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MEATY AROMA FROM HYDROLYSATES OF INSECT PROTEINS

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I. INTRODUCTION

The potential for using insects in food is the subject of much research due to their applications [1], although there is some hesitation regarding their appearance and the presence of unpleasant flavors and aromas. Furthermore, insects are a source of protein that can be used as a precursor to flavors and aromas. However, imitating meat aromas and flavors requires an optimization process through enzymatic hydrolysis and/or fermentation. The objective of this work is to determine the profile of volatile compounds generated from lyophilised hydrolysates of insect proteins (*Tenebrio molitor*) subjected to reaction with different components to promote the formation of meat aromas.

II. MATERIALS AND METHODS

Sample preparation with insect hydrolysates. Insect flour (*Tenebrio molitor*) was subjected to enzymatic hydrolysis and subsequent lyophilisation. The insect product was used as a substrate under different reaction conditions (Table 1) and at 98°C for 5 min. Two samples (IN-Ax and IN-B) and two controls (T-Ax and T-B) were studied. The samples were stored at -20°C until analysis.

Volatile compound (VOC) analysis by GC-MS. Extraction of volatile compounds from the headspace of the liquid samples was performed using an SPME fiber (PAL Smart SPME Carbon-WR, Agilent Technologies) [2] with a Gerstel robotic smart series multipurpose injector (Gerstel, Germany) and an 8890 GC with 5977B MS (Agilent Technologies, USA). VOC quantification was expressed as total ion current and grouped according to chemical class.

Sensory analysis: To characterize the different samples sensorially, a Free-Choice Profile Analysis) was performed using 15 assessors [3]. In a first session, the assessors generated the aromatic attributes that described the samples by evaluating the similarities or differences among three samples, and indicating the attributes which helped in the differentiation. In a second session, each assessor evaluated the samples with their own attributes selected in the first session using unstructured 10-cm scales ranging from "not perceived" to "intense." Five ml of each sample was placed in a 20-ml headspace vial, and a vial of coffee grounds was included to clean the nose between samples.

Statistical analysis. Principal Component Analysis (PCA) was performed using XLStat 2019 (Addinsoft, Barcelona, Spain).

Table 1 – Composition of samples.

	Hydrolysed insect	Sugar	Other
T-Ax	-	A	x
T-B	-	B	-
IN-Ax	IN	A	x
IN-B	IN	B	-

III. RESULTS AND DISCUSSION

The results of the volatile profile analysis of the samples, grouped by chemical group, are shown in Figure 1, along with the aromatic notes they produce. The samples that did not contain insect hydrolysate are characterized by the presence of acidic compounds and pyrazines, which confer acidic notes (T-Ax), and aldehydes, which produce green notes. In contrast, the samples with insect hydrolysate are more complex due to the presence of sulfur compounds and furanones in IN-Ax, which confer meaty savory notes. Sample IN-B is characterised by the presence of branched aldehydes, which confer lactic, malty, and fruity notes (Figure 1A). The volatile profile is in coincidence with the sensory analysis shown in Figure 1B where the distribution of all the odor descriptors generated by each panelist is

shown in different colors (Figure 1B). The sample IN-B contributed to toasted nuts, walnuts, malt, and wood aroma notes while IN-Ax contributed to chicken, roasted meat, and toasted nuts notes. Therefore, the presence of insect hydrolysate contributed to the development of meaty aroma notes, while the control samples, which did not contain the hydrolysates, exhibited eggy and rotten odors.
The samples were subjected to a spray-drying process to obtain a product that can be used as an ingredient in the formulation of meat analogues (Figure 2).

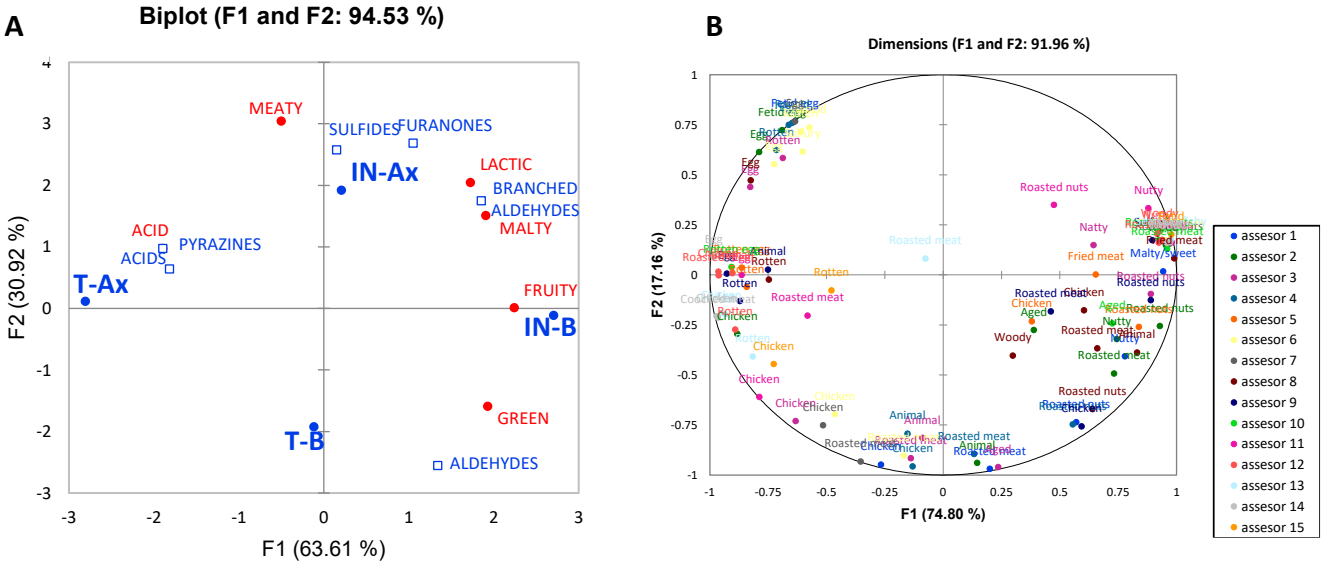


Figure 1. Profile of volatile compounds obtained by SPME-CG-MS grouped by chemical group in the ingredients obtained from insect hydrolysate (*Tenebrio molitor*) (A), Distribution of odor descriptors generated by each panelist (B).

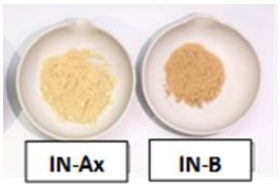


Figure 2. Examples of spray-dried samples.

IV. CONCLUSION

An ingredient has been obtained from the proteins of *Tenebrio molitor* that can be used in the manufacture of meat analogues at pilot plant level, with a volatile profile composition that provides meaty and flavorful notes.

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