

## Insect-Wheat flour blend as a non-conventional protein source

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### 1. Background & Objectives

Insects represent a sustainable alternative as a source of protein for human and animal consumption. Currently, more than 2000 different insect species, all of them with high-quality proteins as well as other beneficial nutritional ingredients, are eaten around the world. According to the Food and Agricultural Organization (FAO), insects produce smaller environmental footprint since they require less space, water and food than conventional livestock, and additionally, the risk of transmitting zoonotic diseases is negligible.

### 2. Methods

#### 2.1. Sample preparation

For the provision of the alternative source of high-quality proteins, crickets in the adult stage were fed and bred according to European Food Safety Authority. The crickets were then harvested in hygienic conditions to ensure the sanitary status of the final product (water / 90°C 3min).

To determinate the nutritional value, crickets were freeze dried.

To study the rheological behavior, whole insects were dried in a forced draft oven (130°C /1h). Final water activity was lower than 0,6. Crickets were ground to obtain a powder with the desired particle size. Mixtures containing wheat flour and 10% cricket powder were prepared.

#### 2.2 Nutritional value of crickets

Moisture (AOCS Bc 2-49:2009), Crude protein (AOAC 2001.11 modified), Fat (AOCA Ba 3-38:2009), Ash (AOCA Bc 5-49:2009), Carbohydrates and Fiber by difference. Essential amino acids (Ionic Exchange Chromatography). Table I.

#### 2.3 Rheological analysis of the blend

Rheological properties were determined using an alveograph (IRAM 15857:2012) and a farinograph (IRAM 15855:2000, modification N°1: 2007 included). For each rheological test, two mixtures were prepared. Triplicates were tested for each mixture.

### 4. Conclusion

It can be concluded that the wheat flour/ cricket powder mixture is suitable for the development of bakery products that have short kneading and fermentation times. The mixture could be used for making french bread or bread with a high content of fat, sugar and/or egg.

**Cricket powder can be considered as a promising alternative source of protein to obtain flour blends. This flour blend can be used as an ingredient to develop functional foods with a high nutritional profile.**

The aim of this work was to

- Determine the nutritional value of native crickets
- Study the rheological behavior of an insect-wheat flour blend with a 10% of cricket powder as a practical step towards their use for the development of functional foods

### 3. Results

Moisture	71 %
Crude protein (on dry basis)	57,2 %
Fat (on dry basis)	27,8 %
Ash (on dry basis)	4,2 %
Carbohydrates and Fiber (on dry basis)	10,8 %
Essential amino acids	37,1 %

Table I. Nutritional value of crickets

Rheological results obtained from the insect-wheat flour blend (M1, M2) were compared against wheat flour (WF). Averages with their standard deviations are shown in tables II and III.

	Water absorption (%)	Dought stability (min)	Dough development time (min)	Mixing tolerance index after 12 min (Brabender units)
WF	58,7±0,6	20,0±1,0	8,5±0,9	23,3±2,9
M1	56,3±0,1	8,8±0,3	7,2±1,0	65,0±5,0
M2	56,8±0,1	9,0±0	7,0±0,5	66,7±5,8

Table II. Farinograph parameters

	P	L	P/L	W
WF	79,3±3,1	86,7±6,5	0,9±0,1	219,0±7,2
M1	82,5±0,7	53,0±1,4	1,6±0,1	154,0±2,8
M2	86,0±1,4	51,0±2,8	1,7±0,1	156,0±5,7

Table III. Alveograph parameters

