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QUANTITATIVE DESCRIPTIVE ANALYSIS OF BURGERS THAT USE INSECT "*ACHETA DOMESTICUS*" PROTEIN PARTIALLY REPLACING BEEF PROTEIN

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I. INTRODUCTION

Currently, in order to solve the problem of the lack of protein sources, new foods need to be introduced into the market, and insects have shown promise as a way to feed the growing world population without compromising sustainability [1]. The implications and future challenges for the sector will be to make the population adapt and accept the idea of eating insects [2]. However, due to the strong tradition of meat consumption by Brazilian consumers, the development of hybrid meat products with insect flours has great potential to meet consumer expectations, since the sensory attributes expected from the consumption of hybrid meat products will have characteristics similar to those of meat products [3]. Based on this information, the objective of this study was to analyze and compare, through a quantitative descriptive test, the intensity of attributes presents in hybrid beef burgers prepared with different levels of insect (*Acheta domesticus*) flour addition.

II. MATERIALS AND METHODS

This project was submitted to the Research Ethics Committee of FZEA/USP under number CAAE: 74899123.0.0000.5422. For the preparation of the burgers, the proximate composition of the raw materials was determined to verify mainly the protein content of the beef forequarter meat (chuck tender) in comparison with the values of domestic cricket flour (*Acheta domesticus* - FAD) in order to perform the calculations to define the amount of FAD necessary to be added in the formulations to replace the values of 10 and 20% of beef, maintaining isoprotein formulations in the three burger treatments. Three formulations were defined: control treatment (CON) produced with 75.0% ground beef forequarter, and treatments T10 and T20, reducing this amount of meat by 10 and 20%, respectively, resulting in a formulation with 67.5% beef and 2.40% FAD (T10), and another with 60.0% beef and 4.80% FAD (T20).

The sensory profile of the three burger treatments was performed through a quantitative descriptive analysis with 10 trained panelists, including employees, undergraduate and graduate students of Faculty of Animal Science and Food Engineering/FZEA, in a total of 8 meetings of 1 hour each, encompassing selection, training and testing itself using discriminative power, reproducibility and consensus among the tasters as criteria. Ten descriptor terms were collected from the evaluation of appearance, aroma, flavor and texture of the treatments using the network method. The intensity of each descriptor was evaluated for the three treatments using an unstructured 9 cm scale. The individual results of each panelist were statistically analyzed by analysis of variance (ANOVA), taking the samples as sources of variation and replications. The data from the quantitative descriptive analyses were analyzed by ANOVA and Tukey's mean test at 5% using the statistical software SPSS v.30.

III. RESULTS AND DISCUSSION

With the exception of the characteristic flavor of seasoning in the burgers, the quantitative descriptive analysis results indicate a significant difference ($p < 0.05$) for attributes (Table 1). The intensity of the internal brown color (CON- 4.41 and T20- 6.65), the agglomeration of the burgers' internal particles (CON- 5.85 and T20- 7.52), flavor of insect flour (CON- 0.15 and T20- 2.18), aroma of seasoning (CON- 2.96 and T20- 3.61), and the aroma of the domestic cricket are all increased with the amount of insect flour in the burgers.

On the other hand, the panelists reported that the burgers were tender (CON- 6.71 and T20- 4.85) and juicier (CON- 6.77 and T20- 4.97), and that aroma (CON- 5.05 and T20- 3.36) and flavor (CON- 5.02 and T20- 3.61) of beef were more intense when the insect content was lower.

Table 1 - Qualitative Descriptive Analysis of the three burger treatments with and without the addition of insect flour.

Attribute	Treatment			
	CON	T10	T20	Sig.
Brown color inside the burger	4.41c±0.46	5.23b±0.60	6.65a±0.28	*
Agglomeration of internal particles	5.85c±0.51	6.85b±0.47	7.52a±0.37	*
Characteristic aroma of *Acheta domesticus* insect	0.22c±0.10	1.06b±0.92	1.96a±0.29	*
Characteristic flavor of *Acheta domesticus* insect flour	0.15c± 0.05	1.08b±0.54	2.18a±0.44	*
Characteristic aroma of beef	5.05a±0.46	4.14b±0.45	3.36c±0.34	*
Characteristic flavor of beef	5.02a±0.49	4.38b±0.75	3.61c±0.79	*
Characteristic aroma of seasoning	2.96b±0.38	3.36b±0.57	3.61a±0.66	*
Characteristic flavor of seasoning	3.77±2.09	3.72±2.99	3.70±3.07	n.s.
Tenderness	6.71a±0.35	5.66b±0.34	4.85c±0.33	*
Juiciness	6.77a±0.37	5.78b±0.33	4.97c±0.34	*

Sig.: Significance: n.s.: no significant difference (P>0.05); * different lowercase letters in the same line (different treatments): values differ statistically from each other (P<0.05). Treatments: CON: burgers prepared without added insect meal (75.0% beef); T10: burgers prepared with 10% meat reduction (67.5% beef + 2.4% ADF); T10: burgers prepared with 20% meat reduction (60.0% beef + 4.8% ADF).

IV. CONCLUSION

According to the study, the two levels of substitution of meat protein with insect flour protein, resulted in significant differences in almost all attributes evaluated. In this case, the different intensities of the appearance, aroma, flavor and texture attributes determine whether the consumer will have an aversion to the product with insect flour added. Because the characteristics assessed in burgers with the inclusion of insect flour differ from the control group, it is necessary to investigate consumer acceptance of the burgers.

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