by Gas Chromatography/Mass Spectrometry

Beginning in 2006.

Program description

This scientific survey takes place in a broad interdisciplinary project about *Stegobium paniceum* infestation and reinfestation of glue paste lined easel paintings. This coleopteran of the Anobiidae specy has a strong attraction for the glue paste, in particular some kinds of recipes which contain a large proportion of flour (see the program infestation and reinfestation - this program is available in french, but will be soon available in english).



Photo 1 : Damages caused by the *Stegobium paniceum* on "Sainte Geneviève de Brabant" from Jean-Baptiste Greuze, Musée des Beaux Arts de Marseille – photography: F. Baussan, P. Glotain.

The chemical characterization of glue pastes by GC/MS aim to determine the molecular composition of different recipes which mainly consist in a mixture of protein for the animal part and carbohydrates for the vegetal part.

In fine, characterization of the most attractive recipes should permit, while analysing an unknown sample, to determine the infestation risk of a traditionally lined painting. At the same time, S.P.M.E. (Solid Phase Micro Extraction) experiments are implemented to identify some volatile organic compounds which could be involved in the attraction process.

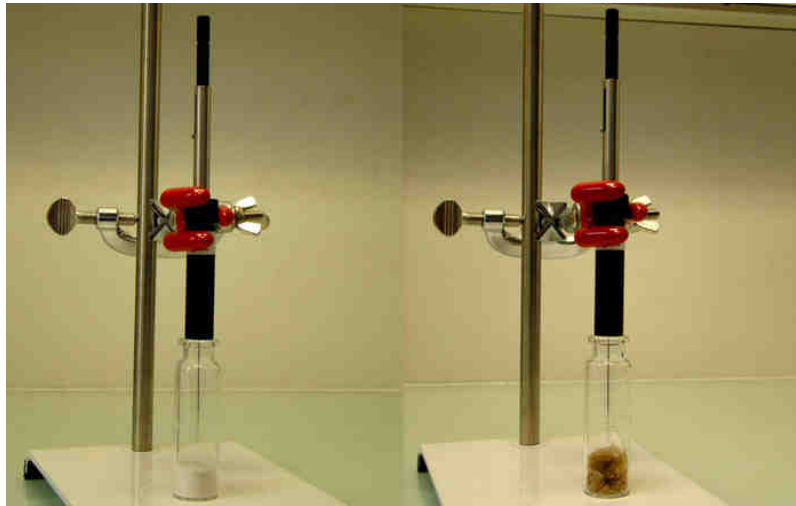


Photo 2 : Solid Phase Micro Extraction (S.P.M.E.) experiments – photography: N. Bouillon, CICRP.
On the left : extraction of the VOC's of flour. On the right: extraction of the VOC's of glue.

Experimental approach

According to the entomology study (see the program infestation and reinfestation), experiments were organized around three main issues:

- qualitative analysis of the proteins, sugars, and lipids composition of different recipes in order to identify unknown samples and the flour type they are made up with
- quantitative characterization of the sugar/protein ratio to determine the flour proportion in the analysed glue-paste
- identification of some attractive VOC's component



Photo 3 : GC/MS device of the laboratory – photography: N. Bouillon, CICRP.

Results

The relative proportion of amino-acids from proteic part has led to reliable characteristic ratios for each traditional recipe. A semi-quantitative analysis of saccharic part has shown that the two most attractive recipes, namely "traditionnelles françaises" type contain a particular carbohydrate composition. This could be explained by the different sifting level related to the grain husk amount in the flours.

Work in progress

Analysis of the molecular contribution of each component is in progress. Qualitative analysis of some fatty acids, which could be related to the flour identification, will be implemented as well as the detection of Venice turpentine, used as a plasticizer, pointed in the entomology study to have a possible repulsive effect on *Stegobium paniceum*.

Besides, coleopterans are sensitive to terpenic compounds. That's why some experiments were carried out for the detection of some attractive VOC's given off by the most attractive flours.

Outlooks-Forthcoming

Quantitative analysis of vegetal part, focussing on the flour, in a given glue paste will be experimented. The complexity of these works comes from the use of an internal standard for a sequential analysis on the same sample.

Publications

Katia Baslé, Nicolas Bouillon, Fabien Fohrer, Odile Guillon et Roland May, "Pour une approche raisonnée des problématiques d'infestation en milieu patrimonial : le cas du *Stegobium paniceum*" – Techné, Mars 2008.

Nicolas Bouillon, Fabien Fohrer, Etude de l'infestation par les insectes des collections de peinture de chevalet rentoilées à la colle de pâte : caractérisation physico-chimique par CPG/SM des colles de pâte traditionnelles et de leurs COV, ICOM Triennial meeting Preprints, Septembre 2008.