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1 Structure Design of Insect-Based Meat Analogs with High-Moisture Extrusion

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5

6 Abstract

7 A rapid increase of world population and a lack of traditional protein sources create preconditions for
8 the search of alternatives and development of new acceptable food products. Insects currently are
9 perceived as an alternative source of proteins in a few European countries. Twin screw high-moisture
10 extrusion applied to the mixture of protein concentrates (insect with concentration of 15-50% dry
11 matter and soy) and water resulted in fibrous meat analogs with hardness texture and protein
12 composition similar to meat. The best result (most similar to standard soy-based sample) was
13 highlighted for the mixture of protein concentrates (40% *Alphitobius diaperinus* and 60% soy dry
14 matter). Scanning electron microscopy indicated further improvement of texture for the samples
15 with 5-10% of soy fiber.

16 Keywords

17 Lesser mealworm (*Alphitobius diaperinus*), meat substitute, alternative protein source

18

19 1. Introduction and theory

20 Meat is an important component in Western diets (Elzerman et al., 2011; Schösler et al., 2012) which
21 role is continue to increase as meat consumption is predicted to double globally by 2050 (Steinfeld et
22 al., 2006). Meat production and consumption at the same time is responsible for the highest
23 environmental impact in food sector (Aiking, 2011; Steinfeld et al., 2006). In order to provide more
24 environmentally friendly alternatives a number of meat substitutes was developed and faced the
25 market with different success rate (Belluco et al., 2013; Gahukar, 2011). Insects became a viable
26 alternative of food proteins in Western countries quite recently, but progressing due to high feed to
27 proteins conversion rate, high protein and/or fat content (Caparros Megido et al., 2014; Megido et
28 al., 2016; Rumpold and Schlüter, 2013; Siemianowska et al., 2013), potentially low environmental
29 impact (Smetana et al., 2016, 2015) and low land use impact (Rumpold and Schlüter, 2013; van Huis
30 et al., 2013; van Zanten et al., 2015).

31 Further progression of insects as alternative protein source for food depends in a great degree on the
32 assurance of its safety and nutritional quality (EFSA, 2015). Moreover, it is recognized that the
33 similarity in taste and physical properties (e.g. texture) of new products (meat substitutes) plays an
34 important role in acceptance of alternative foods (Elzerman et al., 2011; Hoek et al., 2013, 2011).
35 That's why the creation of insect based substitute, which would imitate the texture of meat in its full
36 complexity, is a great challenge both in scientific and technological ways (Hoek et al., 2013).

37 This study, as a part of CORNET ENTOMOFOOD project, aims at the design of high-moisture extruded
38 intermediate (HMI) based on insect biomass, which can mimic texturized properties similar to the

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