Evaluation of quality indicators of foam-structured beverages

Olga Pushka, Illia Shevchenko, Tetiana Sylchuk, Larysa Sharan

National University of Food Technologies, Kyiv, Ukraine

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Corresponding author:

Tetiana Sylchuk
E-mail:
tsnuft@gmail.com

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Abstract

Introduction. The aim of the study was to evaluate the effect of lemon balm brewing methods and different types of chicken egg white on foam stability and sensory properties in model beverage systems, in order to substantiate the development of formulations and technologies for intended drinks.

Materials and methods. Infusions of lemon balm (*Melissa officinalis* L.), cherry juice, honey, native and reconstituted chicken egg white, and cinnamon were used in the study. Foam stability was assessed by measuring foam volume and the duration of foam height retention. Dry matter content was determined using the refractometric method, while titratable acidity was measured by acid–base titration.

Results and discussion. The method of preparing the lemon balm infusion significantly alters the taste characteristics, aroma, and color of the beverage. The hot lemon balm infusion was characterized by a more pronounced flavor and aroma, as well as a higher concentration of dry substances, whereas the cold infusion exhibited higher acidity and less intense sensory properties. These differences can be explained by enhanced extraction of volatile compounds and phenolic substances at elevated temperatures. To prepare drinks based on lemon balm infusions, a comparative assessment of the quality of native egg white (sample 1) and dry egg white (samples 2–4) from different manufacturers was conducted. The functional properties of egg white powders varied depending on their origin and processing conditions, which directly affected foaming behavior and stability. The sample 3 dry egg white demonstrated the best foam stability and the greatest increase in foam volume, reaching the highest volumetric expansion of 331.25%. In comparison, sample 2 egg white reached 325% at the sixth minute of whipping and 293.75% at the fourth minute, while native chicken egg white reached 217.65% at the fourth minute of whipping. In the model system, sample 3 egg white also showed the highest foam stability: its foam retained more than 50% of its initial volume even after 2 hours, whereas the native egg white lost more than 30% of its volume within 30 minutes, indicating weaker interfacial film formation.

The beverage with 10% egg white was found to be optimal in terms of sensory properties, achieving the highest complex quality indicator of 45.00 points, compared to 42.17 points for the sample with 12% egg white and 34.17 points for the sample with 7%. This concentration provided a balanced combination of foam stability, mouthfeel, and flavor perception without excessive protein-related off-notes.

Conclusions. Cold and hot lemon balm infusions, as well as dried egg whites, significantly influenced foam stability, taste, and texture. Optimal foam formation, sensory qualities and functional properties of the beverage were obtained when using 10% dried egg white.

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Introduction

Modern society is increasingly oriented toward a healthy lifestyle, which drives the growing demand for functional beverages. These products not only quench thirst but also perform health-promoting functions by supporting physiological and psychological well-being.

In place of traditional bar menus, bar programs are increasingly being introduced–conceptual solutions that integrate beverage assortments with marketing strategies and service design. Unlike standard menus, bar programs are strategic in nature and focused on current consumer demands in the areas of health, biohacking, and mental well-being. Such programs contribute to shaping a culture of functional nutrition within the restaurant sector, positioning healthy beverages as part of everyday consumer choice. Each type of drink is developed according to a recipe adapted to specific physiological needs (Pushka et al., 2025).

These bar programs typically include: (a) *detox drinks*, aimed at supporting metabolic processes and facilitating the elimination of metabolic by-products; (b) *anti-stress drinks*, capable of reducing cortisol levels and stabilizing emotional state; (c) *immunostimulating drinks*, which support the body's protective functions through vitamins and minerals; (d) *sleep-enhancing drinks*, formulated with functional ingredients that may improve sleep quality; (e) *drinks for children and adolescents*, designed to supply essential vitamins and energy; (f) *drinks for athletes*, intended to enhance endurance and support post-exercise recovery.

Today, there is a significant increase in demand for healthy, natural, and functional products, accompanied by growing regulatory initiatives aimed at limiting the consumption of harmful ingredients (Stabnikova and Paredes-López, 2024). These trends encourage manufacturers to develop beverages with improved nutritional composition and enhanced health value.

Alexandropoulou et al. (2025) analyzed the impact of healthy dietary practices on physical and psycho-emotional well-being, demonstrating that diets enriched with functional foods are associated with improved health indicators, highlighting their technological and social relevance. Similarly, Aprilia et al. (2025) reported significant therapeutic and preventive potential of biologically active compounds derived from natural plant materials, underlining their importance for both pharmaceutical and food technologies.

Plant materials incorporated into functional foods can provide health benefits by serving as sources of bioactive compounds with antioxidant activity, including vitamin C, tocopherols, carotenoids, and phenolic compounds (Stabnikov et al., 2025). Numerous studies support the use of plant-based ingredients in functional beverage development (Gubsky et al., 2025; Stabnikova et al., 2021). Bomba et al. (2023) demonstrated the effectiveness of plant extracts in preventing metabolic disorders, while Karputina et al. (2022) and Tyshchenko et al. (2023) identified antioxidant, anti-inflammatory, and health-promoting effects of various herbal and plant materials, including amaranth, chia, ginger, and turmeric, added to non-alcoholic beverages. Priss et al. (2025) highlighted the potential of wild catnip (*Nepeta cataria* L.) extracts for producing beverages with high biological value and sensory quality. The addition of aqueous or aqueous–alcoholic infusions of spices, such as common rue (*Ruta graveolens* L.) and catmint (*Nepeta transcaucasica* L.), to alcoholic cocktails has been shown to enhance redox potential and and overall sensory appeal (Kuzmin et al., 2020).

The technological aspects of functional beverage formulation have also been widely investigated. It was showed that freeze-dried vegetable powders retain a high content of biologically active substances, making them suitable for non-alcoholic functional drinks

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(Ivanov and Schutuyk, 2012). Dulka et al. (2024) and Paska et al. (2024) demonstrated that chia mucilage formed during seed hydration improves beverage texture, stability, and microbiological safety without compromising sensory properties. Kurilenko et al. (2024) emphasized the importance of optimizing processing technologies to preserve active compounds during beverage enrichment.

In parallel, nutritional and regulatory challenges remain important considerations. Kersting et al. (2025) pointed out that plant-based milk alternatives may lack sufficient levels or bioavailability of calcium, vitamin D, vitamin B12, and protein, necessitating careful formulation and fortification strategies. Sugajski (2023) emphasized the role of water quality in functional beverages, as contamination can negate potential health benefits.

Legislative initiatives aimed at reducing sugar consumption, as discussed by Nikolenko (2024), further stimulate the development of nutritionally improved beverage formulations. Within this context, the development of functional beverages with balanced nutritional, technological, and sensory properties remains a relevant research direction.

The aim of this study was to evaluate the effect of different lemon balm (*Melissa officinalis* L.) brewing methods and native and dry chicken egg white protein on foam stability and sensory properties in model beverage systems, in order to substantiate the development of formulations and technologies for functional beverages.

Materials and methods

Materials

The object of the study was model systems of infusions of a mixture of lemon balm, chamomile, and lavender, reconstituted chicken egg whites, and the beverage "Mellow Raspberry Bliss" with different dosages of formulation components. The drink included natural ingredients with health-promoting properties: phytocomponents (lemon balm, chamomile, lavender), cherry juice, honey, egg white, and cinnamon. Preparation of the samples began with the reproduction of formulations according to the selected concepts.

A comparative characterization of two extracts of the dried mixture of lemon balm, chamomile, and lavender was carried out, prepared by two methods: hot (90–95 °C, time 15 min) and cold (- 4 – 6 °C, time, 12 h), followed by filtration. Based on the obtained infusions, the drink was formed by adding cherry juice, cinnamon, egg white, and honey. To ensure the foamy structure, chicken egg white was used.

Preparation of test samples

A comparative study of four samples was carried out: native egg white (hereinafter referred to as sample 1) and three dried egg white samples (samples 2, 3, and 4). Sample 1 was native chicken egg white obtained from fresh eggs and separated manually immediately before use. Samples 2–4 were industrially produced dried chicken egg white powders obtained by industrial dehydration and supplied by different manufacturers (Table 1).

The dried samples differed in production methods and functional characteristics, including foaming capacity and foam stability, which made it possible to assess the influence of the source and manufacturer of egg white on the quality characteristics of foam-structured beverages. Prior to use, the dried egg white powders were reconstituted with potable water in accordance with the manufacturer's instructions to obtain liquid egg white systems suitable for incorporation into beverage formulations.

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Table 1

Eggs used in the study

Samples	Characteristics	Manufacturer
1	Native egg white	Boyarka, Ukraine
2	Industrially produced powder by industrial dehydration of native chicken egg whites	produced by TM Oreshkino, Ukraine
3	Industrially produced powder by industrial dehydration of native chicken egg whites	produced by TM Cookit, Italy
4	Industrially produced powder by industrial dehydration of native chicken egg whites	produced by TM Zdorovo, Ukraine

Methods

Foam stability

A comparative analysis of the foam stability of native egg white and three reconstituted dried egg whites from different manufacturers was carried out, as well as their ability to form and maintain foam in the drink composition. Before being added, the egg whites were reconstituted in water to the required concentration and added to the mixture, after which the beverage was intensively mixed in a bar shaker for 4 minutes. The stability of the foam was studied by measuring the volume and duration of foam cap retention.

Functional beverage based on egg white

In the course of the research, a beverage aimed at improving sleep and reducing excitability, "Mellow Raspberry Bliss," was developed based on an infusion of lemon balm, chamomile, lavender, cherry juice, egg white, honey, and cinnamon. To determine the best method of lemon balm extraction, two techniques were studied – hot brewing and cold infusion (4–6 °C), comparing sensory properties, dry matter content, and acidity. When developing a mixed drink, it is important to consider not only the foaming agent's ability to create a stable foam but also its safety, storage conditions, and cost-effectiveness. The study of the effect of egg white content on the suitability of the beverage was carried out by varying its mass fraction within the range of 7%, 10%, and 12% of the total beverage mass.

Sensory properties

The sensory properties of the drinks were evaluated by a tasting commission using a 5-point scale. The obtained samples were subjected to sensory evaluation by a tasting panel, during which the intensity and quality of taste, aroma, and aftertaste were assessed. Based on the mean sensory scores and taking into account the assigned weighting coefficients, the complex quality index was calculated.

The complex quality index (CQI) was calculated based on the weighting coefficients of each parameter. The resulting CQI values were used to compare the samples and to determine the optimal level of egg white addition to the beverage formulation.

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Physico-chemical characteristics

Physicochemical characteristics were determined according to current standards: dry matter content was measured refractometrically, and titratable acidity was determined by acid–base titration.

Statistical analysis

Data analysis included calculation of arithmetic means and standard deviations.

Results and discussion

Characteristics of lemon balm infusions

The sensory and physicochemical indicators of lemon balm infusions (Table 2) demonstrate a significant dependence of the beverage quality on the preparation method. In particular, as a result of cold infusion, a light straw-colored, slightly cloudy drink with a mild, neutral taste and delicate aroma was obtained – such a beverage is well suited as a refreshing one, especially in combination with other ingredients.

Table 2

Quality indicators of lemon balm infusion

Quality indicators of lemon balm infusion	Experimental sample	
	Lemon balm infusion prepared by cold steeping	Lemon balm infusion prepared by hot steeping
Color	Golden, semi-transparent, with slight turbidity	Light golden with characteristic shine
Taste	Mild, weakly expressed	Moderately rich, with distinct minty notes
Aftertaste	Practically absent	Moderately expressed minty shade
Aroma	Light, floral-minty	Pronounced, with shades of roasted herbs
Appearance	Light straw with noticeable turbidity	Rich brown with shine
Consistency	Homogeneous, liquid	Homogeneous, liquid
Dry matter content, %	0.2	1
Titrated acidity, °	1.8	0.9
Color	Golden, semi-transparent, with slight turbidity	Light golden with characteristic shine
Taste	Mild, weakly expressed	Moderately rich, with distinct minty notes

Thus, each preparation method has its advantages: the hot infusion is more concentrated and aromatic, whereas the cold infusion is characterized by milder sensory properties. The choice of infusion method therefore depends on the desired characteristics of the final

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product. Based on lemon balm infusion, the recipe for the "Mellow Raspberry Bliss" beverage was developed, with the incorporation of egg white to form a stable foamy structure (Figure 1).

Figure 1. "Mellow Raspberry Bliss" beverage and its components

Research on functional beverages and their technological and physiological aspects has also been widely addressed in publications by other authors (Karputina et al., 2022; Paska and Mlynko, 2023).

The hot infusion, on the contrary, had an intense color, a pronounced aroma of essential oils, and a rich flavor with a minty aftertaste, which makes it attractive as a functional drink with a calming effect. The consistency of both samples remained stable.

However, the hot infusion contained five times more dry matter (1.0% vs. 0.2%), which indicates higher efficiency of bioactive compound extraction during thermal processing. As for acidity – the cold infusion had a higher value (1.8 degrees vs. 0.9 degrees), which is probably due to the preservation of organic acids that are partially destroyed under high temperatures. This contributes both to the improvement of taste and to the microbiological stability of the beverage.

These studies are consistent with those of the authors who used phytochemicals and antioxidant activities of decoction lemon balm and sage (Yaman, 2020) and green tea extract (Heydari et al., 2025).

Native chicken egg white has limitations in the bar industry due to microbiological risks and a short shelf life, so a promising alternative is dried egg white – it is more convenient to use, has a longer shelf life, and better stabilizes the foam. To determine the optimal manufacturer and dosage of egg white, foam stability tests were carried out using both the classical method and a shaker.

The most economically advantageous option is raw egg white; however, it has a limited shelf life (up to 3 weeks) and requires heat treatment due to the risk of microbial contamination, including salmonella. Dried egg whites are safer, easier to transport, and can be stored for up to 12 months. Sample 3 is the most expensive, sample 4 is the most affordable, and sample 2 is a compromise option. One kilogram of dry powder yields 7–8 kg of reconstituted product, equivalent to the amount of fresh egg white. Taking into account sanitary standards and economic aspects, dried egg whites have a number of advantages in many respects.

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Quality of egg whites

One of the criteria for assessing the quality of such a drink is the volume and stability of the foam, which depends on the specific properties of the selected egg white. The foam formation dynamics (Figure 2) show the rate at which the maximum foam expansion is achieved – a key parameter for service speed in food service establishments.

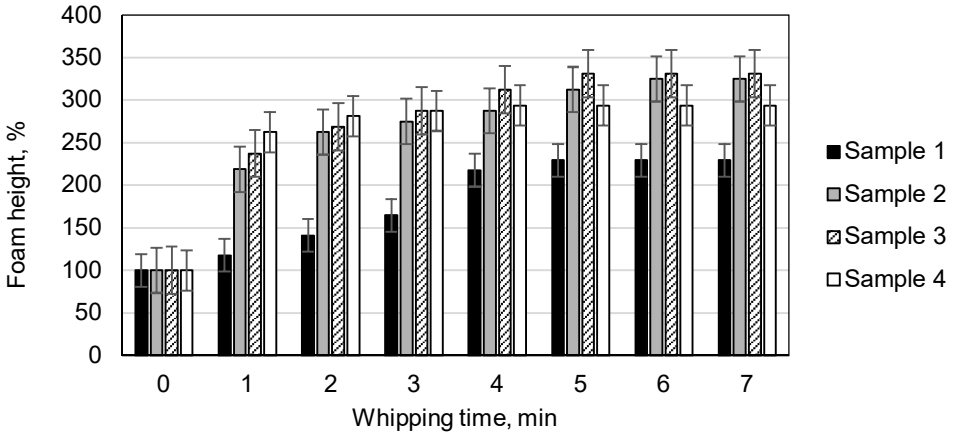

Figure 2. Foam volume increase during whisking of egg whites (native and dry from different manufacturers)

All test samples begin to form foam within the first minute of whisking; however, significant differences are observed afterward. The best results were demonstrated by Sample 3 egg white, reaching the highest volumetric increase of 331.25% already by the fifth minute, after which the values did not change. Sample 2 also showed a high increase – 325% by the sixth minute, but with lower stability. In Sample 4 egg white, foam formation occurs quickly, but stabilizes by the fifth minute at 293.75%, which may indicate lower structural strength. The worst performance was observed in native egg white – its volume increases slowly, reaching only 217.65% by the fourth minute, after which it remains unchanged.

This trend is due to the fact that chicken egg whites from different manufacturers had different initial physicochemical parameters (dry matter content, pH), which affected the results obtained. The results obtained coincide with the studies of the authors who analyzed the foam resistance of native egg white and dry egg white (Polovyk et al., 2019).

To determine foam stability, measurements of foam height reduction were conducted over 120 minutes after whisking using both the traditional method and a shaker (Figures 3–4). This made it possible to compare not only the initial volume but also the duration of foam retention depending on the method used.

The foam formed by native egg white was less stable compared to the dry analogues. The Sample 2 egg white showed the best stability when whipped with a mixer, while the Sample 3 egg white was more stable when using a shaker. Thus, foam stability depends on the type of egg white and the whipping method.

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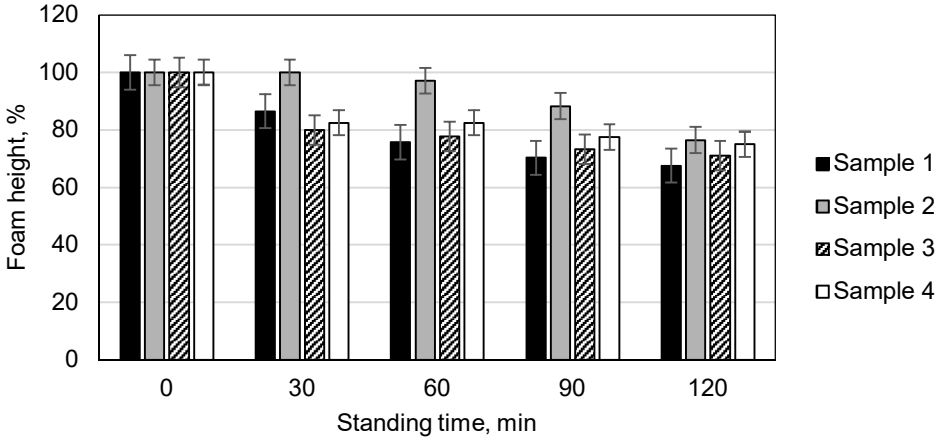

Figure 3. Foam column height of egg white during mixing with a mixer

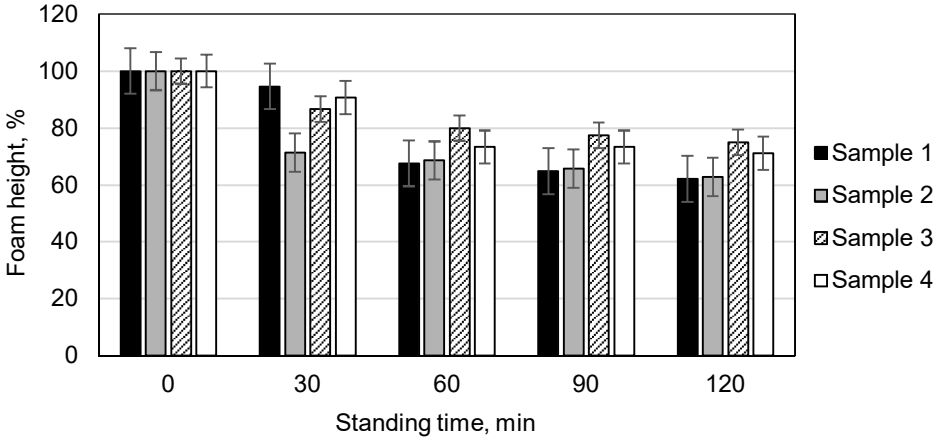

Figure 4. Foam column height of egg white during shaking

To evaluate the foaming ability of egg whites, generalized indicators of foam formation and foam stability (%) were calculated for samples whipped with a mixer and a shaker. The study covered 4 minutes of whipping and 30 minutes of standing (Table 3).

Table 3

Foaming ability and foam stability of egg whites

Indicator	Egg white							
	Sample 1		Sample 2		Sample 3		Sample 4	
	M	S	M	S	M	S	M	S
Foaming ability, %	129.41	135.29	187.50	118.75	212.50	400.00	193.75	400.00
Foam stability, %	82.05	92.50	93.48	77.14	90.00	83.75	85.11	83.75
Dry matter content in egg whites, %	18	18	10	10	9	9	8	8

Note: M - mixer; S - shaker

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The highest foaming ability during shaking was shown by sample 3 and sample 4 egg whites (400%), while the sample 2 egg white demonstrated the best foam stability when whipped with a mixer (93.48%). Sample 1, although it formed a relatively stable foam, was inferior in foaming properties to the dry analogues. To determine the relationship between dry matter content and foam stability of egg whites, their mass fraction in each sample was analyzed. This made it possible to identify a potential correlation between the concentration of dry matter and foam properties.

Sample 1 contained the highest amount of dry matter – 18%, but this was not decisive for achieving the highest foaming rate. The lowest dry matter content was found in the sample 4 egg white – 8%. Thus, the dry matter content does not always correlate with the ability of egg white to form and retain foam.

Since it is a multicomponent beverage, the ability of egg whites to form and retain foam within a model system was studied. For this purpose, four model samples were prepared using cold-brewed lemon balm infusion, lavender infusion, chamomile infusion, cherry juice, and one of the four tested egg whites. The ingredients were mixed in a bar shaker (Figure 5).

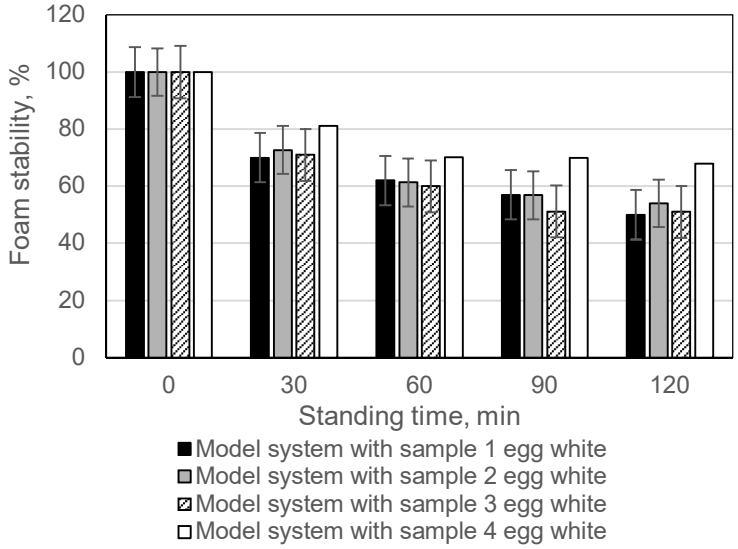

Figure 5. Foam stability of various egg whites in the model beverage system

The least stable foam was observed in the model system with sample 1, which lost more than 30% of its volume after just 30 minutes. The best stability was demonstrated by the sample 3 egg white, in the system with which the foam retained more than 50% of its initial volume even after 2 hours.

For guests of food service establishments, an important aspect is the visual presentation of the beverage, which includes the uniformity of structure, the presence of foam, and the overall impression of the drink in the glass. The color is evaluated in terms of naturalness, intensity, and correspondence to consumer expectations. The aroma should be balanced, without foreign or overly sharp odors, with clear notes of the used ingredients. The consistency determines the overall mouthfeel – whether the beverage is light and airy or, conversely, too thick. The taste should be balanced, with a clear sweet and sour composition that reveals all components of the

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recipe. The aftertaste is important for forming the overall impression – it should be pleasant and lasting, without bitterness or unpleasant notes.

According to the data in Table 4, the addition of different amounts of egg white significantly affects the sensory properties of the drink. The study showed that with an increase in egg white concentration, both the color (from dull pink to rich raspberry) and the flavor profile changed.

Table 4

Quality indicators of the "Mellow Raspberry Bliss" beverage with different dosage of reconstituted egg white, similar to sample 3

Indicator	7%	10%	12%
Appearance	Light infusion with fluffy white foam	Light infusion with fluffy white foam	Light infusion with fluffy white foam
Color	Dull pink	Light pink	Rich raspberry
Aroma	Fresh	Fresh	Refreshing
Consistency	Medium-thick, with foam and specks of berry puree	Medium-thick, with foam and specks of berry puree	Medium-thick, with foam and specks of berry puree
Taste	Distinctly sweet	Harmonious, with optimal combination of malt and bitterness	Slightly fruity
Aftertaste	Pronounced herbal	Moderately herbal	Herbal
Dry matter content, %	10.3%	8.9%	7%

The best results were obtained for the sample with 10% egg white with a balanced taste, pleasant aftertaste, and harmonious texture. The drink with 7% was too sweet, while the one with 12% had a less harmonious taste. The aroma in all samples remained stable, with characteristic notes of lemon balm. The appearance and consistency were also similar: a light drink with lush foam and medium density.

The complex quality indicator (CQI), calculated on a 5-point scale, made it possible to determine the optimal sample according to sensory and functional criteria.

As a result of the study, it was found that the inclusion of egg white at levels of 7%, 10%, and 12% affects the sensory characteristics of the test samples differently. The lowest value of the complex quality indicator (CQI = 34.17) was recorded for the sample containing 7% egg white, which was due to lower scores for taste and aftertaste. Increasing the proportion of egg white to 10% led to a noticeable improvement in sensory properties, resulting in the highest CQI value of 45.00. A further increase in egg white content to 12% did not allow for additional improvement of the complex quality indicator. The CQI value for this sample was 42.17, which can be attributed to a reduced balance of sensory characteristics.

Based on the analysis of the sensory and physicochemical parameters of the mixed functional drink "Mellow Raspberry Bliss" formulated with different levels of egg white, it was determined that the variant containing 10% egg protein exhibited the most harmonious sensory profile. This conclusion was drawn from the results of sensory evaluation, in which the attributes of appearance, aroma, taste, aftertaste persistence, and overall harmony were assessed using a five-point scale. The complex quality index (CQI) was calculated as a weighted sum of the mean sensory scores, with the weighting coefficients reflecting the relative importance of individual sensory attributes. The sample containing 10% egg white achieved the highest CQI value (45.0), indicating superior overall sensory quality compared to the samples containing 7% and 12% egg

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white. The optimality of the 10% egg protein level was confirmed by the simultaneous increase in the CQI value and the absence of undesirable sensory effects, such as excessive foam density or imbalances in taste and aftertaste, which were observed at lower or higher egg white concentrations.

Conclusions

The feasibility of developing functional beverages was confirmed as a promising direction for expanding bar assortments in HoReCa establishments. The investigation of the influence of specific ingredients on the sensory and physicochemical parameters of beverages made it possible to formulate scientifically substantiated principles for the development of recipes and production technologies for functional drinks with pronounced sensory appeal and health-promoting properties.

It was established that different methods of preparing lemon balm infusions significantly affect the sensory characteristics, acidity, and dry matter content of the final beverage. Cold infusion resulted in a dry matter content of 0.2%, whereas hot infusion increased this value to 1.0%; the corresponding titratable acidity values were 1.8° and 0.9°, respectively. Cold infusion formed a delicate taste profile with light acidity, while hot infusion produced a more intense taste and concentrated aroma, allowing the extraction process to be adjusted according to the intended functional purpose of the beverage.

The comparative study of egg white types (native and three dried variants) demonstrated the technological advantages of dried egg whites for use in bar practice. Dried egg white Sample 3 exhibited the highest foam stability and the greatest increase in foam volume, reaching a maximum volumetric expansion of 331.25%. In comparison, Sample 2 achieved 325% at the sixth minute of whipping, Sample 4 reached 293.75%, and native chicken egg white achieved only 217.65% at the fourth minute. Although native egg white is less expensive, it is characterized by lower microbiological safety and reduced technological efficiency.

The optimal dosage of reconstituted egg white for the “Mellow Raspberry Bliss” beverage was determined to be 10%. According to the complex quality indicator (CQI), this formulation achieved the highest score of 45.0 points, demonstrating excellent foaming capacity, prolonged foam stability, a pleasant mouthfeel, and the highest sensory evaluation scores.

Analysis of the chemical composition of the “Mellow Raspberry Bliss” beverage confirmed its functional orientation. Consumption of the beverage provides 31.7% of the recommended daily intake of tryptophan and 41.3% of bioflavonoids for adults, nutrients that play an important role in supporting sleep quality and overall psycho-emotional balance.

References

Alexandropoulou I., Gkouvi A., Kontouli K.M., Papadopoulou-Maniki S., Giannioti A., Bogdanos D.P., Vassilakou T., Mouchtouri V.A., Goulis D.G., Grammatikopoulou M.G. (2025), Sustainable Healthy Diet practices: A cross-sectional analysis of an adult Greek sample, *Nutrition Journal,* 24, 32, https://doi.org/10.1186/s12937-025-01096-7

Aprilia B.E., Fibri D.L.N., Rahayu E.S. (2025), Development and characterization of high-protein flakes made from *Spirulina platensis* in instant cereal drinks enriched with probiotic milk powder, *Food Production, Processing and Nutrition,* 7(1), 24, https://doi.org/10.1186/s43014-024-00298-6

Bomba M.Ya., Fedyna L.O., Masliichuk O.B., Maikova S.V. (2023), Non-traditional plant raw materials of the Carpathians in the technology of health-improving beverages, *Tavriya*

ISSN: 2409-4951 (Online), 2310-1008(Print)

Scientific Bulletin. Series: Technical Sciences, 6, pp. 42–51, https://doi.org/10.32851/tnv-tech.2022.6.6

Dudarev I. (2023), Development of beer mixed drinks compositions with "oat milk" and juices, *Restaurant and Hotel Consulting. Innovations,* 6*(*2), pp. 214–231, https://doi.org/10.31866/2616-7468.6.2.2023.291704

Dulka O.S., Prybylskyi V.L., Fedosov O.L., Kyrpichenkova O.M., Kuts A.M., Shydlovska O.B., Ishchenko T.I., Tsyrulnikova V.V., Bondar N.P. (2024), The use of chia seeds in the technology of non-alcoholic beverages, *Journal of Chemistry and Technologies,* 32(1), pp. 163–170, https://doi.org/10.15421/jchemtech.v32i1.276288

Gubsky S., Stabnikova O., Stabnikov V., Paredes-López O. (Eds.). (2025), *Wild Edible Plants: Improving Foods Nutritional Value and Human Health through Biotechnology*, CRC Press, Boca Raton, https://doi.org/10.1201/9781003486794

Heydari M., Pourahmad R., Hashemiravani M. (2025), The effect of green tea extract on the viability of *Lactobacillus casei* and the qualitative characteristics of a probiotic drink based on a mixture of celery, carrot and apple juice, *Journal of Food Science and Technology,* 156(21), pp. 125–135.

Ivanov Y., Schutuyk V. (2021), Functional drink from malt raw materials as a substitute for natural coffee, *Food Industry,* 29, pp. 42-52, https://doi.org/10.24263/2225-2916-2021-29-7

Karputina M., Khargeliya D., Vitriak O. (2022), Safety and quality of beverages based on sorghum, *Commodity Science. Technologies. Engineering,* 43(3), pp. 99–107, https://doi.org/10.31617/2.2022(43)08

Kersting M., Kalhoff H., Zahn K., Belgardt A.J., Sinningen K., Lücke T. (2025), Replacing cow's milk with plant-based drinks: Consequences for nutrient intake of young children on a balanced diet in Germany, *Journal of Health, Population and Nutrition, 44, 93*, https://doi.org/10.1186/s41043-025-00836-z

Kurylenko Y., Sukhenko V., Andronovych H., Kurakin O. (2024), Multinutrient functional beverage, *Innovations and Technologies in the Service Sphere and Food Industry,* 4(14), pp. 25–30, https://doi.org/10.32782/2708-4949.4(14).2024.4

Kuzmin O., Kucherenko V., Sylka I., Isaienko V., Furmanova Y., Pavliuchenko O., Hubenia V. (2020), Antioxidant capacity of alcoholic beverages based on infusions from non-traditional spicy-aromatic vegetable raw materials, *Ukrainian Food Journal*, 9(2), pp. 404-424, https://doi.org/10.24263/2304-974X-2020-9-2-12

Nikolenko V. (2024), International experience in the functioning of the soft drinks market, *Economics and Business Management,* 15(3), pp. 58–71, https://doi.org/10.31548/economics/3.2024.58

Paska M., Mlynko O. (2023), Technological aspects of the use of functional beverages in the restaurant business, *Economics and Society,* 52*,* https://doi.org/10.32782/2524-0072/2023-52-88

Paska M., Izhevska O., Makarovskyi N. (2024), Chia seeds and their role in creating functional beverages in restaurant establishments, *Economics and Society,* 68, https://doi.org/10.32782/2524-0072/2024-68-61

Polovyk V.V., Koretska I.L., Berezova H.O., Kravchuk N.M. (2019), The use of sweet organic amendments to improve the quality of the dessert, *Tavriya Scientific Bulletin. Series: Technical Sciences,* 30(69), pp. 126-132, https://doi.org/10.32838/2663-5941/2019.6-2/23

Pomalango Z.B., Paneo M.A., Pakaya N., Aman L.O., Hutuba A.H. (2025), Cholesterol-lowering effects of turmeric effervescent dosage in preventing atherosclerosis, *Science and Technology Indonesia,* 10(2), pp. 482–492, https://doi.org/10.26554/sti.2025.10.2.482-492

Priss O., Kolisnychenko T., Zahorko N. (2025), The catnip plant for beverage production, In: S. Gubsky, O. Stabnikova, V. Stabnikov, O. Paredes-López (Eds.), *Wild Edible Plants: Improving Foods Nutritional Value and Human Health through Biotechnology* (pp. 108-142), CRC Press, Boca Raton, https://doi.org/10.1201/9781003486794-4

Pushka O.S., Shevchenko I.V., Sylchuk T.A. (2025), Analysis of the marketing feasibility of introducing functional drinks in the hotel and restaurant business. *Market Infrastructure,* 82*,* pp. 299–303, https://doi.org/10.32782/infrastruct82-48

Schönenberger K.A., Ranzini C., Laval J., Bellenger P., Tenon M., Fança-Berthon P. (2025), The influence of food matrices on the bioavailability of curcuminoids from a dried colloidal

ISSN: 2409-4951 (Online), 2310-1008(Print)

turmeric suspension: A randomized, crossover, clinical trial, *Food & Function*, 16, pp. 774-784, https://doi.org/10.1039/d4fo03414g

Stabnikov V., Stabnikova O., Paredes-López O. (2025), Antioxidant compounds in wild edible berries. In: S. Gubsky, O. Stabnikova, V. Stabnikov, O. Paredes-López. (Eds.), *Wild Edible Plants: Improving Foods Nutritional Value and Human Health through Biotechnology* (pp. 143-184), CRC Press, Boca Raton, https://doi.org/10.1201/9781003486794-5

Stabnikova O., Marinin A., Stabnikov V. (2021), Main trends in application of novel natural additives for food production, *Ukrainian Food Journal*, 10(3), pp. 52–551, https://doi.org/10.24263/2304-974X-2021-10-3-8

Stabnikova O., Paredes-López O. (2024), Plant materials for the production of functional foods for weight management and obesity prevention, *Current Nutrition & Food Science*, 20(4), pp. 401–422, https://doi.org/10.2174/1573401319666230705110854

Sugajski M., Buszewska-Forajta M., Buszewski B. (2023), Functional beverages in the 21st century, *Beverages,* 9(1), 27, https://doi.org/10.3390/beverages9010027

Tyshchenko V.I., Bozhko N.V. (2023), Use of phytoextracts for fortification of functional purpose soft beverages, *Bulletin of Uman National University of Horticulture,* 1, pp. 123–127, https://doi.org/10.32782/2310-0478-2023-1-123-127

Tyshchenko V.I., Bozhko N.V. (2023), Analysis of modern trends in the production of non-alcoholic beverages using unconventional plant raw materials, *Tavriya Scientific Bulletin. Series: Technical Sciences,* 1, pp. 114–124, https://doi.org/10.32851/tnv-tech.2023.1.12

Yaman C. (2021), The effect of sample amount and decoction time on the phytochemicals and antioxidant activities of decoction lemon balm and sage, *Journal of Agriculture and Nature*, 24(4), pp. 725–732, https://doi.org/10.18016/ksutarimdoga.vi.810689

Author identifiers ORCID

Olga Pushka	0000-0001-8016-4889
Illia Shevchenko	0009-0006-6050-0914
Tetiana Sylchuk	0000-0001-8035-4957
Larysa Sharan	0000-0001-6404-0907

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APA Style

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ISSN: 2409-4951 (Online), 2310-1008(Print)