

PRIEDAI

MOKSLINIŲ PUBLIKACIJŲ SĄRAŠAS

1. TEZĖS

Tarptautinėse duomenų bazėse esančiuose mokslo leidiniuose

Sereikaitė, J.; Gruškienė, R.; Celitan, E.; Krivorotova, T. (2018). β -Carotene loaded three-component particles for food fortification. *Journal of biotechnology*, 280S, S55.

Sereikaitė, J.; Celitan, E.; Žilinskas, A. (2019). Vegetables as biocatalysts in the stereoselective biotransformation of racemic bicyclo[3.3.1]nonane-2,6-diol diacetate. *Journal of biotechnology*. **Submitted.**

Recenzuojamuose leidiniuose

Celitan, E.; Gruškienė, R.; Krivorotova, T.; Sereikaitė, J. (2019). Stability of water soluble β -carotene-loaded nanoparticles. *EuroFoodChem XX Conference, Portugal, June 17–19, 2019: Book of Abstracts*. **Submitted.**

Nerecenzuojamuose leidiniuose

Celitan, E.; Gruškienė, R.; Sereikaitė, J. (2018). β -Carotene loaded three-component particles: preparation and stability. *XVth International conference of the Lithuanian Biochemical Society, Dubingiai, June 26–29, 2018: the programme and abstract book*, 23–24.

Celitan, E.; Gruškienė, R.; Krivorotova, T.; Sereikaitė, J. (2019). Antioxidant activity of β -carotene loaded three-component particles. *Baltic Polymer Symposium 2019, Vilnius, Lithuania, September 18–20, 2019*. **In preparation.**

2. STRAIPSNAI

Celitan, E.; Žilinskas, A.; Sereikaitė, J. (2019). Screening of some vegetables for the biotransformation of bicyclo[3.3.1]nonane-2,6-diol diacetate. *Green Chemistry Letters and Reviews*. **Submitted**, manuscript ID: TGCL-2019-0058.

Celitan, E.; Gruškienė, R.; Krivorotova, T.; Sereikaitė, J. Synthesis and investigation of β -carotene loaded three-component particles. *Food Research International*. **In preparation.**

1 priedas. Sereikaitė, J.; Gruškievė, R.; Celitan, E.; Krivorotova, T. (2018). β -Carotene loaded three-component particles for food fortification. *Journal of biotechnology*, 280S, S55

only be revealed through histopathological examination. Animal tissue and plant structures compliant with the recipe were also found. Histological examination reveals the morphological structure of the tissues and organs used in meat products. We consider the histopathological examination to be a simple and effective tool for assessing and highlighting structural nonconformity when the product meets the physicochemical and microbiological standards.

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β -Carotene loaded three-component particles for food fortification

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Carotenoids are a diverse group of compounds that contribute to the yellow to red colors in many foods. They are polyenes consisting of 3 to 13 conjugated double bonds and up to 6 carbon ring structures at one or both ends of the molecule. β -Carotene is one of the major carotenoids present in the diet. It is a precursor of vitamin A and exhibits antioxidant activity. However, the application of β -carotene in functional foods and dietary supplements is limited due to its very low water solubility and air-, light and temperature sensitivity. The new three-component system for β -carotene delivery was developed. It is based on the synthesis of β -carotene-2-hydroxypropyl- β -cyclodextrin inclusion complex and its subsequent coating with pectin. Inclusion complexes were prepared by co-precipitation method using a β -carotene solution in acetone and a cyclodextrin solution in water at the concentration of 25%. The prepared water-soluble inclusion compounds were additionally complexed with low-methoxyl pectin from citrus peel. Optimal encapsulation conditions, i.e. inclusion complex-pectin ratio and pH were determined. The obtained β -carotene-2-hydroxypropyl- β -cyclodextrin-pectin nanoparticles were characterized by UV/VIS, FT-IR and DLS methods. β -Carotene-cyclodextrin-pectin particles obtained by the simple and inexpensive complexation method can be great helpers to enrich the food with β -carotene.

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Heat-treated sucuk with *Pedococcus acidilactici* S147: the effect of core temperature

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In this study, effects of two different core temperature applications in heat-treated sucuk produced with autochthonous *Pedococcus acidilactici* S147 on physico-chemical and microbiological properties of the final product were investigated. After fermentation (at $24 \pm 1^\circ\text{C}$ for 24 h) heat treatment was applied to samples such that the core temperature was 60°C or 68°C . After this process, the samples were dried. As a result of the analyses, *P. acidilactici*

S147 strain showed a good growth during fermentation stage. The heat treatment application caused a reduction in *P. acidilactici* S147. After heat treatment, the number of lactic acid bacteria showed a reduction of less than 0.5 log units at 60°C . The reduction was more than 5.0 log unit at 68°C . Production stage, core temperature and production stage $\times$ core temperature interaction were observed to have very significant effects ($p < 0.01$) on lactic acid bacteria. Micrococcus/Staphylococcus was only affected by the production stage factor at $p < 0.01$ level. Moreover, the production stage factor caused a very significant ($p < 0.01$) change in pH, aw, TBARS values and colour parameters (L^* , a^* , b^*). The core temperature factor showed a significant effect ($p < 0.05$) on pH value and core temperature $\times$ production stage interaction affected aw value ($p < 0.05$).

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Volatile compounds of pastirma: effects of autochthonous *S. xylosum*, *S. equorum* and *S. vitulinus* strains

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The aim of the study is to determine the effects of autochthonous *Staphylococcus xylosum* 39, *S. equorum* 53 and *S. vitulinus* 75 isolated and phenotypic/genotypic identified from pastirma, traditional Turkish dry cured meat product, on volatile compounds of pastirma. These strains were applied to meat pieces in the curing stage of the production and pastirma was produced under traditional conditions in a small-firm. The group produced without the strains was evaluated as control. Volatile compounds of the samples were extracted and identified by using SPME technique and GC/MS, respectively. A total of 41 volatile compounds consisting of aldehydes, alcohols, aromatic and aliphatic hydrocarbons, acids, ketones, furans, terpenes and sulphur compounds, were identified from the samples. The use of different strains in pastirma production had a limited effect on volatile compounds. The group containing *S. equorum* 53 showed the highest amounts for 2,3-butanedione and 3-hydroxy-2-butanone, followed by the group *S. vitulinus* 75. In the production of pastirma, the use of *S. vitulinus* 75 increased benzaldehyde amount. This strain also increased the amount of 2-methyl-3-phenyl-propanal. In addition, there are no significant differences among groups without addition of strain and with *S. xylosum* 39 or *S. equorum* 53, in terms of 2-methyl-3-phenyl-propanal.

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Effect of lactic fermentation on antioxidant properties and thiamine of multigrain sourdoughs

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Lactic fermentation is a powerful tool used to increase the functionality of different food products. Three types of multigrain flours were obtained by milling blends of wheat, rye and triticale (80:10:10, 70:15:15 and 60:20:20). Further fermentation was car-

2 priedas. Sereikaitė, J.; Celitan, E.; Žilinskas, A. (2019). Vegetables as biocatalysts in the stereoselective biotransformation of racemic bicyclo[3.3.1]nonane-2,6-diol diacetate. *Journal of biotechnology*. **Submitted**

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Vegetables as biocatalysts in the stereoselective biotransformation of racemic bicyclo[3.3.1]nonane-2,6-diol diacetate

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Intact plant materials as biocatalysts have received great attention in organic chemistry. Reactions catalyzed by whole plant cells are carried out under mild conditions, and the process is simple, inexpensive and ecofriendly. Fruits and vegetables find their application in the catalysis of various types of reactions, especially in the preparation of enantiomerically pure compounds.

In this study, we present the screening of vegetables for the biotransformation of racemic bicyclo[3.3.1]nonane-2,6-diol diacetate. The experiments were performed at 25 and 30 °C for three days using the rootstocks of ginger and the roots of carrot, parsnip, celery, parsley and black radish as biocatalysts. NMR analysis and the measurement of specific rotation showed that (1R,2R,5R,6R)-(+)-bicyclo[3.3.1]nonane-2,6-diol monoacetate and (1S,2S,5S,6S)-(-)-bicyclo[3.3.1]nonane-2,6-diol monoacetate are the main products of the biotransformation. Some traces of (1R,2R,5R,6R)-(+)-bicyclo[3.3.1]nonane-2,6-diol were also identified as the reaction product. Both enantiomers of bicyclo[3.3.1]nonane-2,6-diol monoacetate were selected as the end-products of the biotransformation reaction, and the reaction conditions, i.e. temperature and time were optimized. (1R,2R,5R,6R)-(+)-bicyclo[3.3.1]nonane-2,6-diol monoacetate was obtained with the optical purity of 44 % using the roots of carrot, and (1S,2S,5S,6S)-(-)-bicyclo[3.3.1]nonane-2,6-diol monoacetate was obtained with the optical purity of 29% using the roots of parsnip.

Keywords: Vegetables, biocatalysts, bicyclo[3.3.1]nonane-2,6-diol diacetate, biotransformation

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Stability of water soluble β -carotene-loaded nanoparticles

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Carotenoids is a group of pigments naturally present in vegetable raw material. They have biological properties and have been used mainly in food, pharmaceutical, and cosmetic industries. β -Carotene is the most common carotenoid in food, which plays an important role in metabolism and health care. However, the application of β -carotene is currently limited because of their poor water-solubility, high melting point, low bioavailability, and chemical instability [1-3]. The research into water-soluble carotene-encapsulated systems is important for their potential formulations and the production of carotene-enriched foods.

Water-soluble β -carotene / 2-hydroxypropyl- β -cyclodextrin complexes were prepared by co-precipitation method using a β -carotene in acetone solution and a cyclodextrin in water solution at the concentration of 25 %. The prepared water-soluble inclusion compounds were additionally complexed with pectins. For particles formation, pectins with the different degree of esterification (pectic acid, high methoxyl pectin and low methoxyl pectin) at different pH (4, 5, 6, 7) were used. The pectin concentration in the solution of resulting particles was constant and equal to 0.4 mg/mL while the complex concentration was equal to 0.02, 0.03 or 0.05 g/mL. FTIR, Raman spectroscopy, UV and DLS methods were used to confirm the interaction of components.

The studies of stability were based on the measurement of the changes of particle size during the storage and the estimation of the relative stability of β -carotene. To evaluate the stability of encapsulated β -carotene against UV radiation or temperature, the particles were irradiated by UV-C 30 Watt lamp or incubated at 60 and 95 °C temperature for certain period of time. Finally, the changes of absorbance at 450 nm were registered. It was evaluated how the stability depends on the ratio of components, the type of pectin and pH of the solution. It was observed that β -carotene in the particles with high methoxyl pectin had improved thermal and UV stability at the lower pH values. Meanwhile, based on size measurements, the particles with pectic acid were more stable at the higher pH values. The ratio of the components did not have a significant impact on stability studies, although at the lower concentration of inclusion complex in the particles, β -carotene had a slightly better UV stability.

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4 priedas. Celitan, E.; Gruškienė, R.; Sereikaitė, J. (2018). β -Carotene loaded three-component particles: preparation and stability. *XVth International conference of the Lithuanian Biochemical Society, Dubingiai, June 26–29, 2018: the programme and abstract book*, 23–24



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LBS Chairman

2. β -Carotene loaded three-component particles: preparation and stability

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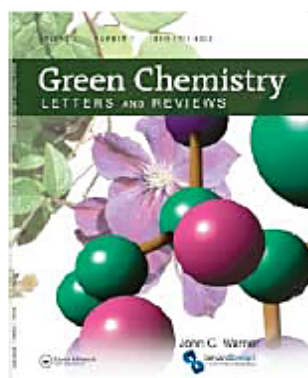
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β -carotene is an orange colored compound belonging to the carotenoid family that can be found in many fruits and vegetables. The consumption of this carotenoid is important for maintaining human health and wellbeing because it is enzymatically converted to vitamin A in the human intestine by the β -carotene 15,15'-monooxygenase. Besides its pro-vitamin A function, β -carotene has many other activities that may contribute to human health, such as the ability to exhibit antioxidant activity, reduce the risk of type 2 diabetes, lower metabolic syndrome in middle-aged adults, enhance immune system performance, and reduce the risk of cardiovascular diseases. However, the application of β -carotene is currently limited due to its poor water-dispersibility, chemical stability and bioavailability.

The new water-soluble three-component system for β -carotene delivery was developed. Inclusion complexes of β -carotene with 2-hydroxypropyl- β -cyclodextrin were prepared by co-precipitation method using a β -carotene solution in acetone and a cyclodextrin in water at the concentration of 25 %. Further, the prepared water-soluble inclusion compounds were complexed with pectin. For β -carotene-2-hydroxypropyl- β -cyclodextrin-pectin particles formation, pectic acid and pectin with 26 % and 60 % degree of esterification were used. Optimal encapsulation conditions, i.e. inclusion complex-pectin ratio and pH are examined. The sizes of the obtained nanoparticles were measured next day after preparation and after 30 days of storage in 4 °C temperature using DLS method. To evaluate the stability of encapsulated β -carotene against UV radiation, particles were irradiated by Philips UV-C 30 Watt lamp for certain period of time and changes in absorbance at 450 nm were observed.

5 priedas. Celitan, E.; Žilinskas, A.; Sereikaitė, J. (2019). Screening of some vegetables for the biotransformation of bicyclo[3.3.1]nonane-2,6-diol diacetate. *Green Chemistry Letters and Reviews*. **Submitted**, manuscript ID: TGCL-2019-0058

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Screening of some vegetables for the biotransformation of bicyclo[3.3.1]nonane-2,6-diol diacetate

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Screening of some vegetables for the biotransformation of bicyclo[3.3.1]nonane-2,6-diol
diacetate

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