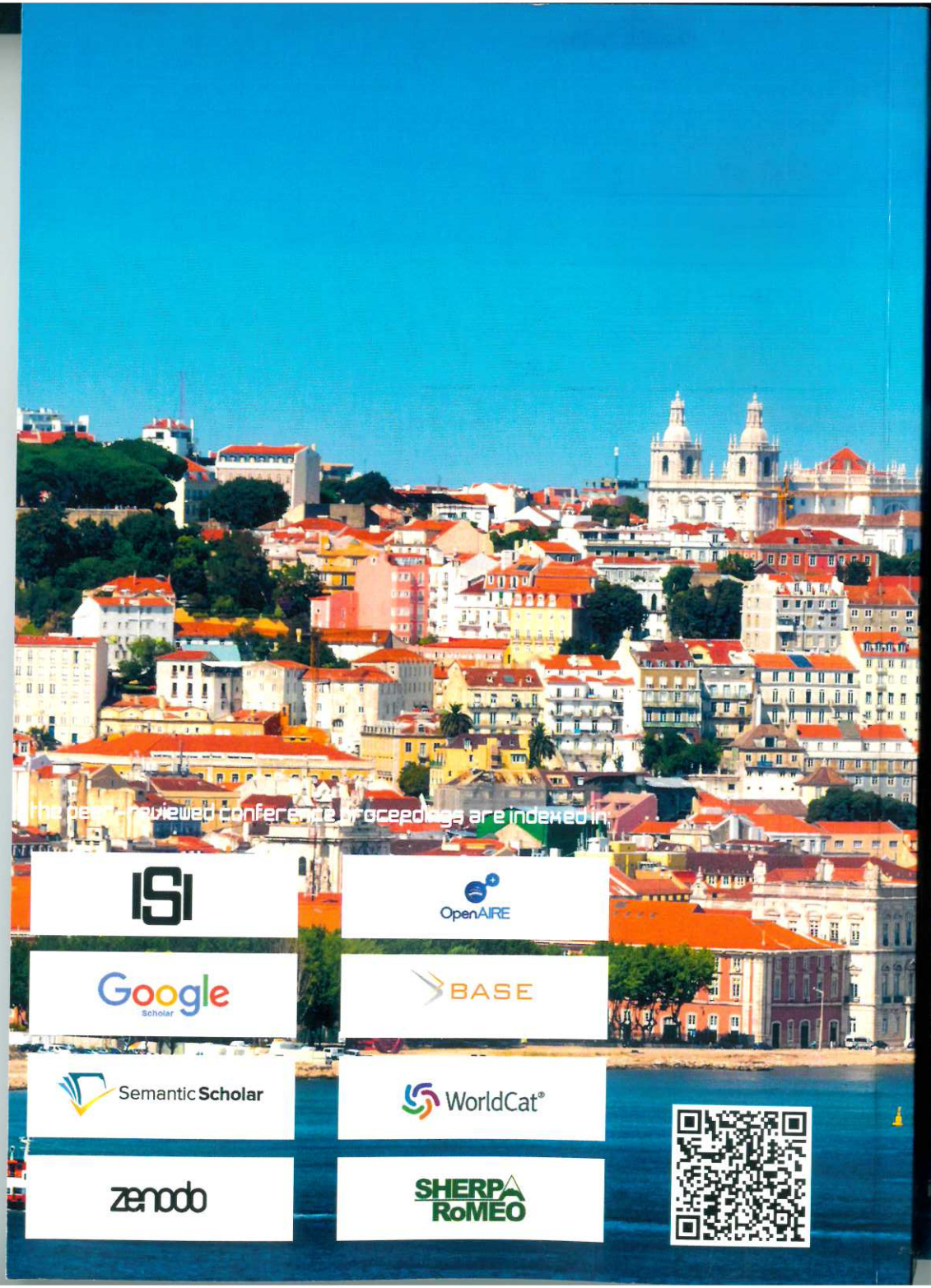

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Development of Antimicrobial Properties Nutraceuticals: Gummy Candies with Addition of Bovine Colostrum, Essential Oils and Probiotics

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Abstract**—**In this study, antimicrobial nutraceuticals - gummy candies (GC) from bovine colostrum (BC), essential oils (EOs), probiotic lactic acid bacteria (PLAB), and their combinations, were developed. For antimicrobial GC preparation heteropolysaccharide (agar) was used. The antimicrobial properties of EOs (*Eugenia caryophyllata*, *Thymus vulgaris*, *Citrus reticulata* L., *Citrus paradisi* L.), BC, *L. paracasei* LUHS244, *L. plantarum* LUHS135, and their combinations against pathogenic bacteria strains (*Streptococcus mutans*, *Enterococcus faecalis*, *Staphylococcus aureus*, *Salmonella enterica*, *Escherichia coli*, *Proteus mirabilis*, *and Pseudomonas aeruginosa)* were evaluated. The highest antimicrobial properties by EO's (*Eugenia caryophyllata* and *Thymus vulgaris)* were established. The optimal ingredients composition for antimicrobial GC preparation was established, which incorporate the BC fermented with *L. paracasei* LUHS244 in combination with *Thymus vulgaris* or *Eugenia caryophyllata*. These ingredients showed high inhibition properties of all tested pathogenic strains *(except Pseudomonas aeruginosa)*. Antimicrobial GC formula consisting of thyme EO (up to 0.2%) and fermented BC (up to 3%), and for taste masking, mandarin or grapefruit EOs (up to 0.2%) was used. Developed GC high overall acceptability and antimicrobial properties, thus, antimicrobial GC could be a preferred form of nutraceuticals.

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Keywords**—**Antimicrobial activity, bovine colostrum, essential oil, gummy candy, probiotic.

Examinations of Sustainable Protection Possibilities against Granary Weevil (*Sitophilus granarius* L.) on Stored Products

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Abstract**—**Granary weevil, *Sitophilus granarius* (L.) (Col.: Curculionidae) is a typical cosmopolitan pest. It can cause significant damage to stored grains, and can drastically decrease yields. Damaged grain has reduced nutritional and market value, weaker germination, and reduced weight. The commonly used protectants against stored-product pests in Europe are residual insecticides, applied directly to the product. Unfortunately, these pesticides can be toxic to mammals, the residues can accumulate in the treated products and many pest species could become resistant against the protectants.

During recent years, alternative solutions of grain protection have received increased attention. These solutions are considered the most promising alternatives to residual insecticides.

The aims of our comparative study were to obtain information about the efficacies of the 1. diatomaceous earth, 2. sterile insect technology and 3. herbal oils against the *S. granarius* on grain (foremost maize), and to evaluate the influence of the dose rate on weevil mortality and progeny.

The main results of our laboratory experiments are the followings:

1. Diatomaceous earth was especially efficacious against *S. granarius*, but its insecticidal properties depends on exposure time and applied dose. The efficacy on barley was more better, than on maize. Mortality value of the highest dose was 85% on 21st day in the case of barley. It can be ascertained, that completely elimination of progeny was evidenced on both gain types. Summarizing, a satisfactory efficacy level was obtained only on barley at a rate of 4g/kg. Alteration of efficacy between grain types can be explained with differences in grain surface.

2. The mortality consequences of Roentgen irradiation on the *S. granarius* was highly influenced by the exposure time and the dose applied. At doses of 50 and 70Gy, the efficacy accepted in plant protection (mortality: 95%) was recorded only on the 21st day. During the application of 100 and 200Gy doses, high mortality values (83.5% and 97.5%) were observed on the 14th day. Our results confirmed the complete sterilizing effect of the doses of 70Gy and above. The autocide effect of 50 and 70Gy doses were demonstrated when irradiated specimens were mixed into groups of fertile specimens. Consequently, these doses might be successfully applied to put sterile insect technique (SIT) into practice.

3. The results revealed that both studied essential oils (*Callendula officinalis*, *Hippophae rhamnoides*) exerted strongly toxic effect on *S. granarius*, but *C. officinalis* triggered higher mortality. The efficacy (94.62±2.63%) was reached after a 48 hours exposure to *H. rhamnoides* oil at 2ml/kg while the application of 2ml/kg of *C. officinalis* oil for 24 hours produced 98.94±1.00% mortality rate. Mortality was 100% at 5 ml/kg of *H. rhamnoides* after 24 hours duration of its application, while with *C. officinalis* the same value could be reached after a 12 hour-exposure to the oil. Both essential oils applied eliminated the progeny.

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Keywords**—**Sitophilus granarius, stored product, protection, alternative solutions.