

РЕЗЮМЕТА НА НАУЧНИТЕ ТРУДОВЕ

НА ДОЦ. Д-Р МАРИЯ ДОНЕВА

представени за участие в конкурс за заемане на академичната длъжност „професор” по ш. 5. Технически науки, професионално направление 5.12. Хранителни технологии, научна специалност „Технология на биологично активните вещества (вкл. ензими, хормони, белтъчини)“ обявен от Институт по криобиология и хранителни технологии, гр. София в ДВ брой 44, стр. 23 от 30.05.25 г.

В. НАУЧНИ ПУБЛИКАЦИИ, ПРЕДСТАВЕНИ ЗА УЧАСТИЕ В КОНКУРСА ЗА АКАДЕМИЧНАТА ДЛЪЖНОСТ "ПРОФЕСОР"

4. ХАБИЛИТАЦИОНЕН ТРУД ИЛИ РАВНОСТОЙНИ НАУЧНИ ПУБЛИКАЦИИ

1. Doneva, M., Dyankova, S., Terziyska, M., Metodieva, P., Nacheva, I., 2024. Antioxidant Protein Hydrolysates from Hemp Seed Oil Cake-Optimization of the Process Using Response Surface Methodology. *Applied Sciences*, 41(4), art. no. 8602, ISSN: 2076-3417 (online). <https://doi.org/10.3390/app14198602>

WEB OF SCIENCE Q2, IF - 2.5, SCOPUS - SJR - 0.508

Abstract: Hemp seed oil cake, a by-product of hemp seed oil extraction, is characterized by its high protein content and bioactive components, making it a valuable resource for the development of functional products through enzymatic hydrolysis. Hemp seed oil itself is renowned for its rich content of essential fatty acids, vitamins, and antioxidants, contributing to its widespread use in health and wellness products. Consequently, the residual cake presents significant potential for the food, pharmaceutical, and cosmetic industries as a source of high-quality protein ingredients. The optimization of enzymatic hydrolysis conditions is crucial for maximizing the efficiency and quality of the resulting protein hydrolysates. This study aims to optimize the hydrolysis process of hemp seed oil cake with bromelain, focusing on three key factors: enzyme concentration (E/S ratio), temperature, and time, to achieve hydrolysates with superior antioxidant activity. Response Surface Methodology (RSM) was applied using a Box-Behnken design to model and optimize the hydrolysis conditions. The experimental design involved three levels for each factor: 1%, 2%, and 3% for bromelain concentration; 20 degrees C, 30 degrees C, and 40 degrees C for temperature; and 60, 120, and 180 min for hydrolysis duration, resulting in 21 experimental runs. The antioxidant activity was assessed via DPPH and ABTS radical scavenging assays (%RSA), and the derived regression models were statistically analyzed and validated. The findings indicate that the optimal conditions for obtaining protein hydrolysates with the highest

antioxidant activity are a bromelain concentration of 3.0%, a temperature of 40 degrees C, and a hydrolysis time of 60 min.

2. Dyankova, S., **Doneva, M.**, Terziyska, M., Metodieva, P., Nacheva, I., 2024. Optimization of the Process for Obtaining Antioxidant Protein Hydrolysates from Pumpkin Seed Oil Cake Using Response Surface Methodology. *Applied Sciences*, 14(5), art. no. 1967, ISSN: 2076-3417 (online). <https://doi.org/10.3390/app14051967>

WEB OF SCIENCE Q2, IF - 2.5, SCOPUS - SJR - 0.509

Abstract: Pumpkin seed cake, a byproduct of cold-pressed oil production, represents a food waste material with a great potential for valorization. The objective of the present study is to optimize the papain enzymatic hydrolysis process of pumpkin seed cold-pressed oil cake (CPC) to obtain protein hydrolysates with the highest antioxidant activity. Box–Behnken Response Surface Methodology (RSM) was used to optimize the simultaneous effects of an enzyme concentration of papain, a temperature, and a reaction time on the process of enzymatic hydrolysis on pumpkin seed cold-pressed oil cake (CPC). For these three input factors, different values are used—1, 2, and 3% for papain concentration, 20, 30, and 40 °C for temperature, and 60, 120, and 180 min for hydrolysis time. Thus, the design generated a total of 21 experimental runs. The aim is to obtain protein hydrolysates with the highest antioxidant activity. The responses DPPH and ABTS were calculated and the determined regression models were statistically analyzed and validated. The results revealed that optimal conditions included a papain concentration of 1.0%, a temperature of 40 °C, and a hydrolysis time of 60 min to retrieve the highest level of bioactive compounds.

3. **Doneva M.***, ¹Loginovska K., Dyankova S., Nacheva I., Metodieva P., Ninova-Nikolova N., 2024. Application of Whey Protein Hydrolysates as a Fermentation Medium With Strains of Lactic Acid Bacteria. *Journal of Chemical Technology and Metallurgy*, 59 (1), 15 - 22, ISSN: 1314-7471. <https://doi.org/10.59957/jctm.v59.i1.2024.2>

SCOPUS - Q3, SJR - 0.190

Abstract: The aim of the present study is to obtain enzymatic hydrolysates from whey protein and evaluate their potential application as a substrate for fermentation with lactic acid bacteria. For hydrolysis of whey proteins, papain is used in 3 concentrations - 0.1, 0.5 and 1.0 mg mL⁻¹. The degree of hydrolysis (DH) was determined on the obtained whey protein hydrolysates (WPHs), the highest percentage being achieved with hydrolysate WPH3 using the papain enzyme at a concentration of 1 mg mL⁻¹.

¹ Кореспондиращ автор

Fermentation of the whey protein hydrolysates was carried out with the participation of the probiotic strains *Lactiplantibacillus plantarum* subsp. *plantarum* NBIMCC 3447 and *Lactobacillus gasserii* NBIMCC 2450. The survival of two strains of probiotic lactic acid bacteria was investigated. In the samples obtained from hydrolyzed whey medium with 0.5 mg mL⁻¹ papain, the highest values of viable probiotic bacterial cells were recorded - for *Lactiplantibacillus plantarum* NBIMCC 3447 2.5 x 10⁹ CFU mL⁻¹, and for *Lactobacillus gasserii* NBIMCC 2450 2.1 x 10⁹ CFU mL⁻¹, respectively. Antioxidant activity is reported on the fermented products. The WPH2 variant has the highest antioxidant potential - 9.14 mg TE/100 mL.

4. Terziyska M., **Doneva M.**, Metodieva P., Nacheva I., 2023. Influence of particle size and storage period on the moisture of granular synbiotic products. *Food Science and Applied Biotechnology*, 6 (1), 117 - 126, ISSN: 2603-3380.
<https://doi.org/10.30721/fsab2023.v6.i1.255>

WEB OF SCIENCE (CABI), SCOPUS - Q4, SJR - 0.222

Abstract: A synbiotic is a product in which a probiotic and a prebiotic are combined at the same time. The benefits of synbiotics for human health are indisputable and this increases interest in them. This paper investigates the effect of particle size and storage time on the moisture content of granulated lyophilized synbiotic products - "LIO - Strawberry Milk" and "LIO - Aronia Milk". For each of these two products, four variants of mixtures are prepared - Variant 1 - a lyophilized product with added 30% sucrose; Option 2 - a lyophilized product with added 10% sucrose and 2% fructooligosaccharides (FOS); Option 3 - a lyophilized product with added 10% sucrose and 2% locust bean gum and Option 4 - a lyophilized product with added 10% sucrose, 1% locust bean gum and 1% FOS. A two-factor analysis of variance was used for the study. The obtained results show that the two factors - particle size and storage time have no mutual influence on the humidity of the studied products. However, they have a significant impact individually. It was also established that the size of the particles is directly dependent on the type and concentration of the added substances.

5. Solakov, N., Loginovska, K., Valchkov, A., Metodieva, P., **Doneva, M.**, Nacheva, I., 2022. Technology for lyophilized functional product production on the basis of buffalo colostrum. *AgroLife Scientific Journal*, 11 (2), 169 - 173, ISSN: 2285-5718.
<https://doi.org/10.17930/AGL2022222>

WEB OF SCIENCE - Q4, IF – 0.5

Abstract: A technology for obtaining a new lyophilized functional product with healthy qualities - "FucoSTEM" has been created. Its composition includes sources of useful

and biologically active ingredients of various origins. The bioformula of the new bioproduct was complied with the requirements for physiological activity, harmlessness and microbial stability. The main parameters of the process of freeze-drying of 4 main components of the composition of the product -colostrum, chokeberry juice, beta-glucans and fructooligosaccharides were established, and their phase behavior at low and high temperatures was studied. Analysis of the thermal curves, obtained by differential scanning calorimetry, provides information on enthalpy, melting temperatures and crystallization, thus proving that an endothermic phenomenon between -5 degrees C and -40 degrees C is observed, which corresponds to the melting of the samples.

6. **Doneva, M.**, Dyankova, S., Miteva, D., Nacheva, I., Metodieva, P., 2021. Cryobiological studies and freeze drying of cow's milk and curd. *Journal of Chemical Technology and Metallurgy*, 2021, 56(5), 932–937, ISSN: 1314-7471.

SCOPUS - Q3, SJR - 0.253

Abstract: An analysis of the specific technological conditions for lyophilization of dairy products (cow milk and curd), ensuring the preservation of product quality was carried out. Differential scanning calorimetry was used to study phase transitions in 3 variants of fresh cow's milk and 3 variants of low-fat curd at temperatures from -80°C to 50°C. An endothermic phenomenon in the interval (-5°C to 40°C) was observed on all thermograms, which corresponds to the melting of the samples. The initial temperature of melting (T_J) was around -5°C. The melting point peak (T_{mp}) in milk samples varies from 9,83 ± 0,76°C to 12,33 ± 2,43°C, while in curd samples - from 6,96 ± 2,27°C to 9,73 ± 1,31°C. Samples with a higher moisture content have higher values of T_m. The obtained results made it possible to substantiate thermodynamically the temperature regimes of lyophilization. Properly programmed temperature regime of lyophilization provided optimal drying speed and good quality of the final products.

7. Miteva, D., Dyankova, S., Ivanova, S., **Doneva, M.**, Nacheva, I., Solak, A., Metodieva, P., 2021. Study of the impact of radiation treatment upon biochemical properties of lyophilized dairy products, *Bulgarian Chemical Communications*, 2021, 53(1), 26–32, ISSN: 0861-9808. <https://doi.org/10.34049/bcc.53.1.5255>

SCOPUS - Q4, SJR - 0.168

Abstract: The effect of freeze-drying and radiation treatment on the protein profile and fatty acid composition of lyophilized cow's milk and curd was studied. The results of SDS-PAGE showed that lyophilization did not alter the qualitative composition of the main proteins in milk and curd. A significant decrease in casein and whey proteins was observed after irradiation with 10 kGy. These changes in protein

components are associated with a decrease in allergenicity after radiation treatment. Changes in fatty acid composition are reflected by an increase in saturated fatty acid content and a decrease in monounsaturated and polyunsaturated fatty acids. In connection with the reported experimental data it is recommended that milk and curd should be totally skimmed before radiation treatment for potential decrease of the allergenicity.

8. Getsov, P., Tsvetkov, T., Sotirov, G., Nacheva, I., Hubenova, Z., **Doneva, M.**, Metodieva, P., 2020. Application of cryotechnology in the creation of Space foods for crews working in extreme conditions. *Aerospace Research in Bulgaria*, 32, 193-208, ISSN: 1313-0927 (print), 2367-9522 (online).

WEB OF SCIENCE - Q4

Abstract: The article presents the achievements in the field of cryobiology and is related to the work for ESA project. Space food is a variety of food products specially formulated and processed for space flight use. Food should meet specific requirements to ensure balanced nutrition for those working in extreme conditions while being easily and safely stored, prepared and consumed in low gravity environments. It is reviewed domestic and foreign market for space foods and defined requirements to astronauts; for other users: military; extreme professions; extreme sports, for hospitals and children gardens. There are summarizes the nutritional requirements for all mentioned above group users of space foods. There is shown Bulgarian experience in research and development of space foods and comparison of the Bulgarian Space Menu.

9. Terziyska, M., Todorov, Y., Miteva, D., **Doneva, M.**, Dyankova, S., Metodieva, P., Nacheva, I., 2020. Bayesian Regularized Neural Network for Prediction of the Dose in Gamma Irradiated Milk Products. *Cybernetics and Information Technologies*, 20(2), 141-151, ISSN: 1311-9702 (print), 1314-4081 (online). <https://doi.org/10.2478/cait-2020-0022>

WEB OF SCIENCE Q4, SCOPUS - Q2, SJR - 0.272

Abstract: Gamma irradiation is a well-known method for sterilizing different foodstuffs, including fresh cow milk. Many studies witness that the low dose irradiation of milk and milk products affects the fractions of the milk protein, thus reducing its allergenic effect and make it potentially appropriate for people with milk allergy. The purpose of this study is to evaluate the relationship between the gamma radiation dose and size of the protein fractions, as potential approach to decrease the allergenic effect of the milk. In this paper, an approach for prediction of the dose in gamma irradiated products by using a Bayesian regularized neural network as a mean to save recourses for expensive electrophoretic experiments, is developed. The

efficiency of the proposed neural network model is proved on data for two dairy products - lyophilized cow milk and curd.

10. Terziyska, M., Todorov, Y., **Doneva, M.**, Metodieva, P., 2019. Distributed Adaptive Neuro Intuitionistic Fuzzy Architecture for prediction of the dose in gamma irradiated milk products. *IFAC-PapersOnLine*, 52(25), 75–80, ISSN: 2405-8963.
<https://doi.org/10.1016/j.ifacol.2019.12.449>

SCOPUS - Q2, SJR - 0.332

Abstract: In this paper, a Distributed Adaptive Neuro Intuitionistic Fuzzy Architecture (DANIFA) with a second order Takagi-Sugeno inference is presented. The architecture represents a layered set of simple fuzzy inferences connected in a distributed way, thus minimizing the number of the interconnected fuzzy rules and their associated parameters. The flexibility of the designed structure to handle uncertain data variations is complemented, by embedding an Intuitionistic fuzzification approach. A simple two-step gradient descent algorithm with a fixed learning rate is used as a learning algorithm of the proposed architecture. To test the prediction abilities of the designed model a biological case for estimation of the low gamma irradiation dose to denature the protein fractions in milk products with potential uncertain data variations is studied.

7. НАУЧНИ ПУБЛИКАЦИИ В ИЗДАНИЯ, КОИТО СА РЕФЕРИРАНИ И ИНДЕКСИРАНИ В СВЕТОВНОИЗВЕСТНИ БАЗИ ДАННИ С НАУЧНА ИНФОРМАЦИЯ

1. Dyankova S., **Doneva M.**, Solak A., Miteva D., Nacheva I., Loginovska K., Solakov N., 2024. Physicochemical studies and electrophoretic profile of freeze-dried quail eggs. *BIO Web of Conferences*, 102, art. no. 01003, ISSN: 2273-1709.
<https://doi.org/10.1051/bioconf/202410201003>

WEB OF SCIENCE (CABI), SCOPUS

Abstract: The aim of the research is a comparative physicochemical and electrophoretic analysis of lyophilized egg white (albumen), egg yolk and whole egg (mélange) from quail eggs, obtained by processing at three different freezing temperatures before lyophilization. The conditions of freezing and the parameters of lyophilization, in which products with the best physicochemical properties are obtained, have been established. The protein content varies from 87.76% (egg white) to 31.09% (yolk), and the amount of lipids is 0.21% and 52.94%, respectively. All egg powders have low residual moisture – from 1.92% to 3.49%.

The content of essential amino acids is significantly higher in the lyophilized egg white - 44.07g/100g than in the lyophilized yolk - 16.29g/100g. The results of the electrophoretic analysis (SDS–PAGE) showed a reliable match in the protein profile of the raw and freeze-dried quail eggs. Therefore, the proteins in the egg white and yolk remain unchanged after freeze-drying. This technology is a suitable approach for the utilization of unrealized quail eggs while preserving the composition, nutritional value and beneficial biological qualities. In addition to the functional advantages, freeze-dried egg powders are convenient to transport and have a significantly extended shelf life.

2. Loginovska K., Valchkov A., **Doneva M.**, Metodieva P., Dyankova S., Miteva D., Nacheva I., 2024. Technology for obtaining fermented products based on walnut milk, *BIO Web of Conferences*, 58, art. no. 01014, ISSN: 2273-1710.
<https://doi.org/10.1051/bioconf/202410201014>

WEB OF SCIENCE (CABI), SCOPUS

Abstract: A technology has been developed for obtaining lyophilized fermented products based on walnut milk. Fermentation was carried out with two probiotic strains of *Lactiplantibacillus plantarum subsp. plantarum* NBIMCC 3447 and *Lactobacillus gasseri* NBIMCC 2450. In the capacity of prebiotic and cryoprotectant the composition of the products includes fructooligosaccharides (FOS) in three concentrations - 1, 2 and 4%. An increase in cell survival was found with an increase in the concentration of the fructo-oligosaccharides in the medium. After fermentation and lyophilization, *L. plantarum* showed better survival compared to *L. gasseri* in all samples examined. Probiotic cells fermented in medium with 4% FOS retain high viability after lyophilization - 93-96%, while those in medium with 2% FOS reach 85-93% survival. Fructooligosaccharides not absorbed by the cells at the end of the fermentation process render a cryoprotective effect and lead to a higher survival of the cells of both strains in the lyophilization process.

3. Valchkov, A., Loginovska, K., **Doneva, M.**, Solakov, N., Metodieva, P., 2024. Modern trends and opportunities for the use of prebiotic components, *Journal of Mountain Agriculture on the Balkans*, 27(2), 512-545, ISSN: 1311-0489 (print), 2367-8364 (online)

WEB OF SCIENCE (2015-) (CABI)

Abstract: The prebiotics represent nutrients that are not degraded in the upper gastrointestinal tract and have a beneficial effect by selectively stimulating the growth and/or activity of one or several types of microorganisms in the large intestine, thereby improving the health status of the host. In recent decades, numerous functional foods have been produced in whose composition prebiotic components are included. The

combination of probiotics with prebiotics in one product leads to obtaining a higher class of functional products - synbiotics. In recent years, various formulations have been created through which the prebiotic components, in combination with probiotic bacteria, can be delivered to the body completely safely and thus be preserved whole until they are delivered there - by encapsulation, granulation, etc. These are the so-called integrated synbiotics. Some prebiotic components have cryoprotective properties during the lyophilization process. In this review article, various current possibilities and trends for the utilization of prebiotics will be discussed.

4. **Doneva, M.**, Loginovska, K., Valchkov, A., Ivanova, S., Metodieva, P., Nacheva, I., 2024. Comparative fatty acid analysis of fermented milks of plant origin, *Journal of Mountain Agriculture on the Balkans*, 27(3), 491-511, ISSN: 1311-0489 (print), 2367-8364 (online)

WEB OF SCIENCE (2015-) (CABI)

Abstract: Experiments were conducted to determine the fatty acid composition of natural and fermented plant-based milks from walnuts and almonds. The fatty acid profile of natural plant milks was compared with those fermented with *Lactiplantibacillus plantarum* NBIMCC 3447 and *Lactobacillus gasseri* NBIMCC 2450 walnut and almond milks. The amount of polyunsaturated fatty acids increased and the content of saturated fatty acids significantly decreased in the fermented experimental variants of plant milks. In the fermentation samples, an increase in the content of Omega 6 fatty acids was observed, compared to the source samples, and it was most noticeable in the fermented walnut milks, where it increased 4.5 times. Moreover, in the fermented experimental variants, the content of lauric, myristic and stearic acids decreased reliably. The resulting fermented plant-based milks have a low content of saturated fatty acids, which makes them suitable food sources in a healthy human diet.

5. **Doneva, M.***, Dyankova, S., Loginovska, K., Metodieva, P., Nacheva, I., 2024. Obtaining protein hydrolysates from hemp meal, *Journal of Mountain Agriculture on the Balkans*, 27(6), 711-726, ISSN: 1311-0489 (print), 2367-8364 (online)

WEB OF SCIENCE (2015-) (CABI)

Abstract: Hemp seed proteins have proven nutritional properties, but the preparation of hydrolysates by enzymatic processing of hemp meal is an emerging field with many potential applications for the development of new functional products. In this study, the results of a series of experiments on hydrolysis of the protein components of hemp meal obtained as a by-product of the production of vegetable oils are presented. Hydrolysis was carried out using two plant enzymes – papain and bromelain. The efficiency of the hydrolysis process was evaluated for each enzyme by modifying the following parameters: enzyme concentration (1%, 2% and 3%)

and reaction time (60 min, 120 min and 180 min). The change in the state of the protein substances after hydrolysis was identified with SDS-PAGE. The degree of hydrolysis (DH) was determined for the obtained hydrolysates. It was found that a hydrolysis time of 180 minutes and a 3% concentration of the bromelain enzyme were the optimal conditions to achieve the highest value of the degree of hydrolysis.

6. Dyankova, S., **Doneva, M.***, Loginovska, K., Dimitrov, N., Miteva, D., 2024. Investigation on the influence of enzyme treatment parameters on yield and degree of hydrolysis of proteins from pumpkin meal, *Journal of Mountain Agriculture on the Balkans*, 27(6), 711-726, ISSN: 1311-0489 (print), 2367-8364 (online)

WEB OF SCIENCE (2015-) (CABI)

Abstract: Pumpkin seed (*Cucurbita pepo* L.) is a source of vegetable oil with a high content of unsaturated fatty acids, tocopherols and phytosterols. The potential for the valorization of the protein-rich meal, a by-product of the production of cold-pressed pumpkin oil, is large and still unrealized on a significant range. The hydrolysates obtained by enzymatic treatment of pumpkin seed proteins are rich in bioactive peptides that can be used in the production of new dietary and nutritional supplements and functional foods. The aim of the present study is to conduct experiments on direct enzymatic hydrolysis of pumpkin meal with two plant proteolytic enzymes - papain and bromelain, while varying the parameters of the process: enzyme concentration (1{. \%}, 2{. \%} and 3{. \%}) and duration (60 min, 120 min and 180 min). Hydrolysis efficiency was evaluated by determining the degree of hydrolysis (DH) and SDS-PAGE of the resulting hydrolysates. Bromelain treatment (concentration 3{. \%}) for 120 and 180 min was found to result in the highest DH values of 31.11{. \%} and 34.85{. \%}, respectively. These results are also confirmed by the electrophoretic profile of the hydrolyzed samples.

7. Valchkov A., Loginovska K., **Doneva M.**, Ninova-Nikolova N., Metodieva P., 2023. Comparative analysis of the degree of hydrolysis and antioxidant activity of milk and whey hydrolysates, *BIO Web of Conferences*, 102, art. no. 01002, ISSN: 2273-1711. <https://doi.org/10.1051/bioconf/20235801002>

WEB OF SCIENCE (CABI), SCOPUS

Abstract: The degree of hydrolysis and antioxidant activity of protein hydrolysates from fresh cow's milk and whey obtained by the action of the proteolytic enzymes papain, bromelain and chymosin were compared. The lowest degree of hydrolysis in fresh milk hydrolysates was reported for sample MP1 (10 min reaction time, treatment with 0.1 mg/ml papain), and the highest percentage was obtained at hydrolysate MB12 (at 60 min reaction time, treatment with 1.0 mg/ml bromelain). For the whey

samples in sample WC1 (10 min reaction time, treatment with 1.0 µl/ml chymosin), the percentage of hydrolysis was the lowest. The highest percentage was achieved at WP12 hydrolysate using papain at a concentration of 1 mg/ml and a 60-min reaction time. The obtained values for the antioxidant capacity of the hydrolysed products show a higher activity compared to the starting substrates. The highest activity in the milk hydrolysates of 11.32 mg TE/100 ml was found in variant MB3, and in the whey hydrolysates of 7.83 mg TE/100 ml - in variant WP7. Hydrolysates treated with chymosin had lower TE values compared to the hydrolysate's variants, treated with papain and bromelain.

8. Solak A., Dyankova S., **Doneva M.**, Pavlova M., 2023. Edible pH sensitive polysaccharide-anthocyanin complex films for meat freshness monitoring. *BIO Web of Conferences*, 58, art. no.01007, ISSN: 2273-1711.
<https://doi.org/10.1051/bioconf/20235801007>

WEB OF SCIENCE (CABI), SCOPUS

Abstract: One of the innovative methods for real-time determination of food freshness is the application of pH-indicator sensors, where the color change can be used for the visual detection of acidic/basic volatile compounds formed during product storage due to microbial growth. The aim of the present study is to develop a pH-responsive freshness indicator based on anthocyanins from chokeberry (*Aronia melanocarpa* Elliot) and black carrot (*Daucus carota* ssp. *sativus* var. *atrorubens* Alef.), incorporated into an alginate/pectin/arabic gum composite film. The resulting films show distinct color changes as the pH varies. The color changes from red (pH 2.0 - 3.0) through pink and pale pink (pH 4.0, 5.0 and 6.0) to purple and blue (pH 7.0 - 8.0). The most distinct is the color transition between pH 6.0 and 7.0 for the black carrot extract and the chokeberry: black carrot mixture (1:3). The applicability of the developed pH-indicator films was demonstrated in chicken meat by tracking the changes during its storage at 4°C for 7 d. The observed results show a distinct color change from pink (day 1-3) to violet and blue on day 7. The developed pH-sensitive films have potential for use in a smart packaging system as a sensor for meat freshness monitoring © FoSET 2022. All rights reserved.

9. Loginovska, K., Valchkov, A., **Doneva, M.**, Metodieva, P., Nacheva, I., 2023. Technology for obtaining a lyophilized product based on milk hydrolyzate. *Journal of Mountain Agriculture on the Balkans*, 26(5), 47-65, ISSN: 1311-0489 (print), 2367-8364 (online).

WEB OF SCIENCE (2015-) (CABI)

Abstract: A recipe formula and technological scheme for the production of a new lyophilized probiotic product based on a bioactive hydrolyzate from fresh milk, fermented with selected strains of lactic acid bacteria, was created. The composition of the new

functional food is multi-component and includes an enzymatically produced protein hydrolyzate enriched with proven useful probiotic strains *Lactobacillus plantarum* subsp. *plantarum* NBIMCC 3447 and *Lactobacillus gasseri* NBIMCC 2450, as well as physiologically active substances of different origin - fruits, fructooligosaccharides, microcrystalline cellulose, xylitol and mannitol. Analytical determination of the new bioproduct according to organoleptic parameters was carried out. It is powdered with a fine consistency, with a pleasant, specific for the composition aroma and color. The survival of the lactic acid microflora in the lyophilized probiotic product was monitored during its storage at room temperature (18°C) and in refrigerated conditions (4°C) for a period of 270 days (9 months). When stored at 18°C, it was found that the functional food has probiotic properties up to the 60th day (second month), with the reported survival of the microflora on that day - 6,18 LogN. When stored in refrigerated conditions, the probiotic properties are preserved until the 180th day (sixth month), with the reported survival of the lactic acid microflora on that day - 6,11 LogN.

10. Valchkov, A., Loginovska, K., **Doneva, M.**, Metodieva, P., Nacheva, I., 2023. Physicochemical and biochemical evaluation of a lyophilized probiotic product based on milk hydrolyzate. *Journal of Mountain Agriculture on the Balkans*, 26(6), 81-97, ISSN: 1311-0489 (print), 2367-8364 (online).

WEB OF SCIENCE (2015-) (CABI)

Abstract: Analytical determination of the lyophilized product was carried out according to physicochemical and biochemical indicators. Regarding the active acidity (pH), a sharper change was observed in the values of the studied product -- 3.87, with generally accepted standard norms for lactic acid foods in the range of 4.37 -- 4.46, which is an indicator of more high survival of probiotic strains, therefore higher probiotic potential in the final product. The content of carbohydrates in the probiotic food was doubled compared to the control sample (starting raw material - lyophilized milk), which is due to the added carbohydrate ingredients - fructooligosaccharides, microcrystalline cellulose, xylitol, mannitol, etc. The content of the macroelement potassium and the microelements copper and iron was similar in the control sample and in the functional food. The amount of microelements manganese and zinc in the product was many times higher compared to the raw material. The amino acid profile of the lyophilized product showed that after enzymatic hydrolysis and fermentation with the probiotic strains *Lactobacillus plantarum* subsp. *plantarum* NBIMCC 3447 and *Lactobacillus gasseri* NBIMCC 2450 had a significant increase in free amino acids compared to the starting material. Summarizing the results, it was found that it is a probiotic product containing peptides, free amino acids and biologically active substances, that can have a positive impact on the physiological and metabolic functions of the body.

11. **Doneva, M.**, Nacheva, I., Metodieva, P., 2022. Particle distribution in granular synbiotic products. *AgroLife Scientific Journal*, 11 (1), 56-62, ISSN: 2285-5719.

WEB OF SCIENCE - Q4, IF – 0.5, SCOPUS

Abstract: This article presents an analysis of the particle distribution of granular lyophilized synbiotic products. The main purpose of the present study is to find a relationship between the particle size distribution and the varying component in the composition of the products. Particle size measurements were performed with an ANALYSETTE 22 NanoTec plus analyzer. The results obtained we then subjected to statistical analysis to study the distribution properties of functional food samples. It has been found that for the preparation of granules with a low degree of dusting it is optimal to use 10% sucrose, 1% locus bean gum and 1% fructooligosaccharides (FOS) for processing the lyophilized mixture. Determining the distribution of granules is directly dependent on their composition and purpose. The natural composition of the granulated "LIO - Milk strawberry" and "LIO - Milk chokeberry" guarantees exceptional uniformity in use, as well as prevention of possible oxidation.

12. Dyankova, S., Solak, A., Nacheva, I., **Doneva, M.**, 2022. A new type of edible food packaging based on composite biopolymer material with included chokeberry extract. *Journal of Mountain Agriculture on the Balkans*, 25(6), 459-477, ISSN: 1311-0489 (print), 2367-8364 (online).

WEB OF SCIENCE (2015-) (CABI)

Abstract: A composite biopolymer material with potential application as food packaging has been developed. The composite material is made of sodium alginate, pectin, gelatin and gum arabic. The preparation method is based on pre-dissolving the components, mixing the solutions in a specific ratio, adding a plasticizer and homogenizing. Crosslinking with CaCl₂ solution followed by pouring and drying under controlled temperature conditions was applied. The rheological parameters of the film-forming mixtures were investigated. The determined values for dynamic viscosity are from 747 to 1030 mPa.s. Ethanol extract of chokeberry with anthocyanin content - 1.007 10.04 cyd eq mg/ml and antioxidant activity - 75.381.06 mumol TE/ml was added to the film-forming mixture in some of the samples. The resulting packaging film is homogeneous, without fragile areas, elastic, semitransparent with a cherryred nuance and has good barrier properties against light. The performed analyzes showed the preservation of the main biologically active substances from the plant extract. The antioxidant activity of the film is 15.89 0.19 mumol TE/g. The final products of the proposed technology are eco-friendly food packaging films, obtained from renewable sources. They are a good basis for the inclusion of

antioxidants, which can increase the nutritional value and improve the quality of food packaged in them.

13. Valchkov, A., Markov, Z., Loginovska, K., Solakov, N., **Doneva, M.**,* 2022. Change in chitinase activity in different methods of separation of the culture medium. *Journal of Mountain Agriculture on the Balkans*, 25(4), 286-303, ISSN: 1311-0489 (print), 2367-8364 (online).

WEB OF SCIENCE (2015-) (CABI)

Abstract: Chitinases are effective agents for biological control of plant diseases caused by various phytopathogenic fungi. This determines the significant biotechnological potential for the production of chitinase enzymes and their use as biological agents for plant disease control. Experienced experiments were performed using six different nutrient media to cultivate a producer strain of *Bacillus subtilis* NBIMCC 2353 in order to increase the enzyme chitinase produced and increase the viable cell number. Successful separation of the culture fluids from the studied media was achieved by the methods of separation - centrifugation and filtration. Clear solutions with enzymatic activity (supernatants) and cloudy solutions (precipitates) containing the cells of the producer strain were obtained. The supernatants obtained by the filtration method were found to have higher enzymatic activity than those obtained by centrifugation. Similarly, the precipitates obtained by the filtration method have a larger number of cells than those obtained by the centrifugation method. In both methods of separation with the highest chitinase activity, are distinguished the supernatants from the modified nutrient medium with added fresh mycelium of *Ganoderma lucidum*, and with the highest number of viable cells - the sediments from the same medium. High values for chitinase activity and viable cell count were also obtained in supernatants and sediments from the nutrient media with added chitin and arabinose in both methods of separation.

14. Loginovska, K., **Doneva, M.***, Ninova-Nikolova, N., Nacheva, I., Metodieva, P., 2022. Effect of natural cryoprotective agents on the survival of *Lactobacillus plantarum* and *Lactobacillus gasseri* in lyophilized bioactive products. *Journal of Mountain Agriculture on the Balkans*, 25(2), 52-66, ISSN: 1311-0489 (print), 2367-8364 (online).

WEB OF SCIENCE (2015-) (CABI)

Abstract: The survival of two strains of probiotic lactic acid bacteria *Lactobacillus plantarum* subsp. *plantarum* NBIMCC 3447 and *Lactobacillus gasseri* NBIMCC 2450 included in functional products based on hydrolyzed cow's milk and whey has been studied. Two types of cryoprotective medium were used - a first option combination of 3% sucrose and 2% pectin and a second option 0.2% locust bean gum solution. A comparative analysis of the number of viable cells (cfu/ml) after

freezing and freeze-drying was performed. The results show that the import of cryoprotective medium to microorganisms in the fermentation medium has a positive effect and preserves cell survival after freezing and lyophilisation up to 95%, compared to control samples. It has been found that the solution of sucrose and pectin exhibits a better cryoprotective effect in milk environment, while in an environment with hydrolysed milk proteins Locust bean gum contributes to the preservation of a higher number of viable cells both after freezing and after lyophilisation of products.

15. Loginovska, K., Metodieva, P., **Doneva, M.**, Nacheva, I., 2022. Application of natural biologically active components in quality of cryoprotectants in lyophilization of kefir. *Journal of Mountain Agriculture on the Balkans*, 25(1), 27-39, ISSN: 1311-0489 (print), 2367-8364 (online).

WEB OF SCIENCE (2015-) (CABI)

Abstract: The survival of the microflora of kefir from goat's milk was studied after freezing and freeze-drying with included natural biologically active components - fructooligosaccharides and gum locus bean, in their capacity of cryoprotective media. The effect of each cryoprotectant has been studied independently and in combination between them. To achieve the maximum number of vital and active cells after freeze-drying, the optimal process parameters were established by applying differential thermal analysis (DTA). The results show that the inclusion of kefir microorganisms in a protective medium leads to a higher survival after freezing and lyophilization, compared to the sample without cryoprotector. Yeasts, followed by streptococci, have the highest resistance, and lactobacilli are the most sensitive to the process. The combination of 5% fructooligosaccharides with 1% gum locus bean can be considered optimal in terms of the cryoprotective effect on the main groups of microorganisms in kefir. Achieved high levels of survival allow the creation of lyophilized foods rich in viable synbiotic microflora.

16. Loginovska, K., Solakov, N., **Doneva, M.**, Valchkov, A., 2021. Functional bioproduct FucoStem - evaluation of the product on organoleptic, physicochemical, biochemical and microbiological indicators. *AgroLife Scientific Journal*, 2021, 10(1), 130-135, ISSN: 2285-5721.

WEB OF SCIENCE - Q4, SCOPUS

Abstract: The authors present the results of organoleptic, physicochemical, biochemical and microbiological studies of a new lyophilized functional bioproduct "FucoSTEM". The product is a nutritious concentrate developed on the basis of buffalo colostrum. The inclusion in the composition of fruit (chokeberry) leads to an increase in the content of total phenolic substances, anthocyanins and high antioxidant activity of

the product. The obtained results prove that the new product "FucoSTEM" has a balanced composition, preserved quality characteristics, high biological and energy value. It is microbiologically pure and safe to use. These features define it as suitable for use by a wide range of users.

17. Loginovska, K., **Doneva, M.**, Solakov, N., Valchkov, A., Nacheva, I., 2021. Tracing the development of *Bacillus subtilis* in broth with added micelles and extracts from higher medicinal mushrooms. *AgroLife Scientific Journal*, 10(1), 130-135, ISSN: 2285-5721

WEB OF SCIENCE - Q4, SCOPUS

Abstract: The growth of cell culture of strain *Bacillus subtilis* NBIMCC 2353 has been traced by two experiments. At 48th hour the number of cells reaches its maximum, which is above 8 log units (experiment 1), after included on the 24th hour of enrichment agents in native form - mushroom body and micelles of the high medical mushrooms *Ganoderma lucidum* (Red reishi), and *Cordyceps sinensis* at concentrations of 2% and 4%. Cell culture basically fails to develop in its maximum capabilities due to difficulty absorbing macro-, micro-elements and protein compounds, contained in the high mushrooms. Positive effects have been found in experiment 2, such as prolonging the propagation time and doubling the number of cells of *Bacillus subtilis* NBIMCC 2353, upon added into the nutrient medium of easily accessible components, such as *Cordyceps sinensis* and *Ganoderma lucidum* powder extracts. The largest increase in cell amount was observed at the 54th hour from the start of incubation, which was over 11.5 log units, for variants with added 2 g extract.

18. Metodieva, P., Solakov, N., **Doneva, M.**, 2019. Evaluation of the fatty acid composition of whey based lactic acid beverages. *Bulgarian Journal of Animal Husbandry*, 56(3), 21-26, ISSN: 0514-7441 (print), 2534-9856 (online).

WEB OF SCIENCE (2016-) (CABI, FSTA)

Abstract: Whey is a milk serum that is produced as a waste product in the production of cheese, yellow cheese and yoghurt. It is characterized by valuable biological nutritional qualities because of its soluble milk proteins, milk sugar, mineral substances, trace elements and vitamins. Due to the high absorption of the biologically active components contained in the whey, the interest in its use as a protein supplement in patients with specific diseases, athletes, young children and the elderly is constantly increasing. Various whey-based products are known which use separate ingredients. The aim of the present study is to develop a technology for complex utilization of the skeletal components. A formula for a whey-based lactic acid beverage has been developed. Sour whey is enriched with fructal concentrate of *Henomeles* (*Chaenomeles speciosa* Nivalis) and hydrocolloid. Biochemical studies have been carried out on the fatty acid composition of the raw material and

the resulting lactic acid product, which establishes that the technological processing through which the raw material - pasteurisation and lactic acid fermentation passes - does not change the fatty acid composition.

19. Dyankova, S., **Doneva, M.**, Solak, A., Metodieva, P., 2018. Comparative analysis of extracts from some medicinal plants used in traditional Bulgarian medicine. *Journal of Mountain Agriculture on the Balkans*, 21(3), 172-183, ISSN: 1311-0489 (print), 2367-8364 (online).

WEB OF SCIENCE (2015-) (CABI)

Abstract: The subjects of the investigation are six medicinal plants used in folk medicine in Bulgaria - dwarf everlast (*Helichrysum arenarium*L.), knotgrass (*Polygonum aviculare*L.), wild basil (*Clinopodium vulgare*L.), European mistletoe (*Viscum album*L.), field horsetail (*Equisetum arvense*L.) and common speedwell (*Veronica officinalis*L.). The traditional use of the listed herbs involves the preparation of decoctions or infusions from individual plants or mixtures thereof, which have a variety of physiological effects - lowering of blood pressure, diuretic and choleric effect, general strengthening of the organism, etc. The purpose of the study is to obtain water-ethanol extracts from dried plant raw materials by analyzing the influence of ethanol concentration on the extraction yield and total phenol content of the extracts. The studies were conducted at hydromodul 1:10 and three different concentrations of ethanol - 50, 60 and 70%. The amount of extracted substances in the samples depends on the type of raw material and the ethanol concentration. Similar dependence is observed with respect to the content of total phenols. The highest values were recorded in *C. vulgare* extracted with 50% ethanol (4,240,040 mg GAE/ml) and in *V. officinalis* extract obtained with 70% ethanol (3,260,049 GAE mg/ml).

20. **Doneva, M.***, Nacheva, I., Dyankova, S., Metodieva, P., Miteva, D., 2018. Application of plant proteolytic enzymes for tenderization of rabbit meat. *Biotechnology in Animal Husbandry*, 34(2), 229-238, ISSN: 1450-9156 (print), 2217-7140 (online).

WEB OF SCIENCE (CABI)

Abstract: The purpose of this study is to assess the tenderizing effect of plant proteolytic enzymes upon raw rabbit meat. Tests are performed on rabbit meat samples treated with papain and two vegetal sources of natural proteases (extracts of kiwifruit and ginger root). Two variants of marinade solutions are prepared from each vegetable raw materials - 50% (w/w) and 100% (w/w), with a duration of processing 2 h, 24 h, and 48 h. Changes in the following physico-chemical characteristics of meat have been observed: pH, water-holding capacity, cooking losses and quantity of free amino acids. Differences in values of these characteristics have been observed, both

between control and test samples, as well as depending of treatment duration. For meat samples marinated with papain and ginger extracts, the water-holding capacity reached to 6.740.04% (papain), 5.580.09% (variant 1) and 6.800.11% (variant 2) after 48 hours treatment. In rabbit meat marinated with kiwifruit extracts, a significant increase in WHC was observed at 48 hours, 3.370.07 (variant 3) and 6.840.11 (variant 4). The test samples also have reduced cooking losses compared to control samples. In control samples, cooking loss is increased from 13.79% (2 h) to 20.78% (48 h). SDS-PAGE of meat samples after 48 h of treatment shows a reduction in the intensity of actin and myosin bands in all variants with papain and vegetal extracts. Electrophoretic pattern of test samples depicts proteolysis and degradation of muscle proteins.

21. Metodieva, P., Nacheva, I., **Doneva, M.**, Loginovska, K., 2018. Assessment of the degree of impact of factors such as temperature and storage period on the qualitative indicators of probiotic goat milk variants. *Journal of Mountain Agriculture on the Balkans*, 21(2), 39-50, ISSN: 1311-0489 (print), 2367-8364 (online).

WEB OF SCIENCE (2015-) (CABI)

Abstract: On the basis of goat milk, by selecting and introducing additional strains to the classical yoghurt yeast, biofermentation experiments were carried out to obtain probiotic products. The influence of the factors as temperature and duration of storage on the main qualitative indicators of three variants of probiotic products based on goat milk were studied. The degree of impact of the basic technological parameters on the acidity and the total number of micro-organisms of the lactic acid sample variants was assessed by the two-factor dispersion analysis. The statistical processing of the data obtained showed that with respect to titratable and active acidity, the temperature factor had a greater impact, whereas the degree of impact of the storage time factor had a major influence on the total number of microorganisms.

22. Metodieva, P., **Doneva, M.**, Dyankova, S., Nacheva, I., 2018. Electrophoretic profile of fermented probiotic products from goat milk. *Journal of Mountain Agriculture on the Balkans*, 21(2), 51-60, ISSN: 1311-0489 (print), 2367-8364 (online).

WEB OF SCIENCE (2015-) (CABI)

Abstract: Goat milk is a proven healthy product with valuable protein content. Unlike cow milk that can cause allergies and indigestion, goat milk has a higher digestibility and lower allergenic properties. Therefore, due to nutritional and health benefits, the demand for goat milk and goat milk products has increased in recent years. The purpose of the study is to characterize the protein profiles of different probiotic goat milk products. The products are obtained by selecting and including additional

strains to the classic starter and variation and the technological parameters - temperature mode and storage duration. A series of biochemical tests were performed on the protein spectrum of the test specimens. It was found that the protein profiles of the three probiotic products did not show significant differences. The storage temperatures and period are more important to the change in the status of protein substances in the test groups studied.

23. **Doneva, M.**, Dyankova, S., Metodieva, P., 2018. Immobilization of proteolytic and amylolytic enzymes in a collagen carrier. *Journal of Mountain Agriculture on the Balkans*, 21(5), 39-48, ISSN: 1311-0489 (print), 2367-8364 (online).

WEB OF SCIENCE (2015-) (CABI)

Abstract: Collagen is one of the preferred natural carriers for enzyme immobilization because of its availability and structural characteristics. The fibrillar structure and the high degree of order in collagen fibers is a prerequisite for mechanical strength and elasticity. Collagen is resistant to most proteolytic enzymes, with the exception of collagenases. The aim of the study is to create a technology for immobilizing proteolytic and amylolytic enzymes in a collagen carrier and to determine the extent to which enzyme activity and stability are retained in the product series. Highly purified, water-soluble collagen, extracted from waste products of the meat and leather industry, is used as a carrier. A total of five variants of collagen products have been developed and experimented with by inclusion of the corresponding enzyme: papain, trypsin, alkaline protease, fungal alpha-amylase and bacterial alpha-amylase respectively. It has been found that the bioactive collagen matrices obtained are stable at room temperature, provide the catalytic stability of the enzyme molecules involved therein and can be used in the food and pharmaceutical industry.

24. Nacheva, I., **Doneva, M.**, Metodieva, P., Loginovska, K., 2017. Tracing some quality and biochemical parameters of kefir from goat milk during storage. *Journal of Mountain Agriculture on the Balkans*, 20(1), 1-9, ISSN: 1311-0489 (print), 2367-8364 (online).

WEB OF SCIENCE (2015-) (CABI)

Abstract: From raw material - goat milk is prepared a fermentation product (kefir), which was characterized by main quality indicators. According to the data obtained by organoleptic evaluation, storage of kefir at 4°C is preferably up to 14 day. After the second week, the product retains its largely useful and beneficial to the human body characteristics. Data of physicochemical and biochemical composition resulting from goat milk fermented product (kefir) characterize it as a 100% natural product with multiple health effects. Electrophoretic studies, which establish changes in

casein and whey fractions of fresh and fermented goat milk and kefir during storage, were conducted. The main casein fraction (alpha-casein and beta-casein) and beta-lactoglobulin and alpha-lactoalbumin of whey proteins.

25. Dyankova, S., **Doneva, M.**, Marinova, G., 2017. Technological investigations for obtaining anthocyanins from black chokeberry (*Aronia melanocarpa*). *Journal of Mountain Agriculture on the Balkans*, 20(5), 215-224, ISSN: 1311-0489 (print), 2367-8364 (online).

WEB OF SCIENCE (2015-) (CABI)

Abstract: The fruits of chokeberry are a valuable source of bioactive compounds that may be used in the production of new functional foods and beverages. It is believed that chokeberry juice has a beneficial effect in many diseases-hypertension, atherosclerosis, diabetes and the like. This effect is mainly due to anthocyanins, polyphenols and vitamins contained in it. The aim of the study is to make a comparative analysis of the content of anthocyanins in the fruit juices and pulps from chokeberry. Technological research for ultrasonic extraction were carried out with water-ethanol mixtures at a ratio of material:solvent - 1:1 and 1:2. The influence of two factors was studied: the concentration of ethanol and the duration of the process on the extraction of anthocyanins. It was found that the total quantity of extracted anthocyanins is greater in hydro modul 1:2. Under these conditions, the highest yield of anthocyanins was observed for the solvent - 75% ethanol. The analysis of antioxidant activity (radical scavenging activity) of the produced extracts showed very high - up to 64 882,5 mmol/l equivalents of Vit. C.

8. НАУЧНИ ПУБЛИКАЦИИ В НЕРЕФЕРИРАНИ СПИСАНИЯ С НАУЧНО РЕЦЕНЗИРАНЕ ИЛИ В РЕДАКТИРАНИ КОЛЕКТИВНИ ТОМОВЕ

1. Solak, A., Dyankova, S., Nacheva, I., **Doneva, M.**, Lazova-Borisova, I., 2022. Analysis of plant extracts with antibacterial effects and their application in edible alginate-pectin films. *Journal of Agricultural, Food and Environmental Sciences, JAFES*, 76(3), 68-75, ISSN: 2545-4315.

Abstract: The existing potential risks for consumers from the synthetic antimicrobial additives and the aspiration towards reduction of the possibilities for emergence of microbial resistance reinforce the trends of searching for alternative solutions to protect foods from microbial contamination. One of these solutions is the use of natural plant antibacterial compounds. The aim of this study was to examine the antibacterial activity of extracts derived from sour cherry (*Prunus cerasus*), St. John's Wort (*Hypericum perforatum*), clove (*Syzygium aromaticum*) and smoke tree (*Cotinus coggygria*). The total content of phenols was highest in the extract from smoke tree

(31.80 mg GAE / mL) and clove (23.12 mg GAE / mL). All extracts had an inhibiting effect on the tested microorganisms (*Staphylococcus aureus* ATCC 43300 and *Escherichia coli* ATCC 25922). The largest inhibition zones were observed in the extracts from St. John's Wort and smoke tree. A very good result was obtained through the combination of extracts from St. John's Wort and clove (39 mm for *Staphylococcus aureus* and 20 mm for *Escherichia coli*). The extracts from smoke tree and the combination of St. John's Wort and clove extracts preserved their high degree of antibacterial activity when they were included in edible alginate-pectin films. The films obtained in this way may be used in packaging to help reduce the microbial population on the surface of food products.

2. Solakov N., Loginovska, K., **Doneva, M.**, Nacheva, I., Valchkov, A., 2020. Optimization of the biosynthesis of proteolytic enzymes from the producer strain *Bacillus subtilis* NBIMCC 2353 by enriching the nutrient medium with natural components. *International Journal of Scientific Engineering and Applied Science*, 6 (11), 30-39, ISSN: 2395-3470.

Abstract: Four fermentation experiments have been performed to optimize the composition of the nutrient medium of the strain *Bacillus subtilis* NBIMCC 2353 in order to achieve high yields of proteolytic enzymes. Natural substrates have been added for the development of cell culture in the nutrient medium. It was established that the intensity of the enzyme production is parallel to the growth curve and the peak is around the 48th hour. The results obtained for a proteolytic activity at the 24th, 48th and the 72nd hour, with the inclusion of powdered extracts from medical mushrooms, are low due to the presence of a large amount of amino acids in the nutrient medium that inhibit enzymatic biosynthesis. With the addition of mushroom body and micelles from higher mushrooms to the cell culture, a higher yield of produced proteases is observed. The highest proteolytic activity is reported after the inclusion in the nutrient medium of natural substrates (native collagen and fresh mycelium from medicinal mushrooms).

3. Петрунов, П., Митева, Д., Димов, Кр., **Донева, М.**, Методиева, П., 2018. Влияние на гама лъчите за понижаване на алергенния ефект на млечни протеини. *Превантивна медицина*, 2(12), 20-24, ISSN: 1314-5681

Резюме: Алергията към кравето мляко и млечни продукти е една от най-широко разпространените хранителни алергии напоследък, особено при пеленачета и деца в ранна детска възраст. Чрез гама лъчение, с подходяща доза, може да бъде модулиран състава на продукти, предназначени за третиране на алергии. Облъчването с γ -лъчи води до различни промени в хранителните компоненти, включително в протеините. Съвременни изследвания показват, че използването на йонизиращи лъчения в ниски дози при млечни продукти водят до разрушаване на епитопите на протеините, което би могло да намали техния алергенен ефект, без това да окаже негативен ефект върху сензорните

и вкусови характеристики на продукта в сравнение с познатата ензимна хидролиза. До сега в нито едно проучване не е оценен ефектът γ -лъчите върху протеините в млякото като хранителен продукт. Тъй като ефекта на облъчването зависи от условията на процеса, е необходимо да се изследват ефектите на антигенност и алергенност на млечните протеини. Научната проблематика на настоящото изследване е подчинена на съвременните тенденции за получаване на нови научни знания и трансфер на технологии.

4. Nacheva, I., Miteva, D., Metodieva, P., **Doneva, M.**, 2018. Improving the quality of meat products through gamma irradiation. *International Journal of Development Research*, 8 art. no. 12848, ISSN: 2230-9926.

Abstract: The aim of the current study is to determine the effect upon experimental meat product samples (flat sausage) prepared with start bacterial cultures, sterilized through irradiation under their biological effectiveness. The experimental types of meat were divided into 3 groups: flat sausage with Megacarn starters, flat sausage with Lactina starters and flat sausage without starters. These groups have been irradiated with 4kGy gamma rays. Biological experiment with white male mice weighted 20 - 30 g, took place. The experimental species were separated into groups of ten and were fed on the studied types of sausages for a period of 20 days. On the 20th day the species were irradiated with 7.5Gy. Mice separately irradiated in advance with 3.5Gy were fed on flat sausage with Megacarn starters. On the 20th day this group was once again irradiated with 7.5Gy. Studied were their weight, survival and the number of leucocytes. Our results showed that after the first irradiation, 40% of the animals fed on non irradiated flat sausage with Megacarn starters died and after the second irradiation 60% of them died. In the group fed on Lactina starters, 100% from the non irradiated and 80% from the irradiated species died. In our study we established that leucocytes restoration was delayed in the mice from the group fed on non irradiated samples. On the 20th day feeding the irradiated animals had a 60% death rate in the group fed on irradiated Megacarn, 10-20% death rate in the group fed on irradiated Lactina and 0% in the control group fed on non irradiated food. The presence of staphylococcus in Megacarn starters gave us grounds to test it independently. The experimental scheme was repeated but the animals were fed on Megacarn water solution. The experimental groups of animals were irradiated with 4kGy and after 20 days on Megacarn water solution they were once again irradiated with 8Gy. During the first irradiation we did not observe dynamical changes in the studied criteria. After the second irradiation the control group resulted in 60% death rate and the group fed on Megacarn water solution resulted in 30-40% death rate.

5. Nacheva, I., Loginovska, K., Metodieva, M., **Doneva, M.***, Miteva, D., Dimov, K., 2016. Иновации в производството на функционални млечни продукти – основа за

повишаване на тяхната конкурентноспособност. XIV International Scientific conference "Management and Engineering 16", 2, pp. 744-750, ISSN: 1310-3946 (print), 1314-6327 (online).

Abstract: The market for functional dairy products is specific and dynamic sector, oriented constantly expanding range of innovative natural products in order to fully satisfy the constantly increasing health demands of consumers. Developed a new bio fermented milk product with high biological value based on live microbial cells (kefir) and added prebiotic - lactulose. The inclusion of biologically active additives in the process of fermentation of kefir ensures stable growth and development of the lactic acid micro-organisms by increasing the nutritional value and keeps the organoleptic and sensory performance of the final product during the period of storage.

6. Начева, И., Вълчков, А., **Донева, М.***, Методиева, П., Логиновска, К., 2015. Синбиотични концентрати – съвременно решение за преодоляване на дисбиозата. Сборник доклади от XIII-та Национална младежка научно-практическа конференция, 27-28 април, ФНТС, 21 -26, ISSN: 1314-0698.

Резюме: Проблемът с нарушаване равновесието на микрофлората в организма(дисбиоза) е пряко свързан с физиологичния статус и състоянието на имунната система на човека. Авторите представят резултати от проведени изследвания, свързани със създаването на нови, полезни за чревното здраве синбиотични продукти. Серията нови продукти „Лактостим“ са разработени по биотехнологичен път и концентрирани чрез сублимационно сушене. Получените синбиотици съдържат активна млечнокисела микрофлора, полизахариден комплекс, витамини, минерални соли и други биологично активни вещества. Новите храни се характеризират с изразена пробиотична активност и висока биологична стойност, което ги прави подходящи за превенция и преодоляване на дисбиотични състояния от различен характер.

7. Miteva, D., Dimov, K., Nacheva, I., **Doneva, M.**, Metodieva, P., 2014. Modern Radiation Technologies for Safe Food Preservation. XII International Scientific Conference "Management and Engineering" 2014, 2, 798-803, ISSN: 1310-3946 (print), 1314-6327 (online).

Abstract: During the recent years the interest in the modern radiation technologies has increased in connection with the possibilities for their application in foods processing, ensuring of their safety and prolonging of their shelf life. In the present work the authors have followed the change in the standard indices of raw meats and meat products, preserved in a conventional way and treated with gamma rays. Based on the obtained results a prolongation of the shelf life as well as preservation of the biological value of cold sterilized foods has been established, compared to those preserved in a traditional way.