



BOOK OF ABSTRACTS

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Crickets (*Acheta domestica*) - Novel Food Ingredient: Influence on Bread and Biscuits Quality and Safety Characteristics

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Abstract. The European Food Safety Authority recognized insects (IN) as novel foods (2015/2283), as well as, the Food Agriculture Organization recommended including them in Western diets [1,2]. The global IN market is expected to increase by 28.5 % for the period 2020 to 2027 [3]. However, the use of IN as food is still limited in the Western countries [4]. One of the solutions to include IN in the main diet in Western countries may pass by be their incorporation into the main formulas of the traditional food. The application of cricket flour (CF) in the food formulas is very broad, however, it should be pointed out, that the addition of proteinaceous ingredients to the food that is thermally treated can lead to an increase in the formation of acrylamide (AA), which is a neurotoxic and carcinogenic compound [5]. The aim of this study was to assess respondents' opinions about the perception of IN as a food or food ingredient and to evaluate the influence of CF on the quality and safety parameters of wheat bread (WB) and biscuits (BI). Taking into consideration that CF contains high concentration of protein, the content of AA in WB and BI was analysed. Also, to prevent AA formation in WB and BI, fermentation with *Lactiplantibacillus plantarum* (Lp. plantarum No. 122) strain was applied as a CF pre-treatment for WB preparation, as well as, fermentation with Lp. plantarum No. 122 and *Lacticaseibacillus casei* No. 210 strains was applied as a CF pre-treatment for BI preparation. Various parameters on non-treated and fermented CF were evaluated (pH, lactic acid bacteria (LAB) count, color coordinates, fatty acids (FA), volatile compounds (VC), and biogenic amines (BA) concentration). The tested product groups were prepared by adding to the main recipe different quantities of non-fermented and fermented CF. It was established that 70.7% of the respondents had never eaten IN. After fermentation, LAB count in fermented CF was, on average, 8.24 log₁₀CFU/g and pH - 4.26. In most of the cases, fermentation reduced the BA concentration in CF and influenced the VC profile in both CF and end-products (WB and BI). Most of the WB with non-treated and fermented CF showed higher AA content (except WB with 10% of fermented CF), in comparison with the control. However, the lowest AA concentration (84.1 µg/kg) was found in biscuits with 40 g of Cr fermented with No. 210 strain, and, BI colour, VC profile, and AA concentration were all influenced by non-fermented and fermented CF addition. Due to the demonstrated decrease of AA concentration in BI, fermented CF can be recommended for the manufacture of such type of products. However, for WB preparation, 10 % of fermented CF can be recommended, because, most of the WB with non-treated and fermented CF showed higher AA concentration, in comparison with control samples.

Key words: insects, *Acheta domestica*, wheat bread, biscuits, fermentation, acrylamide, lactic acid bacteria.

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References: 1. Cappelli, A.; Oliva, N.; Bonaccorsi, G.; Lorini, C.; Cini, E. Assessment of the Rheological Properties and Bread Characteristics Obtained by Innovative Protein Sources (*Cicer Arietinum*, *Acheta Domestica*, *Tenebrio Molitor*): Novel Food or Potential Improvers for Wheat Flour? *LWT* 2020, 118, 108867. <https://doi.org/10.1016/j.lwt.2019.108867>.
2. Del Hierro, J.N.; Gutiérrez-Docio, A.; Otero, P.; Reglero, G.; Martín, D. Characterization, Antioxidant Activity, and Inhibitory Effect on Pancreatic Lipase of Extracts from the Edible Insects *Acheta Domestica* and *Tenebrio Molitor*. *Food Chem.* 2020, 309, 125742.
3. El-Sayed, A.M. The Pherobase: Database of Pheromones and Semiochemicals.
4. Caparros Megido, R.; Gierts, C.; Blecker, C.; Brostaux, Y.; Haubruge, E.; Alabi, T.; Francis, F. Consumer Acceptance of Insect-Based Alternative Meat Products in Western Countries. *Food Qual. Prefer.* 2016, 52, 237–243. <https://doi.org/10.1016/j.foodqual.2016.05.004>.
5. Keramat, J.; LeBail, A.; Prost, C.; Jafari, M. Acrylamide in Baking Products: A Review Article. *Food Bioprocess Technol.* 2011, 4, 530–543.