

## **Секция 2**

# **Современные аспекты разработки и производства функциональных пищевых продуктов для различных групп населения**

## INFLUENCE OF ULTRASONIC TREATMENT TIME ON THE STABILITY AND ANTIOXIDANT ACTIVITY OF DOUBLE EMULSION

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**Abstract:** This study investigated the effect of sonication time on the stability and antioxidant activity of fucoidan-loaded double emulsion. Increasing the duration of ultrasound treatment from 4 to 10 minutes significantly increased the emulsion's resistance to separation (from 60% to 93%) and increased the antioxidant activity of DPPH (from 60% to 92%). The optimized 10 min sonicated emulsion had a small droplet size of 460 nm. The research was carried out with financial support from the Russian Science Foundation grant 22-76-10049.

**Key words:** Fucoidan, double emulsion, antioxidant, ultrasound.

**Introduction.** Bioactive compounds have demonstrated remarkable prophylactic properties against chronic ailments, including cancer, cardiovascular disease, and metabolic disorder. Nevertheless, numerous bioactive compounds, including vitamins, essential fatty acids, anthocyanins, carotenoids, flavonoids, and light, temperature, oxygen, and gastrointestinal (GI) conditions, are susceptible to environmental stresses while in transit. Therefore, when subjected to such an unfavourable environment, the functionality is compromised, resulting in a decrease in bioavailability. The purpose of double emulsions is to encapsulate bioactives within the innermost compartment and prevent their functionality from being lost in the food matrix. Double emulsions have a great ability to control the release of bioactive components, making them an appropriate vector for microencapsulation in the food and pharmaceutical industries. While oil-in-water emulsions can also serve as a means of delivering fatty acids,  $W_1/O/W_2$  double emulsions offer potential benefits over their predecessors, including the ability to encapsulate water-soluble bioactive compounds, conceal unpleasant flavours, and potentially generate fat-reducing byproducts (1-4).

Fucoidan is marine plant based bioactive compound found in mostly brown algae of sea, which composed of sulfonate polysaccharide, has number of medical properties such as antioxidant, anticancer agent, anticogulant and antidispermant. In this study we encapsulated fucoidan in double emulsion and get stablized emulsion using ultrasound

technique to increase its bioavailability in terms of antioxidant activity as well better stability against creaming (5-7).

**Method and material.** Fucoidan purchase from Korea and other material such as soylecithin, sunflower oil, Tween 80 and other material purchased from local market of chelyabinsk Russian federation. All experiment done using Q sonic Ultrasound of frequency 22 kHz and power 700W with on-off inset (7 on : 3 off second).

Present invention for formation of stable fucoidan  $W_1/O/W_2$ . Fucoidan first at concentration of ( 0-3 mg/ml) dissolved in water to prepare inner water phase, later vegetable oil such as sunflower oil (due to its good antioxidant and other beneficial properties) dissolved with lipophilic surfactant and then added to inner water phase in the ratio of 60:40 under continuous sonication for 15 min to get  $W_1/O$  primary emulsion. Outer phase  $W_2$  containing water and polysorbate-80. Further 50% of primary emulsion (  $W_1/O$ ) added to 50%  $W_2$  outer phase to get  $W_1/O/W_2$  under sonication for 4 min. During this process we used Qsonic ultrasound of power 700 W and 20 kHz frequency.

**Result and discussions.** For stable formation of double emulsion with bioactive compound, the most important parameter is droplet size and PDI of emulsion, stability and % DPPH .Based on the formulation, here we check the impact of fucoidan concentration and sonication time on double emulsion properties

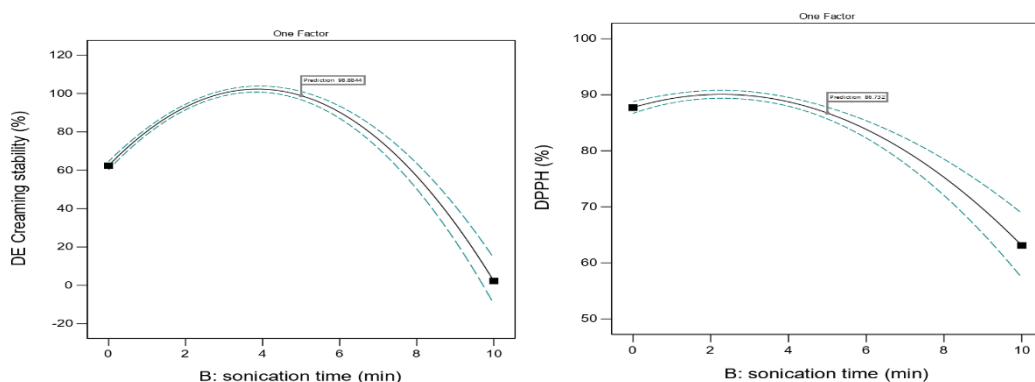


Figure 1 – Impact of sonication time for a) stability and b) %DPPH

#### **Impact of sonication time on stability and % DPPH of double emulsion.**

Result show that in figure 2 that sonication time increase the creaming stability (60% to 93%) and % DPPH activity (91%). The reason for stability improved is that prolonging the duration of sonication yields improved stability for emulsions. Previous studies have established that an extended duration of sonication exposure results in enhanced stability via the cavitation effect-induced reduction in particle size. In addition, it has been discovered that ultrasonic treatment improves the stability of oil-in-water emulsions through the reduction of droplet size, the enhancement of protein interfacial adsorption, and the formation of more stable emulsions. Additionally, it has been observed that both ultrasonic treatment and high-pressure homogenization are efficacious in diminishing apparent viscosity and average particle size, thereby enhancing the stability of emulsions. For higher % DPPH is also due to sonication time this will make emulsion phases will exhibit the distribution of an amphiphilic phenolic

antioxidant. The hydrophilic portion of the double emulsion is located in the external phase, whereas the hydrophobic portion of the alkyl chain in the inner-phase container is mostly oriented towards the lipid core of the oil droplet.

**Conclusion.** Stabilization of Fucoidan concentration base on human dose (1.5mg/mL) in double emulsion using natural lecithin as surfactant and sonication time of 10 min

Double emulsion with this Fucoidan concentration shows higher stability against creaming (93%), and AOA (92 %) and low emulsion droplet size (460 nm).

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### ВЛИЯНИЕ ВРЕМЕНИ ОБРАБОТКИ УЛЬТРАЗВУКОМ НА СТАБИЛЬНОСТЬ И АНТИОКСИДАНТНУЮ АКТИВНОСТЬ ДВОЙНОЙ ЭМУЛЬСИИ

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**Аннотация:** В этом исследовании изучалось влияние времени обработки ультразвуком на стабильность и антиоксидантную активность двойной эмульсии, наполненной фукоиданом. Увеличение продолжительности обработки ультразвуком с 4 до 10 минут значительно повысило устойчивость эмульсии к расслоению (с 60% до 93%) и повысило антиоксидантную активность ДФПГ (с 60% до 92%). Оптимизированная 10-минутная эмульсия, обработанная ультразвуком, имела небольшой размер капель 460 нм. Исследования выполнены при финансовой поддержке гранта РФФ 22- 76-10049.

**Ключевые слова:** Фукоидан, двойная эмульсия, антиоксидант, ультразвук.

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## CHANGES IN QUALITY INDICATORS OF SPROUTED WHEAT GRAINS IN BREAD PRODUCTION

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**Abstract:** Grain bread is the most important source of dietary fiber, vitamins, trace elements and amino acids. In terms of nutritional and biological value, this bread is superior to all traditional types of bread, especially bread baked from high-quality flours. The article presents the results of a study of organoleptic, chemical and microbiological indicators of sprouted wheat grains for further use in bread production.

**Key words:** sprouted grain, grain bread, wheat, microbiological indicators

*Introduction.* Traditional types of bread are baked from flour together with the crusts, removing all or part of the membrane, the embryo, the grain layer in the aleurone