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QUALIFICATION WORK

on the topic: **«DEVELOPMENT OF THE COMPOSITION AND
TECHNOLOGY OF EXTEMPORANEOUS ANTISEPTIC LIQUID SOAP»**

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ANNOTATION

Theoretical studies have confirmed the feasibility and relevance of developing an extemporaneous antiseptic liquid soap based on saponified vegetable oils and chlorhexidine digluconate. For the purposes of the present research, a liquid soap system possessing cleansing, antimicrobial, moisturizing, and dermatoprotective properties was selected.

During the practical stage of the study, the composition and technology of an extemporaneous antiseptic liquid soap were developed. The selection of vegetable oils, the alkaline agent, the antiseptic active pharmaceutical ingredient, and auxiliary components was substantiated, and the expected pharmaco-technological and physicochemical characteristics of the developed formulation were determined.

The work is presented on 45 pages, contains 4 tables, 7 formulas, 3 figures and 30 references.

Key words: antiseptic soap, liquid soap, chlorhexidine digluconate, extemporaneous technology, quality control.

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INTRODUCTION

Actuality of the topic. The development of topical antiseptic preparations remains one of the key directions of modern pharmaceutical technology and preventive medicine. Among such dosage forms, liquid soap with antiseptic properties occupies a special place due to its ease of use, wide availability, and effectiveness in reducing microbial contamination of the skin.

In recent years, the importance of proper hand hygiene has significantly increased, particularly in the context of infectious disease prevention. Conventional synthetic antiseptics, although highly effective, may cause skin dryness, irritation, and disruption of the natural skin microbiota with prolonged use.

Extemporaneous antiseptic liquid soaps allow for flexible formulation design tailored to specific needs, including the incorporation of mild surfactants, moisturizing agents, and antiseptic substances. Such formulations can provide effective antimicrobial action while maintaining skin barrier integrity.

The use of antiseptic agents such as chlorhexidine, benzalkonium chloride, or natural antimicrobial extracts in combination with gentle surfactant systems enables the development of safe and effective cleansing products for regular use.

Thus, the development of an extemporaneous antiseptic liquid soap is a relevant scientific and practical task in modern pharmacy, aimed at improving hygienic care and infection prevention.

The purpose of the study. To develop the composition and technology of an extemporaneous antiseptic liquid soap with antimicrobial, cleansing properties.

Tasks of the study: - to carry out a systematic review and generalization of scientific and literature sources regarding the composition, properties, and application of antiseptic liquid soap formulations;

- to analyze the current market of cleansing and antiseptic products intended for skin hygiene;
- to justify the selection of active antimicrobial substances and auxiliary components for the development of the formulation;

- to elaborate technological principles for the preparation of an extemporaneous antiseptic liquid soap;
- to define the expected quality parameters and pharmaco-technological characteristics of the developed product.

Research objects. Components used for the preparation of a liquid soap base through the saponification of vegetable oils, including natural plant oils as a source of fatty acids, alkaline agents required for the saponification process, and antiseptic substances incorporated to provide antimicrobial properties of the final product.

The subject of research. Development of composition, technological principles, and pharmaco-technological evaluation of an extemporaneous antiseptic liquid soap.

Research methods. The study employs general scientific methods of analysis and synthesis, as well as pharmaco-technological, physicochemical, and microbiological methods used in the development and evaluation of liquid topical dosage forms.

Practical significance of the results. The proposed composition of an extemporaneous antiseptic liquid soap provides a scientifically grounded approach to the development of safe and effective hygienic products. The obtained results may be used for further optimization and implementation in pharmaceutical practice as a topical antiseptic agent with enhanced skin tolerance and antimicrobial efficacy.

Approval of research and publications. The findings of the study were presented at the XXXII International Scientific and Practical Conference of Young Scientists and Students «Topical Issues of New Drug Development» as an oral presentation (Appendices A and B).

Structure and scope of qualification work. The work is presented on 45 pages, contains 4 tables, 3 figures, 7 formulas and 30 references.

CHAPTER 1. SCIENTIFIC AND PRACTICAL ASPECTS OF DEVELOPING ANTISEPTIC LIQUID SOAP BASED ON VEGETABLE OILS

(Literature review)

1.1 Current trends in the development and application of liquid soaps

Liquid soap occupies an important place among modern hygienic and pharmaceutical products intended for routine skin cleansing and reduction of microbial contamination. Compared with traditional solid soap, liquid formulations demonstrate several technological and consumer advantages, including ease of dosing, improved hygienic storage conditions, better solubility in water, and the possibility of incorporating a broad range of functional additives. Owing to these characteristics, liquid soaps are widely used in healthcare institutions, pharmaceutical practice, cosmetic production, and domestic hygiene.

The growing prevalence of infectious diseases and increased attention to sanitary control have intensified scientific interest in antiseptic cleansing products. Hand hygiene remains one of the most effective methods for preventing the transmission of pathogenic microorganisms, particularly bacteria and fungi associated with skin and wound infections. Studies indicate that antiseptic soaps can significantly reduce microbial load on the skin surface and contribute to the prevention of cross-contamination in clinical and community settings. Research performed on medicated and antiseptic soaps demonstrated inhibitory activity against *Staphylococcus aureus* and *Pseudomonas aeruginosa*, microorganisms frequently associated with purulent-inflammatory processes and wound infections [5].

Modern liquid soaps are no longer regarded solely as cleansing products. Contemporary formulations are designed as multifunctional systems combining detergent, antiseptic, moisturizing, deodorizing, antioxidant, and skin-conditioning effects. This tendency is associated with increasing consumer demand for products that maintain skin hygiene without causing irritation, dryness, or disruption of the

natural hydrolipid barrier. Frequent hand washing and repeated exposure to aggressive surfactants may lead to skin dehydration, erythema, itching, and increased sensitivity. Therefore, manufacturers and researchers focus on the development of formulations with balanced physicochemical and dermatological properties [21].

An important trend in recent years has been the incorporation of natural biologically active compounds into antiseptic liquid soap formulations. Herbal extracts, essential oils, and plant-derived antimicrobial agents are considered promising alternatives or complementary components to synthetic antiseptics. Such ingredients possess antimicrobial activity due to the presence of phenolic compounds, flavonoids, tannins, alkaloids, terpenoids, and essential oils. Numerous investigations confirm the effectiveness of plant-derived substances against gram-positive and gram-negative microorganisms.

Studies conducted in Sri Lanka demonstrated that herbal and antiseptic soaps containing natural components exhibited considerable antibacterial activity against common skin pathogens [6]. Similar findings were reported for formulations containing extracts of betel leaf, basil, lime, clove leaf, taro leaf, and other medicinal plants [12, 15, 17, 22]. Betel leaf extracts are especially valued because of their high content of phenolic compounds and essential oils with pronounced antiseptic properties [18]. Investigations involving clove leaf extract also revealed significant antimicrobial efficacy related to the presence of eugenol and other volatile compounds [22].

The development of natural antiseptic soaps additionally reflects the global tendency toward environmentally friendly and sustainable production technologies. Conventional surfactants and synthetic antimicrobial compounds may negatively affect aquatic ecosystems and contribute to environmental pollution. Consequently, scientists increasingly investigate biodegradable surfactants, biosurfactants, plant-derived raw materials, and renewable resources for soap production [7, 10]. Biosurfactants obtained from microbial sources represent an innovative direction in cleansing technology because they demonstrate surface-active and antimicrobial

properties simultaneously. Research by Yannick et al. showed that soaps formulated with biosurfactants isolated from *Bacillus* and *Lactobacillus* strains exhibited effective inhibitory activity against pathogenic microorganisms while potentially reducing environmental impact [7].

Another contemporary tendency is the utilization of agricultural and industrial by-products as raw materials for soap manufacturing. Cocoa pod husk, eco-enzymes, seaweed, and wood tar have been investigated as components of antiseptic soap formulations [9, 10, 11, 30]. Such approaches contribute to sustainable resource utilization and reduction of industrial waste. Cocoa pod husk-based soap demonstrated promising antiseptic properties associated with the presence of bioactive polyphenolic compounds [9]. Seaweed-derived ingredients are also considered valuable due to their polysaccharide content and potential moisturizing activity [11].

The market of antiseptic soaps is continuously expanding due to increased public awareness regarding hygiene and infection prevention. At the same time, scientific interest focuses on optimization of product quality. Formulation scientists investigate the influence of surfactant concentration, pH, viscosity modifiers, stabilizers, and active substances on the physicochemical stability and cleansing efficacy of liquid soaps [23]. Optimization studies indicate that an effective liquid soap should combine stable foam formation, acceptable rheological properties, homogeneous appearance, microbiological stability, and dermatological safety [23].

Another important aspect concerns antimicrobial stewardship in antiseptic products. Excessive use of potent antimicrobial agents may contribute to microbial adaptation and resistance. Kampf emphasized that the development and application of antimicrobial soaps should be scientifically justified and based on balanced antiseptic efficacy rather than excessive concentrations of active compounds [19]. Consequently, modern formulation strategies aim to combine effective antimicrobial action with minimal risk of resistance development and skin irritation.

Research also demonstrates increasing interest in multifunctional soaps enriched with moisturizing and conditioning agents. Goat milk-based soap

formulations, for example, have attracted attention due to their emollient and skin-protective properties combined with natural antiseptic additives [15]. Similar approaches involve the incorporation of aloe vera extract into antiseptic liquid soap systems, where aloe vera contributes moisturizing and anti-inflammatory effects while improving product acceptability [8].

Therefore, current trends in the development of liquid soaps are characterized by the integration of antimicrobial efficacy, skin compatibility, environmental sustainability, and technological optimization. Scientific efforts are directed toward the creation of formulations that not only cleanse the skin effectively but also provide prolonged hygienic protection and improved dermatological tolerability.

1.2 Characteristics and properties of vegetable oils used in soap production

Vegetable oils are fundamental raw materials in soap manufacturing because they serve as natural sources of triglycerides that undergo saponification to produce soap molecules and glycerol. The selection of vegetable oils significantly influences the technological, physicochemical, and functional properties of liquid soap formulations. Different oils possess specific fatty acid compositions, which determine foam formation, cleansing ability, viscosity, stability, hardness, moisturizing properties, and compatibility with the skin.

Triglycerides contained in vegetable oils consist mainly of fatty acids such as lauric, myristic, palmitic, stearic, oleic, and linoleic acids. Saturated fatty acids generally contribute to improved foaming and cleansing characteristics, whereas unsaturated fatty acids enhance emollient and moisturizing effects. Oils rich in lauric acid produce abundant and stable foam, while oils containing higher levels of oleic acid provide softer and more conditioning soap systems.

The ratio between saturated and unsaturated fatty acids is important for achieving balanced product characteristics. Excessive concentrations of saturated fatty acids may lead to increased skin dryness, whereas high levels of unsaturated

fatty acids may reduce foam stability and oxidative resistance. Consequently, combinations of different vegetable oils are often used to optimize soap quality [30].

Vegetable oils also contain minor biologically active constituents such as tocopherols, phytosterols, carotenoids, phospholipids, and polyphenolic compounds. These substances may exhibit antioxidant, anti-inflammatory, and skin-protective properties. Natural antioxidants present in oils help reduce oxidative degradation during storage and may improve product stability.

One of the major advantages of vegetable oils lies in their biocompatibility and biodegradability. Compared with petroleum-derived synthetic ingredients, plant oils are renewable raw materials and are considered environmentally safer. This feature corresponds to current ecological trends in cosmetic and pharmaceutical technology [10].

Scientific investigations confirm the suitability of numerous vegetable oils for liquid soap production. Corn oil-based antiseptic liquid soap demonstrated favorable physicochemical properties and acceptable cleansing performance when combined with aloe vera extract and surfactants [8]. Studies involving blends of vegetable oils with wood tar also confirmed the possibility of obtaining stable antiseptic cleansing systems with satisfactory antimicrobial activity [30].

The choice of oil significantly affects the rheological characteristics of liquid soap. Oils rich in unsaturated fatty acids usually produce softer and more fluid formulations, whereas oils with higher saturated fatty acid content contribute to increased viscosity and foam density. These technological aspects are important for ensuring product stability and consumer acceptability.

Table 1.1 summarizes the influence of major fatty acids on liquid soap properties. Vegetable oils additionally influence the sensory properties of soap formulations, including texture, transparency, spreadability, and skin feel after washing. Properly selected oil compositions allow manufacturers to obtain products that combine effective cleansing with pleasant cosmetic characteristics.

The oxidative stability of oils is another important technological parameter. Oils rich in polyunsaturated fatty acids are more susceptible to oxidation, which may

lead to unpleasant odor formation, discoloration, and reduced product quality. Therefore, antioxidant systems or appropriate storage conditions are often required to maintain formulation stability.

Table 1.1

Influence of fatty acids on liquid soap characteristics

Fatty acid	Main technological effect
Lauric acid	Intensive foam formation and cleansing
Myristic acid	Stable foam and improved detergency
Palmitic acid	Viscosity and structural stability
Stearic acid	Thickening and consistency improvement
Oleic acid	Moisturizing and skin-conditioning effect
Linoleic acid	Emollient and restorative properties

Natural oils also play a role in improving dermatological compatibility. Modern consumers increasingly prefer products containing natural ingredients due to concerns regarding irritation associated with aggressive surfactants and synthetic additives. Soap systems based on vegetable oils may help preserve the physiological lipid barrier of the skin and reduce excessive transepidermal water loss.

Consequently, vegetable oils are multifunctional ingredients in liquid soap technology, serving not only as structural raw materials for saponification but also as biologically active and technologically significant components influencing the quality, stability, and dermatological properties of the final product.

1.3 Technological principles of liquid soap production by saponification of vegetable oils

The production of liquid soap is based on the saponification reaction, during which triglycerides contained in vegetable oils interact with alkaline agents to form soap molecules and glycerol. This process represents one of the fundamental

chemical reactions in soap technology and determines the physicochemical characteristics of the final product.

Liquid soap production differs from solid soap manufacturing primarily by the type of alkali used. Potassium-based alkaline agents are commonly applied because potassium soaps possess greater water solubility and softer consistency than sodium soaps. The technological process requires precise control of reaction conditions to ensure complete saponification and acceptable product stability.

The manufacturing process generally begins with preparation of the raw materials. Vegetable oils are filtered and heated to achieve homogeneity and facilitate the saponification reaction. The alkaline solution is prepared separately and gradually introduced into the oil phase under continuous stirring. Temperature control is particularly important because excessive heating may accelerate degradation of thermolabile components and negatively affect product quality.

The saponification stage involves hydrolysis of triglycerides and formation of fatty acid salts. Reaction completeness depends on the ratio between oils and alkali, mixing intensity, temperature, and reaction duration. Incomplete saponification may result in phase separation, excessive free alkali, or instability of the soap system.

After completion of saponification, dilution with purified water is performed to obtain the desired viscosity and concentration. Additional ingredients such as antiseptic substances, fragrances, stabilizers, moisturizing agents, and plant extracts are usually incorporated after cooling in order to preserve their biological activity [23].

Modern liquid soap technologies increasingly involve the incorporation of natural antimicrobial substances. Studies describe successful inclusion of extracts from betel leaves, gambir, citrus leaves, kecombrang stems, and taro leaves into antiseptic liquid soap formulations [16, 17, 18, 25, 29]. These extracts provide antimicrobial activity due to the presence of phenolic and terpenoid compounds.

Optimization of formulation parameters is essential for obtaining stable products with acceptable technological properties. Factors such as pH, viscosity,

foam stability, detergency, transparency, and microbial purity require careful evaluation during product development [23].

Table 1.2 summarizes the principal technological stages involved in liquid soap production.

Table 1.2

Main technological stages of liquid soap production

Stage	Technological purpose
Preparation of raw materials	Ensuring purity and homogeneity
Preparation of alkaline solution	Obtaining required alkalinity
Saponification	Formation of soap molecules
Dilution	Adjustment of concentration and viscosity
Incorporation of additives	Providing antiseptic and functional effects
Homogenization	Ensuring uniform consistency
Quality control	Evaluation of product parameters

The incorporation of antiseptic agents requires consideration of compatibility with the soap base. Some antimicrobial compounds may lose activity under alkaline conditions or interact with surfactants. Therefore, selection of appropriate formulation conditions is necessary to maintain antiseptic efficacy.

Another important technological aspect concerns foam stability and rheological properties. Consumers generally associate abundant and stable foam with effective cleansing action. However, excessive concentrations of surfactants may increase the risk of skin irritation. Consequently, formulation scientists aim to achieve an optimal balance between detergency and dermatological safety [21].

Research also investigates alternative and environmentally friendly technologies. Eco-enzyme-based liquid soap production has attracted attention because eco-enzymes may improve biodegradability and reduce the need for aggressive synthetic additives [10]. Similarly, biosurfactant-containing formulations represent a promising approach to obtaining sustainable cleansing systems [7].

The stability of liquid soap formulations during storage is another important consideration. Parameters such as pH, viscosity, color, odor, and microbial purity may change over time depending on formulation composition and storage conditions. Stability studies therefore represent an essential stage in product development.

Thus, the technology of liquid soap production by saponification of vegetable oils combines chemical, pharmaceutical, and technological principles aimed at obtaining stable, safe, effective, and consumer-acceptable antiseptic formulations.

1.4 Prospects for the development of extemporaneous antiseptic liquid soaps

The development of extemporaneous antiseptic liquid soaps represents a promising area of modern pharmaceutical and hygienic technology due to the increasing demand for individualized and dermatologically safe cleansing products. Extemporaneous formulations allow flexible adjustment of composition depending on specific hygienic needs, skin characteristics, and desired antimicrobial properties.

One of the major advantages of extemporaneous preparations is the possibility of selecting ingredients according to individual requirements. Such formulations may contain combinations of vegetable oils, mild surfactants, moisturizing substances, natural antiseptic agents, and stabilizers chosen specifically for sensitive or damaged skin. This individualized approach is particularly important for frequent hand hygiene in healthcare workers and patients with skin sensitivity.

The growing popularity of natural products significantly influences the development of extemporaneous liquid soaps. Scientific studies increasingly focus on herbal extracts and essential oils possessing antimicrobial and anti-inflammatory activity [6, 9, 12, 18]. Plant-derived antiseptics are considered promising because they often combine broad-spectrum biological activity with relatively good dermatological compatibility.

Research demonstrates that formulations containing herbal extracts may exhibit inhibitory activity against bacteria and fungi commonly associated with skin

infections [20]. Herbal soaps based on cocoa pod husk, citrus leaves, clove leaves, and other medicinal plants demonstrated promising antimicrobial effects [9, 22, 29]. Such ingredients may additionally provide antioxidant and deodorizing properties.

Another important direction involves the integration of environmentally friendly technologies into soap production. Extemporaneous formulations based on vegetable oils and biodegradable ingredients correspond to modern ecological principles and sustainable production concepts [10]. The use of renewable raw materials contributes to reducing environmental burden and dependence on synthetic petrochemical compounds.

Contemporary research also investigates the use of biosurfactants and bioactive microbial metabolites in antiseptic soap technology [7]. Biosurfactants possess both cleansing and antimicrobial properties and may represent safer alternatives to aggressive synthetic surfactants. Their biodegradability and low toxicity further increase scientific interest in such compounds.

The concept of antimicrobial stewardship significantly affects the future development of antiseptic cleansing products. Excessive use of potent antimicrobial agents may contribute to microbial resistance and ecological imbalance. Therefore, modern approaches emphasize rational incorporation of antiseptic substances in concentrations sufficient for hygienic efficacy but minimizing the risk of microbial adaptation [19].

Extemporaneous soap production additionally provides opportunities for combining pharmaceutical and cosmetic properties within one formulation. Modern consumers expect hygienic products not only to cleanse effectively but also to moisturize, soften, and protect the skin. Consequently, formulations enriched with emollients, humectants, and plant-derived bioactive compounds are becoming increasingly important [21].

Scientific interest also focuses on improving the technological stability of liquid soap systems. Future developments are expected to involve optimized rheological modifiers, biodegradable stabilizers, and innovative delivery systems for

antimicrobial ingredients. Such improvements may enhance storage stability, sensory characteristics, and effectiveness of extemporaneous antiseptic soaps.

The prospects for further development of extemporaneous antiseptic liquid soaps are therefore associated with the integration of natural antimicrobial substances, environmentally sustainable technologies, optimized physicochemical systems, and individualized formulation approaches. These tendencies correspond to current pharmaceutical, cosmetic, and ecological requirements and create favorable conditions for the development of effective and safe hygienic products.

CONCLUSIONS TO CHAPTER 1

1. The analysis of scientific literature demonstrated that antiseptic liquid soaps represent an important group of hygienic and pharmaceutical products widely used for reducing microbial contamination of the skin and preventing the spread of infectious diseases. Modern trends in the development of liquid soaps are focused on improving antimicrobial efficacy, dermatological safety, physicochemical stability, and environmental compatibility of formulations.

2. It was established that contemporary antiseptic liquid soaps increasingly combine cleansing, antimicrobial, moisturizing, and skin-protective properties. The incorporation of plant-derived biologically active substances, essential oils, and natural antimicrobial compounds is considered a promising direction due to their broad spectrum of biological activity and relatively good skin tolerability.

3. The literature review confirmed that vegetable oils are important raw materials in soap production because they provide the triglycerides and fatty acids necessary for the saponification process. The fatty acid composition of vegetable oils significantly influences the technological and consumer characteristics of liquid soap, including foaming ability, viscosity, cleansing properties, stability, and skin-conditioning effects.

4. It was determined that the technology of liquid soap production by saponification requires careful selection of raw materials and optimization of

technological parameters such as the oil-to-alkali ratio, temperature conditions, mixing intensity, and incorporation of functional additives. Proper control of these factors ensures the formation of stable and effective antiseptic cleansing systems.

5. Scientific sources also indicate increasing interest in environmentally friendly and biodegradable soap formulations based on renewable plant raw materials, biosurfactants, and natural antiseptic agents. Such approaches correspond to modern requirements for sustainable production and safe hygienic products.

CHAPTER 2. MATERIALS AND METHODS

2.1 Research materials

The developed antiseptic liquid soap was formulated using active pharmaceutical ingredients and auxiliary excipients selected according to their physicochemical, technological, and functional properties. The characteristics of the materials used in the study are presented below.

Chlorhexidine digluconate (Chlorhexidini digluconas). CAS No.: 18472-51-0. Chlorhexidine digluconate is a clear, colorless or slightly yellowish liquid with weak characteristic odor. It is freely soluble in water and ethanol and demonstrates high chemical stability in aqueous solutions within an appropriate pH range. The molecular formula is $C_{22}H_{30}Cl_2N_{10} \cdot 2C_6H_{12}O_7$, and the molecular weight is 897.76 [3, 14, 26, 27].

Chlorhexidine digluconate belongs to the group of cationic antiseptic agents with broad-spectrum antimicrobial activity. It exhibits bactericidal effects against gram-positive and gram-negative microorganisms, as well as activity against certain fungi and enveloped viruses. The mechanism of action is associated with disruption of microbial cell membrane integrity and coagulation of intracellular components.

Due to its pronounced antiseptic properties and prolonged antimicrobial effect, chlorhexidine digluconate is widely used in pharmaceutical and medical practice. It is incorporated into skin antiseptics, hand hygiene products, mouth rinses, wound cleansing solutions, gels, creams, and other topical formulations. In liquid soap technology, chlorhexidine digluconate is used as an active antiseptic component to enhance the antimicrobial efficacy of cleansing systems intended for hygienic skin treatment.

Refined olive oil (Olivae oleum). CAS No.: 8001-25-0. Obtained from olive fruits by cold pressing followed by refining. It is a transparent liquid with a yellow-green coloration. The oil is miscible with petroleum ether and practically insoluble in ethanol. At reduced temperatures, the liquid becomes turbid and gradually thickens. The relative density is approximately 0.913. Olive oil mainly contains

oleic, linoleic, and palmitic fatty acids. Due to its balanced fatty acid profile, olive oil is considered one of the principal lipid components in soap production and may serve as a basis for cleansing systems with emollient properties [3, 14, 26, 27].

In pharmaceutical and cosmetic practice, olive oil is widely used in the preparation of emulsions, ointments, liniments, oleogels, oil solutions, creams, lotions, shampoos, and topical products. It exhibits softening and skin-conditioning effects and contributes to maintaining the hydrolipid barrier of the skin.

Refined coconut oil (Cocois oleum). CAS No.: 8001-31-8. Produced from the dried endosperm of coconut fruits. It appears as a white oily semi-solid mass. Coconut oil is practically insoluble in water, readily soluble in petroleum ether and methylene chloride, and slightly soluble in ethanol. The refractive index at 40 °C is approximately 1.449. The oil contains lauric, myristic, palmitic, oleic, caprylic, and capric fatty acids [14, 26, 27].

Coconut oil is widely used in pharmaceutical and cosmetic technologies because of its foaming, cleansing, and moisturizing properties. The high content of lauric acid contributes to pronounced detergent and antimicrobial activity, making coconut oil an important component in soap formulations.

Refined shea butter (Butyrum Butyrospermi). CAS No.: 194043-92-0. Obtained from the kernels of the shea tree. It is a dense oily substance of light beige or ivory color. Insoluble in water but readily miscible with fatty oils. The relative density at 20 °C ranges from 0.922 to 0.928. Shea butter mainly contains oleic, stearic, and palmitic fatty acids [26, 27].

Shea butter is commonly used in cosmetic preparations due to its moisturizing, emollient, and protective properties. In cleansing systems, it contributes to improved skin softness and reduction of excessive dryness caused by surfactants.

Refined almond oil (Amygdalae oleum raffinatum). CAS No.: 8007-69-0. Obtained from ripe seeds of *Prunus dulcis* by cold pressing followed by refining. Antioxidants may be added to improve stability. Almond oil is a transparent pale-yellow liquid, slightly soluble in ethanol and miscible with petroleum ether. The relative density is approximately 0.916, and solidification occurs at temperatures

close to 18 °C. The composition includes oleic, linoleic, stearic, linolenic, arachidic, eicosenoic, and erucic fatty acids [3, 14, 26, 27].

Almond oil is extensively used in pharmaceutical and cosmetic formulations, particularly in emulsions, sprays, topical products, and pediatric preparations. It demonstrates good thermal stability and prolonged resistance to rancidity, which makes it suitable for cosmetic and hygienic applications.

Refined jojoba oil (Simmondsia oleum). CAS No.: 61789-91-1. Jojoba oil is a light-yellow oily liquid with a relative density ranging from 0.863 to 0.873. The refractive index is 1.465–1.467. The freezing point is approximately 7.0–10.6 °C, while the melting point is 6.8–7.0 °C. The oil contains palmitic, oleic, linoleic, linolenic, gadoleic, and docosenoic acids [26].

Jojoba oil possesses moisturizing and softening properties, improves the barrier function of the skin, and demonstrates good oxidative stability. It is widely incorporated into topical cosmetic products due to its favorable dermatological characteristics.

Refined palm kernel oil (Guineensis oleum). CAS No.: 8023-79-8. At room temperature, palm kernel oil appears as a solid mass ranging from white to beige in color and melts at approximately 25–30 °C. The fatty acid composition includes lauric, myristic, oleic, palmitic, caprylic, capric, stearic, and linoleic acids.

Palm kernel oil is commonly used in food, cosmetic, and pharmaceutical industries. In soap technology, it contributes to foam formation, structural stability, and cleansing efficiency [26].

Cocoa butter (Cacao oleum). CAS No.: 8002-31-1. Obtained from cocoa beans by pressing, filtration, or centrifugation. Cocoa butter is presented as dense granules of light-yellow to yellow color with a characteristic cocoa aroma. It contains arachidic, lauric, linoleic, and oleic fatty acids [14, 26, 27].

Cocoa butter exhibits moisturizing and softening effects, improves skin elasticity, and supports restoration of the hydrolipid balance. It is frequently used in cosmetic formulations and pharmaceutical preparations intended for topical application.

Refined babassu oil (Orbignya speciosa oleum). CAS No.: 91078-92-1. Babassu oil is an oily liquid that forms a pale-yellow solid mass at temperatures around 20 °C. The melting point ranges from 21 to 26 °C. The oil contains lauric, myristic, oleic, palmitic, caprylic, decanoic, and stearic fatty acids [26].

Babassu oil demonstrates emollient and protective properties, reduces transepidermal water loss, and contributes to maintaining skin hydration. Owing to the high concentration of lauric acid, the oil may additionally exhibit antibacterial activity. It is widely used in skin and hair care products.

Refined palm oil (Guineensis oleum). CAS No.: 8002-75-3. Palm oil is a homogeneous plastic mass with a glossy surface, varying from white to pale yellow in color. The relative density ranges from 0.921 to 0.925, and the melting point is approximately 36 °C. The main constituents are palmitic acid and glycerides of oleic acid [26, 27].

Palm oil is widely applied in food production and soap manufacturing because it contributes to structural stability and satisfactory physicochemical characteristics of cleansing products.

Purified water (Aqua purificata). CAS No.: 7732-18-5. Purified water is a clear, colorless, odorless liquid with a molecular weight of 18.02 and a pH range of 5.0–7.0.

Purified water is obtained by distillation and is considered chemically and pharmacologically inert. In pharmaceutical and cosmetic technology, it serves as a universal solvent and dispersion medium for numerous formulations, including liquid cleansing systems [3, 14, 26, 27].

Potassium hydroxide (Kalii hydroxidum). CAS No.: 1310-58-3. Potassium hydroxide is a white hygroscopic crystalline substance available in the form of pellets or flakes. It readily absorbs moisture and carbon dioxide from the air. The content of the principal substance ranges from 85.0 % to 100.5 %. Potassium hydroxide is highly soluble in water and ethanol. The molecular weight is 56.11 [3, 14, 26, 27].

Potassium hydroxide is widely used in pharmaceutical, chemical, and cosmetic industries. In soap technology, it is applied as an alkaline agent for the saponification of fatty oils during the production of liquid soap. Compared with sodium hydroxide, potassium hydroxide forms softer and more water-soluble soaps, which makes it preferable for liquid cleansing formulations.

2.2 Research methods

Organoleptic evaluation. The organoleptic properties of the developed antiseptic liquid soap were assessed by visual and sensory examination. Parameters including appearance, consistency, color, odor, and homogeneity were evaluated according to generally accepted pharmacopeial procedures. Particular attention was paid to the absence of phase separation, sediment formation, and foreign inclusions, as well as to the uniformity and consumer acceptability of the formulation [2, 14].

Potentiometric determination of pH. The pH value of the developed formulation was determined potentiometrically using a calibrated pH meter equipped with a glass indicator electrode and a reference electrode. Measurements were carried out at a controlled temperature ranging from 20 to 25 °C. Prior to analysis, the instrument was calibrated using standard buffer solutions with known pH values.

The electrodes were immersed into the test solution, and the pH was recorded after stabilization of the readings. The measurements were performed under the same conditions used during calibration to ensure accuracy and reproducibility of the obtained results [2, 14].

Determination of fatty acid content. The fatty acid content was determined by acid–base titration following preliminary extraction of fatty acids from the soap matrix using ethanol and organic solvent systems. The obtained ethanolic solution of fatty acids was titrated with standardized alkaline solution using phenolphthalein as an indicator until a stable pale-pink coloration appeared.

After completion of titration, the solvent was evaporated under heating conditions, and the dry residue was further dried to constant weight. The fatty acid

content was calculated according to the corresponding analytical equations. The final result was expressed as the arithmetic mean of two parallel determinations [2, 14].

The percentage of fatty acids was calculated using the following equation (2.1):

$$X = \frac{(m_1 - V \times K \times 0.011)}{m} \times 100 \quad (2.1)$$

where:

m_1 — mass of dry residue after drying, g;

V — volume of alkaline solution used for titration, ml;

K — correction coefficient accounting for the actual concentration of the titrant;

m — sample weight, g;

0.011 — conversion coefficient corresponding to 1 ml of 0.5 M alkaline solution.

The fatty acid content recalculated to the nominal soap mass was determined according to the equation (2.2):

$$X_0 = \frac{m_1 \times X}{m_2} \quad (2.2)$$

where:

m_1 — actual mass of the soap sample, g;

X — fatty acid content, %;

m_2 — nominal soap mass, g.

Determination of free alkali content. The amount of free alkali present in the soap formulation was evaluated by acid–base titration. The test sample was dissolved in neutralized ethanol and heated in a water bath. Barium chloride solution was added to precipitate interfering compounds, after which the solution was titrated with standardized hydrochloric acid using phenolphthalein as an indicator [2, 14].

The endpoint of titration was determined by complete disappearance of the pink coloration. The free alkali content was calculated using the following equation (2.3):

$$X_1 = \frac{V \times K \times 0.004 \times 100}{m} \quad (2.3)$$

where:

X_1 — mass fraction of free alkali, %;

V — volume of hydrochloric acid solution used for titration, ml;

K — correction factor for the actual concentration of hydrochloric acid;

m — sample weight, g;

0.004 — conversion factor corresponding to 1 ml of 0.1 M hydrochloric acid.

The final result represented the arithmetic mean of two parallel determinations.

Determination of potassium carbonate content. The content of potassium carbonate was also determined by acid–base titration. The soap sample was dissolved in previously neutralized ethanol under heating conditions and titrated with standardized hydrochloric acid solution using phenolphthalein as the indicator [2, 14].

The percentage of potassium carbonate was calculated according to the following equation (2.4):

$$X_2 = \left(\frac{V \times K \times 0.4}{m} - X_1 \right) \times 2.65 \quad (2.4)$$

where:

X_2 — mass fraction of potassium carbonate, %;

V — volume of hydrochloric acid solution used for titration, ml;

K — correction coefficient;

m — sample weight, g;

X_1 — mass fraction of free alkali, %;

0.4 — conversion coefficient;

2.65 — conversion factor from alkali to potassium carbonate.

The content of alkaline products recalculated to sodium oxide equivalent was determined according to the equation:

$$X' = 0.775X_1 + 0.590X_2$$

where:

X_1 — free alkali content, %;

X_2 — potassium carbonate content, %;

0.775 and 0.590 — conversion coefficients.

Foam volume determination. Foaming ability was evaluated using a standardized shaking method. A test solution containing 0.5 % fatty acids was prepared using hard water at a temperature of 20 °C. One hundred milliliters of the prepared solution were transferred into a transparent cylindrical vessel with a lid and shaken intensively for one minute [2, 14].

After shaking, the height of the foam layer was measured, and the initial foam volume was calculated using the following equation (2.5):

$$V = \pi r^2 h \quad (2.5)$$

where:

V — foam volume, cm³;

π — 3.14;

r — radius of the vessel, cm;

h — foam height, cm.

The final result represented the arithmetic mean of three independent measurements.

Determination of acid value. The acid value was determined by titration of the soap sample dissolved in a mixture of ethanol and petroleum ether previously neutralized with potassium hydroxide solution. The mixture was heated until

complete dissolution of the sample, followed by titration with standardized potassium hydroxide solution in the presence of phenolphthalein [2, 14].

The acid value was calculated according to the following equation (2.6):

$$I_A = \frac{5.611n}{m} \quad (2.6)$$

where:

n — volume of potassium hydroxide solution used for titration, ml;

5.611 — amount of potassium hydroxide equivalent to 1 ml of 0.1 M solution;

m — sample weight, g.

Determination of iodine value. The iodine value was used to evaluate the degree of unsaturation of fatty acids contained in the soap formulation. The sample was dissolved in chloroform and treated with iodine chloride solution. The reaction mixture was kept in a dark place with periodic mixing.

After completion of the reaction, potassium iodide solution and purified water were added, and the liberated iodine was titrated with sodium thiosulfate solution using starch as an indicator. A control experiment was carried out simultaneously under identical conditions [2, 14].

The iodine value was calculated using the following equation (2.7):

$$I_I = \frac{1.269(n_2 - n_1)}{m} \quad (2.7)$$

where:

n_1 — volume of sodium thiosulfate solution used for titration of the test sample, ml;

n_2 — volume of sodium thiosulfate solution used in the control experiment, ml;

m — sample weight, g;

1.269 — conversion coefficient.

Statistical processing of the obtained experimental data was performed using standard parametric methods selected in accordance with the nature of the results,

the distribution characteristics of each dataset, and the specific requirements of the study. Prior to analysis, the data were evaluated for normality of distribution, which determined the choice of appropriate statistical approaches.

All calculations and graphical representations were carried out using Microsoft Excel 2021 software.

CONCLUSIONS TO CHAPTER 2

1. The physicochemical and technological characteristics of the selected components for the development of an antiseptic liquid soap based on saponified vegetable oils and an antiseptic agent were analyzed. The properties of vegetable oils, the alkaline agent, purified water, and chlorhexidine digluconate were considered with regard to their role in the formation of a stable soap system.

2. A set of appropriate methods for the quality evaluation of the developed dosage form was substantiated and systematized. The selected methods enable the determination of key quality parameters, including organoleptic properties, pH value, fatty acid content, alkalinity indicators, foaming capacity, and related technological characteristics.

3. It was established that the applied methodological approach ensures a comprehensive assessment of the pharmaco-technological properties of the experimental samples, as well as effective control of the main stages of the technological process, which is essential for further optimization of the antiseptic liquid soap composition.

CHAPTER 3. DEVELOPMENT OF THE COMPOSITION AND TECHNOLOGY OF AN EXTEMPORANEOUS ANTISEPTIC LIQUID SOAP

3.1 Market analysis of liquid cleansing products

The global market of liquid cleansing products is characterized by stable growth and continuous structural transformation, driven by increased attention to personal hygiene, infection prevention, dermatological safety, and the demand for multifunctional cosmetic and hygiene systems. Liquid soaps and related cleansing formulations represent one of the key segments of the personal care industry, combining cleansing, protective, and skin-care functions within a single dosage form [1, 4].

From a geographical perspective, the market is concentrated in several leading countries that define global production, innovation, and consumption trends (Fig. 3.1).

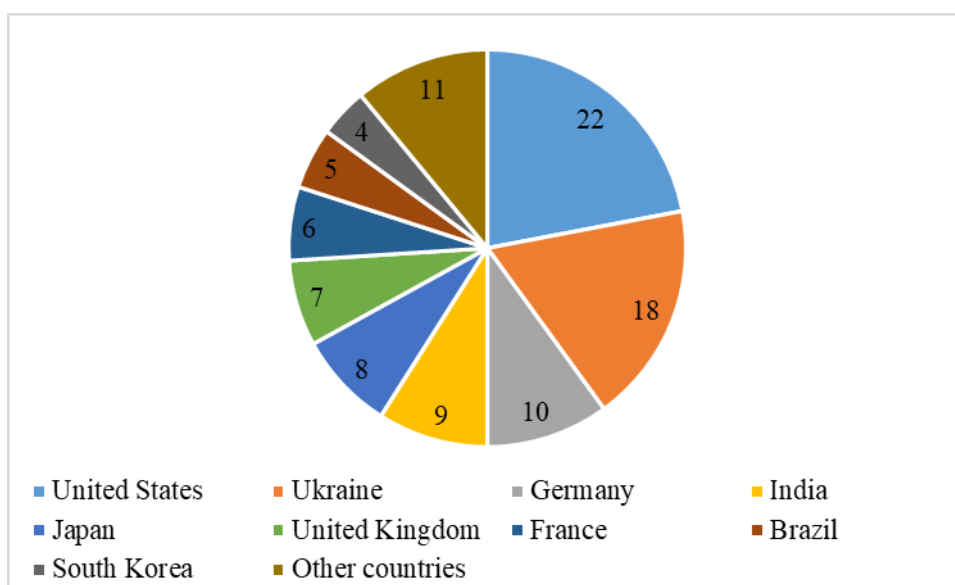


Fig. 3.1 Market distribution by countries, %

The United States holds the largest share of the market at 22%, which is associated with strong development of dermatological and antiseptic product lines, as well as high consumer demand for innovative hygiene solutions. China accounts

for 18% of the global market, driven by large-scale industrial production, high population demand, and rapid expansion of the personal care sector. Germany represents 10% of the market and is characterized by strict regulatory standards, high product quality, and a strong focus on environmentally friendly and dermatologically tested formulations. Japan accounts for 8%, with a focus on advanced cosmetic technologies and mild skincare systems. The United Kingdom represents 7%, with a strong presence of pharmaceutical and dermatocosmetic products. France holds 6% of the market, with emphasis on premium skincare and cosmetic formulations. India accounts for 9%, reflecting rapid growth in hygiene product consumption and expanding manufacturing capabilities. Brazil represents 5%, with increasing demand for mass-market hygiene products. South Korea accounts for 4%, driven by innovation in cosmetic science and functional skincare systems. The remaining 11% is distributed among other countries, including developing markets in Asia, Latin America, and Africa.

In terms of dosage form, liquid cleansing products are predominantly represented by liquid hand soaps, which constitute 48% of the global market (Fig. 3.2).

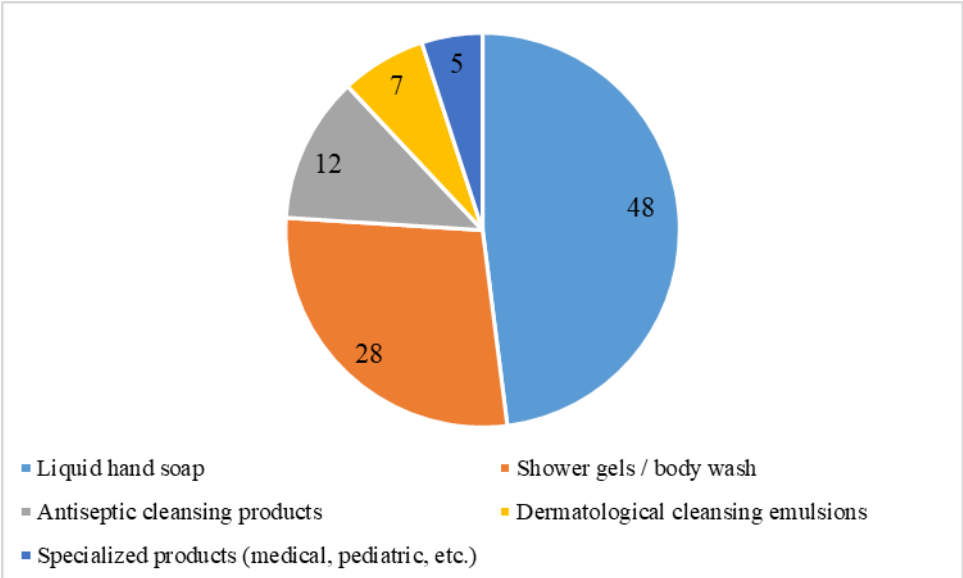


Fig. 3.2 Distribution by product forms, %

Shower gels and body washes account for 28%, while antiseptic and hygienic cleansing solutions represent 12%. Dermatological cleansing emulsions make up 7%, and specialized products intended for medical, pediatric, or sensitive skin applications account for 5%. The dominance of liquid forms is explained by their convenience, hygienic dosing, and compatibility with modern packaging systems, which make them suitable for both household and institutional use.

Functional analysis shows that all liquid cleansing products provide a basic cleansing effect; however, modern formulations are increasingly multifunctional. Moisturizing and skin-conditioning properties are present in 62% of products, reflecting the need to reduce surfactant-induced dryness. Antibacterial and antiseptic functions are included in 30% of formulations, mainly in products intended for healthcare and high-hygiene environments. Dermatoprotective and barrier-repairing effects are observed in 22% of products, while sensory and fragrance-related functions are present in 45% of formulations. This demonstrates a clear trend toward multifunctional systems that combine hygiene with skin care and user comfort (Fig. 3.3).

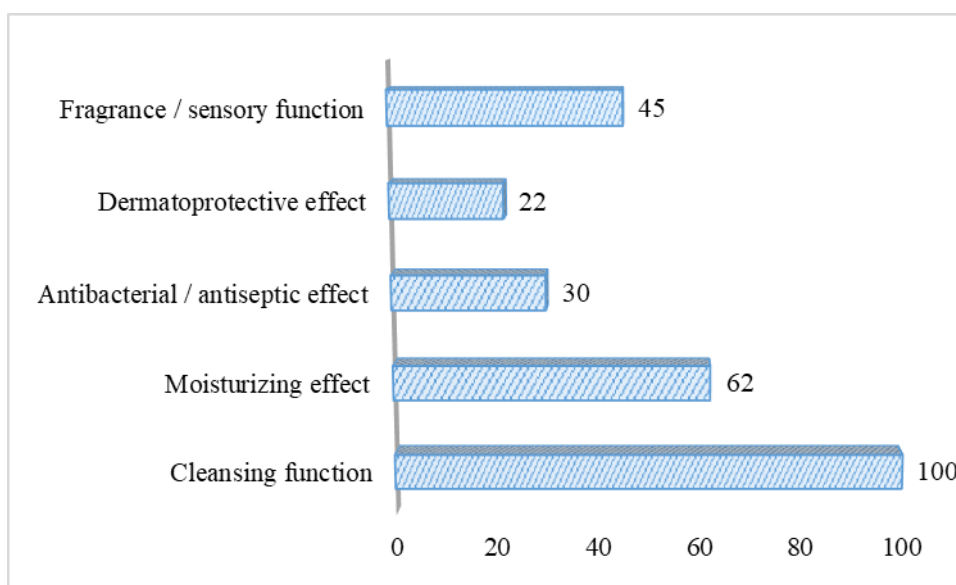


Fig. 3.3 Functional distribution, %

The formulation structure of liquid cleansing products is mainly based on surfactant systems and auxiliary functional ingredients. Anionic surfactants are the

most widely used group, present in 75% of formulations due to their high cleansing efficiency and cost-effectiveness. Amphoteric surfactants are included in 45% of products, mainly to improve mildness and reduce irritation potential. Non-ionic surfactants are used in 35% of formulations to enhance stability and solubilization, while cationic surfactants are present in 12% of antiseptic systems due to their antimicrobial properties.

Moisturizing agents are an essential part of modern liquid soap formulations. Glycerin is the most commonly used humectant, present in 70% of products. Other moisturizing components, including glycols and polymer-based water-retaining substances, are included in 25% of formulations, while advanced biopolymer systems are found in 8%. These ingredients are introduced to maintain skin hydration and improve tolerance to surfactant systems.

Antimicrobial components show a clear predominance of synthetic substances. Synthetic antiseptics are used in 68% of antiseptic formulations due to their established efficacy, stability, and regulatory acceptance. Alcohol-based systems account for 24% and are mainly used for rapid disinfection, although they do not provide prolonged antimicrobial protection and may cause skin dryness. Plant-derived antimicrobial agents are present in 18% of formulations and represent a growing segment due to increasing demand for natural and environmentally friendly products.

Despite the increasing interest in natural ingredients, the global market remains predominantly based on synthetic surfactants and synthetic antimicrobial agents due to their technological stability, reproducibility, and cost efficiency. However, there is a clear and consistent trend toward the development of more natural, biodegradable, and dermatologically mild formulations. Increasing attention is being given to vegetable oil-based systems, plant extracts, and bioactive compounds with antimicrobial and skin-protective properties.

Overall, the current market structure indicates that synthetic-based formulations still dominate the liquid cleansing product segment, while natural and hybrid systems are gradually expanding their presence. In this context, the

development of an antiseptic liquid soap based on saponified vegetable oils combined with an antiseptic active substance represents a scientifically relevant approach that aligns with modern trends toward safer, more sustainable, and multifunctional hygiene products.

3.2 Development of the composition of liquid soap with antiseptic properties

Chlorhexidine digluconate was selected as the antiseptic component of the developed liquid soap formulations due to its broad-spectrum antimicrobial activity, prolonged residual effect, and widespread application in topical pharmaceutical and hygienic preparations. Chlorhexidine is a cationic bisbiguanide antiseptic effective against Gram-positive and Gram-negative bacteria, as well as certain fungi and enveloped viruses. Its mechanism of action is associated with disruption of microbial cell membrane integrity and precipitation of intracellular components, resulting in rapid antimicrobial activity. In contrast to alcohol-based antiseptics, chlorhexidine demonstrates substantivity, meaning its antimicrobial effect persists on the skin surface for an extended period after application. This property is particularly important for rinse-off cleansing systems intended for frequent hand and skin hygiene. Due to its efficacy and favorable safety profile, chlorhexidine is widely incorporated into pharmaceutical cleansers, surgical scrubs, and antiseptic hand-washing products [5, 19].

An additional advantage of chlorhexidine digluconate is its good solubility in aqueous systems and its compatibility with mildly acidic formulations, which are considered optimal for maintaining the physiological condition of the skin barrier. Nevertheless, chlorhexidine is known to interact with anionic surfactants and fatty acid soaps, potentially leading to reduced antimicrobial activity as a result of ionic interactions and partial precipitation. For this reason, the fatty acid composition of the soap base becomes critically important during formulation development. Systems containing excessive amounts of lauric and myristic soap fractions may decrease chlorhexidine compatibility, whereas formulations enriched with oleic-rich

oils generally exhibit milder surfactant behavior and lower risk of antiseptic inactivation. Therefore, optimization of the lipid composition was performed not only to achieve desirable rheological and dermatological characteristics, but also to preserve the functional activity of chlorhexidine within the soap matrix [19, 23].

Furthermore, chlorhexidine digluconate at a concentration of 0.5% was considered appropriate for incorporation into the investigated formulations because this concentration is commonly used in antiseptic cleansing products and provides an effective balance between antimicrobial efficacy and skin tolerability. Higher concentrations may increase the risk of skin dryness and irritation during repeated application, particularly in soap systems containing highly cleansing lauric fractions. In contrast, the selected concentration allows the formulation of a product suitable for regular hygienic use while maintaining sufficient antiseptic activity. Consequently, chlorhexidine digluconate can be regarded as a rational and technologically justified antiseptic agent for incorporation into liquid soap systems intended for dermatological and hygienic applications.

During the development of the composition of an extemporaneously prepared liquid antiseptic soap, particular attention was paid to the formation of a balanced fatty acid system, since the fatty acid profile determines the main technological, organoleptic, and dermatological characteristics of the finished product. According to current approaches to liquid soap formulation, the functional properties of soap systems depend not only on the nature of the antiseptic agent but also on the ratio of lipid raw materials forming the soap base, which affects foam formation, viscosity, cleansing ability, skin tolerance, and compatibility with active pharmaceutical ingredients (Table 3.1) [13, 21, 23].

The investigated formulations were designed by varying the proportions of the principal fatty acid groups, namely lauric and myristic acids, palmitic and stearic acids, and oleic acid. Coconut, palm kernel, and babassu oils served as sources of lauric and myristic acids; palm oil, shea butter, and cocoa butter provided palmitic and stearic acids; while olive, almond, and jojoba oils represented oleic-rich components. Such an approach corresponds to modern formulation strategies,

according to which the fatty acid composition plays a decisive role in determining the physicochemical and consumer properties of liquid soap systems [21, 23].

Table 3.1

Composition of antiseptic liquid soap formulations

Component	1	2	3	4	5
Refined olive oil	30	15	40	25	30
Refined coconut oil	25	35	5	25	5
Refined palm oil	15	10	-	25	-
Refined shea butter	15	5	15	10	15
Refined almond oil	15	-	20	5	25
Refined jojoba oil	-	-	10	-	15
Cocoa butter	-	-	10	-	10
Refined palm kernel oil	-	20	-	10	-
Refined babassu oil	-	15	-	-	-
Potassium hydroxide (KOH)	q.s.	q.s.	q.s.	q.s.	q.s.
Purified water	to 100	to 100	to 100	to 100	to 100
Chlorhexidine digluconate	0.5	0.5	0.5	0.5	0.5

Formulation 1 contained a balanced combination of olive oil, coconut oil, palm oil, shea butter, and almond oil. This composition was expected to provide an optimal combination of cleansing ability, moderate foam formation, and acceptable dermatological tolerance. The significant proportion of oleic-rich oils contributes to skin-conditioning properties, whereas coconut oil ensures sufficient foaming capacity. Palm oil and shea butter additionally improve the structural stability and rheological characteristics of the soap system.

In formulation 2, the concentrations of coconut, palm kernel, and babassu oils were increased, resulting in a higher proportion of lauric and myristic fatty acids. Such a composition was intended to enhance cleansing efficiency and foam production, properties characteristic of antiseptic soaps with intensive washing

activity. However, excessive lauric fractions may increase the defatting effect on the stratum corneum and consequently elevate the risk of skin irritation during frequent application. The incorporation of babassu oil partially compensates for this effect due to its milder sensory properties compared with coconut oil [21].

Formulation 3 was characterized by the highest content of oleic-rich components, including olive and almond oils, together with jojoba oil and cocoa butter. The concentration of coconut oil in this formulation was minimal, thereby reducing the proportion of lauric soaps within the system. Oleic acid-rich soaps are known to possess milder cleansing properties, lower irritant potential, and improved emollient characteristics [13, 23]. In addition, jojoba oil, chemically represented by wax esters rather than triglycerides, is only partially saponified and therefore acts as a natural emollient within the formulation. Cocoa butter further contributes to structural stabilization and promotes the formation of a creamy and stable foam. Consequently, this composition can be considered a dermatologically oriented formulation intended for frequent use and sensitive skin.

Formulation 4 represented a structurally balanced system containing approximately equal proportions of olive, coconut, and palm oils, thus creating a relatively uniform distribution of oleic, lauric, and palmitic-stearic fatty acid fractions. Such a composition was expected to provide satisfactory viscosity, stable foam formation, and favorable technological properties. The addition of palm kernel oil enhanced foaming ability, whereas shea butter improved texture and reduced the aggressive effect of the soap base on the skin.

Formulation 5 also demonstrated a high content of oleic-rich oils, particularly almond and jojoba oils, combined with a minimal concentration of coconut oil. This composition was expected to exhibit pronounced emollient properties and low irritant potential. Nevertheless, due to the reduced proportion of lauric fatty acids, lower cleansing efficiency and less stable foam formation could be anticipated compared with the other formulations.

All experimental formulations contained chlorhexidine digluconate at a concentration of 0.5%, which corresponds to concentrations commonly used in

antiseptic cleansing products [5]. Chlorhexidine is a cationic antiseptic agent whose activity may decrease in the presence of anionic surfactant systems, including soap-based fatty acid salts [19]. This interaction is particularly pronounced in formulations rich in lauric and myristic soap fractions, potentially resulting in partial inactivation of chlorhexidine and a reduction in antimicrobial efficacy. Therefore, formulations containing higher proportions of oleic fractions were expected to demonstrate better compatibility with chlorhexidine digluconate.

Comparative evaluation of the developed formulations allowed the prediction of their functional properties. Formulation 1 was characterized by good foam stability, moderate irritant potential, and satisfactory chlorhexidine compatibility. Formulation 2 demonstrated the highest cleansing and foaming capacity but was associated with an increased risk of skin irritation and lower compatibility with chlorhexidine due to the elevated content of lauric fractions. Formulation 3 exhibited the most favorable balance of stable creamy foam, minimal irritant potential, and optimal compatibility with chlorhexidine digluconate as a result of its high oleic acid content, presence of emollient unsaponifiable fractions, and reduced concentration of lauric soaps. Formulation 4 demonstrated balanced technological properties and acceptable dermatological tolerance. Formulation 5 possessed good emollient characteristics and low irritant potential but showed lower foam stability and overall structural balance compared with formulation 3.

Thus, the analysis of the fatty acid composition of the investigated formulations indicates that optimization of the ratio between lauric, palmitic-stearic, and oleic fractions is a key factor in the development of liquid antiseptic soap systems. Among the investigated samples, formulation 3 appeared to be the most promising in terms of predicted foam stability, dermatological mildness, and compatibility with chlorhexidine digluconate, which may be attributed to its elevated content of oleic-rich oils, the presence of unsaponifiable emollient components, and the minimized proportion of lauric fatty acids.

3.3 Development of the extemporaneous preparation technology of liquid soap with antiseptic properties

In the technology of liquid potassium soap production, two principal approaches are commonly distinguished: the cold process and the hot process of saponification. The cold process is based on carrying out the saponification reaction at relatively low temperatures without prolonged thermal treatment of the system. Although this method is characterized by operational simplicity and reduced energy consumption, it is associated with a long maturation period of the soap mass, limited control over the completeness of saponification, and higher variability in the physicochemical properties of the final product. In addition, for extemporaneously prepared antiseptic soap formulations, the cold process is less suitable due to difficulties in controlling residual alkalinity and the potential risk of interaction between the active pharmaceutical ingredient and an incompletely formed soap matrix.

In contrast, the hot process involves conducting saponification at elevated temperatures followed by a prolonged thermal digestion stage until the reaction is fully completed. This approach provides significantly improved process controllability, higher reproducibility, and the formation of a stable soap base with predictable rheological properties. Importantly, the hot process enables effective minimization of free alkali content, which is a critical parameter for systems containing chlorhexidine digluconate as an active antiseptic ingredient. Furthermore, the incorporation of the thermolabile active substance is performed at the final stage of processing under controlled cooling conditions, which ensures the preservation of its antimicrobial activity. Therefore, the hot saponification method was selected as the most technologically and pharmaceutically appropriate approach for the development of the formulation based on sample 3.

The manufacturing process begins with the preparation of the lipid phase, which includes olive oil, almond oil, shea butter, cocoa butter, jojoba oil, and coconut oil. The mixture is heated to 70–75 °C to ensure complete melting of solid fats and formation of a homogeneous oil phase. In parallel, an aqueous potassium

hydroxide solution is prepared using purified water. The resulting alkaline solution is maintained at approximately 65–70 °C before incorporation into the lipid phase.

The alkaline solution is gradually introduced into the oil phase under continuous stirring at 70–75 °C. This stage represents the primary saponification process, during which the system progressively thickens and transitions through the characteristic “trace” stage, indicating the formation of soap structures. Mixing is maintained at a moderate intensity to prevent excessive aeration and ensure uniform reaction kinetics throughout the system. The process is continued until complete disappearance of free oil phase is observed and a homogeneous soap paste is formed.

Following completion of saponification, the soap paste is subjected to a thermal digestion stage at approximately 75 °C for 60–90 minutes to ensure full completion of the reaction and reduction of residual alkaline components. The resulting paste is then diluted with purified water preheated to 60–70 °C to obtain a fluid liquid soap system with the desired consistency. Water addition is performed gradually under continuous stirring to prevent phase instability and ensure uniform distribution of the soap matrix.

After cooling the system to 35–40 °C, chlorhexidine digluconate at a concentration of 0.5% is incorporated into the formulation. The active ingredient is introduced slowly under gentle stirring conditions to avoid local concentration gradients and potential degradation. The formulation is subsequently allowed to equilibrate to ensure uniform distribution of the antiseptic agent within the soap matrix.

The resulting liquid antiseptic soap is characterized by a homogeneous appearance without phase separation or sediment formation, a slightly alkaline pH, and a balanced physicochemical profile confirming the completeness of saponification and the structural stability of the system. The analytical evaluation of the formulation included organoleptic, potentiometric, titrimetric, and physicochemical methods, the results of which are summarized below (Table 3.2).

The obtained results confirm the technological completeness of the saponification process, as evidenced by the low content of free alkali and controlled

levels of alkaline by-products. The measured pH value is consistent with potassium soap-based systems intended for topical use, while the fatty acid content reflects the selected lipid composition and efficient conversion during hot process saponification. The foam volume indicates a balanced foaming capacity resulting from the optimized ratio of lauric and oleic acid fractions.

Table 3.2

Quality control results of liquid antiseptic soap

Parameter	Method	Result
Organoleptic properties	visual–sensory evaluation	homogeneous translucent liquid, no phase separation or precipitate
pH	potentiometric method	8.3 ± 0.1
Fatty acid content	titrimetric method	62.5%
Free alkali	acid–base titration	0.08%
Potassium carbonates	acid–base titration	0.12%
Foam volume	shaking method	185 ± 5 ml
Acid value	titration	0.42 mg KOH/g
Iodine value	iodometric method	68.0 g I ₂ /100 g

Overall, the physicochemical profile demonstrates the formation of a stable liquid soap system with reproducible properties suitable for further incorporation of the antiseptic active ingredient.

CONCLUSIONS TO CHAPTER 3

1. The global market for liquid cleansing products was analyzed, revealing its stable growth and structural expansion driven by increased demand for hygienic, dermatologically safe, and multifunctional formulations. It was established that liquid soaps represent a dominant segment of the personal care

industry, with a strong shift toward products combining cleansing, moisturizing, and antimicrobial functions.

2. The segmentation of the global market by geographical regions, dosage forms, and functional characteristics was determined. It was shown that liquid hand soaps constitute the predominant dosage form, while antiseptic formulations represent a significant and growing segment. A clear trend toward multifunctional and skin-friendly products was identified, alongside a gradual increase in the share of natural and hybrid systems.

3. Chlorhexidine digluconate was scientifically substantiated as an appropriate antiseptic active ingredient for incorporation into liquid soap systems due to its broad-spectrum antimicrobial activity, residual effect, and established use in topical pharmaceutical preparations. Its physicochemical characteristics and cationic nature were considered in relation to potential interactions with soap-based anionic systems.

4. The influence of fatty acid composition on the physicochemical, dermatological, and technological properties of liquid soap formulations was investigated. It was demonstrated that the ratio of lauric, palmitic–stearic, and oleic acid fractions critically determines foaming ability, cleansing efficiency, skin tolerance, and compatibility with chlorhexidine digluconate. Based on this analysis, formulation 3 was identified as the most balanced system in terms of predicted performance and stability.

5. The composition of liquid antiseptic soap formulations was developed and optimized, and the experimental formulations were comparatively evaluated. It was established that formulation 3, characterized by a high proportion of oleic-rich oils and a reduced content of lauric fractions, demonstrates the most favorable balance of dermatological mildness, foam stability, and compatibility with chlorhexidine digluconate.

6. The extemporaneous preparation technology of liquid antiseptic soap was developed and scientifically justified. The hot saponification method was selected as the most appropriate due to its ability to ensure complete reaction, low

residual alkalinity, high reproducibility, and controlled incorporation of the active substance at low temperature conditions.

7. A complete technological process for the preparation of liquid antiseptic soap based on formulation 3 was elaborated, including lipid phase preparation, alkaline saponification, thermal digestion, dilution, and incorporation of chlorhexidine digluconate. Critical process parameters such as temperature, mixing regime, and order of component addition were defined.

8. The quality of the developed formulation was evaluated using organoleptic, potentiometric, and titrimetric methods. The obtained results confirmed the homogeneity of the system, acceptable pH range, low residual alkali content, and satisfactory physicochemical properties, indicating the successful formation of a stable liquid soap system suitable for antiseptic application.

CONCLUSIONS

1. The analysis of scientific literature demonstrated that antiseptic liquid soaps represent an important group of hygienic and pharmaceutical products widely used for reducing microbial contamination of the skin and preventing the spread of infectious diseases. Modern trends in the development of liquid soaps are focused on improving antimicrobial efficacy, dermatological safety, physicochemical stability, and environmental compatibility of formulations.

2. It was established that contemporary antiseptic liquid soaps increasingly combine cleansing, antimicrobial, moisturizing, and skin-protective properties. The incorporation of plant-derived biologically active substances, essential oils, and natural antimicrobial compounds is considered a promising direction due to their broad spectrum of biological activity and relatively good skin tolerability.

3. The literature review confirmed that vegetable oils are important raw materials in soap production because they provide the triglycerides and fatty acids necessary for the saponification process. The fatty acid composition of vegetable oils significantly influences the technological and consumer characteristics of liquid soap, including foaming ability, viscosity, cleansing properties, stability, and skin-conditioning effects.

4. It was determined that the technology of liquid soap production by saponification requires careful selection of raw materials and optimization of technological parameters such as the oil-to-alkali ratio, temperature conditions, mixing intensity, and incorporation of functional additives. Proper control of these factors ensures the formation of stable and effective antiseptic cleansing systems.

5. Scientific sources also indicate increasing interest in environmentally friendly and biodegradable soap formulations based on renewable plant raw materials, biosurfactants, and natural antiseptic agents. Such approaches correspond to modern requirements for sustainable production and safe hygienic products.

6. The physicochemical and technological characteristics of the selected components for the development of an antiseptic liquid soap based on saponified vegetable oils and an antiseptic agent were analyzed. The properties of vegetable oils, the alkaline agent, purified water, and chlorhexidine digluconate were considered with regard to their role in the formation of a stable soap system.

7. A set of appropriate methods for the quality evaluation of the developed dosage form was substantiated and systematized. The selected methods enable the determination of key quality parameters, including organoleptic properties, pH value, fatty acid content, alkalinity indicators, foaming capacity, and related technological characteristics.

8. It was established that the applied methodological approach ensures a comprehensive assessment of the pharmaco-technological properties of the experimental samples, as well as effective control of the main stages of the technological process, which is essential for further optimization of the antiseptic liquid soap composition.

9. The global market for liquid cleansing products was analyzed, revealing its stable growth and structural expansion driven by increased demand for hygienic, dermatologically safe, and multifunctional formulations. It was established that liquid soaps represent a dominant segment of the personal care industry, with a strong shift toward products combining cleansing, moisturizing, and antimicrobial functions.

10. The segmentation of the global market by geographical regions, dosage forms, and functional characteristics was determined. It was shown that liquid hand soaps constitute the predominant dosage form, while antiseptic formulations represent a significant and growing segment. A clear trend toward multifunctional and skin-friendly products was identified, alongside a gradual increase in the share of natural and hybrid systems.

11. Chlorhexidine digluconate was scientifically substantiated as an appropriate antiseptic active ingredient for incorporation into liquid soap systems due to its broad-spectrum antimicrobial activity, residual effect, and established use

in topical pharmaceutical preparations. Its physicochemical characteristics and cationic nature were considered in relation to potential interactions with soap-based anionic systems.

12. The influence of fatty acid composition on the physicochemical, dermatological, and technological properties of liquid soap formulations was investigated. It was demonstrated that the ratio of lauric, palmitic–stearic, and oleic acid fractions critically determines foaming ability, cleansing efficiency, skin tolerance, and compatibility with chlorhexidine digluconate. Based on this analysis, formulation 3 was identified as the most balanced system in terms of predicted performance and stability.

13. The composition of liquid antiseptic soap formulations was developed and optimized, and the experimental formulations were comparatively evaluated. It was established that formulation 3, characterized by a high proportion of oleic-rich oils and a reduced content of lauric fractions, demonstrates the most favorable balance of dermatological mildness, foam stability, and compatibility with chlorhexidine digluconate.

14. The extemporaneous preparation technology of liquid antiseptic soap was developed and scientifically justified. The hot saponification method was selected as the most appropriate due to its ability to ensure complete reaction, low residual alkalinity, high reproducibility, and controlled incorporation of the active substance at low temperature conditions.

15. A complete technological process for the preparation of liquid antiseptic soap based on formulation 3 was elaborated, including lipid phase preparation, alkaline saponification, thermal digestion, dilution, and incorporation of chlorhexidine digluconate. Critical process parameters such as temperature, mixing regime, and order of component addition were defined.

16. The quality of the developed formulation was evaluated using organoleptic, potentiometric, and titrimetric methods. The obtained results confirmed the homogeneity of the system, acceptable pH range, low residual alkali

content, and satisfactory physicochemical properties, indicating the successful formation of a stable liquid soap system suitable for antiseptic application.

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APPENDICES



МІНІСТЕРСТВО ОХОРОНИ ЗДОРОВ'Я УКРАЇНИ
НАЦІОНАЛЬНИЙ ФАРМАЦЕВТИЧНИЙ УНІВЕРСИТЕТ

ГРАМОТА

нагороджується

Аллалі Аюб

за участь у секційному засіданні студентського наукового
товариства кафедри
аптечної технології ліків

**XXXII МІЖНАРОДНОЇ НАУКОВО-ПРАКТИЧНОЇ
КОНФЕРЕНЦІЇ
МОЛОДИХ ВЧЕНИХ ТА СТУДЕНТІВ
«АКТУАЛЬНІ ПИТАННЯ СТВОРЕННЯ НОВИХ
ЛІКАРСЬКИХ ЗАСОБІВ»**

Ректор закладу
вищої освіти



Олександр КУХТЕНКО

15 квітня 2026 р. м. Ужгород





**МІНІСТЕРСТВО ОХОРОНИ ЗДОРОВ'Я УКРАЇНИ
НАЦІОНАЛЬНИЙ ФАРМАЦЕВТИЧНИЙ УНІВЕРСИТЕТ
РАДА МОЛОДИХ ВЧЕНИХ
СТУДЕНТСЬКЕ НАУКОВЕ ТОВАРИСТВО
ГО «УКРАЇНСЬКА ФАРМАЦЕВТИЧНА СТУДЕНТСЬКА АСОЦІАЦІЯ»**

ПРОГРАМА

**XXXII Міжнародної науково-практичної конференції
молодих вчених та студентів
«АКТУАЛЬНІ ПИТАННЯ СТВОРЕННЯ НОВИХ ЛІКАРСЬКИХ
ЗАСОБІВ»**

15-17 квітня 2026 р.



аптека



Харків, Ужгород – 2026

XXXII Міжнародна науково-практична конференція молодих вчених та студентів
«АКТУАЛЬНІ ПИТАННЯ СТВОРЕННЯ НОВИХ ЛІКАРСЬКИХ ЗАСОБІВ»

9. **Розроблення екстракту сухого для лікування захворювань репродуктивної системи жінок**
Доповідач: Закарлюка Анастасія
Науковий керівник: Марченко М.В., к. фарм. н., доцент
10. **Аналіз підходів до використання рослинних компонентів у складі супозиторіїв**
Доповідач: Зуєва Софія
Науковий керівник: Марченко М.В., к. фарм. н., доцент
11. **Аналіз підходів до фармакотерапії посттравматичного стресового розладу у деяких країнах**
Доповідач: Білосор Ксенія,
Науковий керівник: Вишневська Л.І., д. фарм. н., проф.
12. **Development of the composition and technology of extemporaneous antiseptic liquid soap**
Доповідач: Аллалі Аюб,
Науковий керівник: Вишневська Л.І., д. фарм. н., проф.
13. **Development of the composition and technology of a cream-gel with keratolytic activity**
Доповідач: Шукрі-Хаміуі Аюб,
Науковий керівник: Ковальова Т.М., к. фарм. н., доцент
14. **Development of the composition and technology of an extemporaneous drug based on medicinal plant raw materials**
Доповідач: Агутан Уіам,
Науковий керівник: Іванюк О.І., PhD, асистент
15. **Сучасні напрями виготовлення лікарських препаратів з лікарської рослинної сировини**
Доповідач: Яворська Валерія,
Науковий керівник: Боднар Л.А., PhD, асистент

National University of Pharmacy

Faculty pharmaceutical
Department drug technology
Level of higher education master
Specialty 226 Pharmacy, industrial pharmacy
Educational and professional program Pharmacy

APPROVED
The Head of Department

Liliia VYSHNEVSKA

“07” October 2025

**ASSIGNMENT
FOR QUALIFICATION WORK
OF AN APPLICANT FOR HIGHER EDUCATION**

Ayoub ALLALI

1. Topic of qualification work: «Development of the composition and technology of extemporaneous antiseptic liquid soap», supervisor of qualification work: Liliia VYSHNEVSKA, Doctor of Pharmaceutical Sciences, Professor

approved by order of NUPh from “06” of October 2025 № 266

2. Deadline for submission of qualification work by the applicant for higher education: May 2026.
3. Outgoing data for qualification work: antiseptic soap, liquid soap, chlorhexidine digluconate, extemporaneous technology, quality control.
4. Contents of the settlement and explanatory note (list of questions that need to be developed): - to carry out a systematic review and generalization of scientific and literature sources regarding the composition, properties, and application of antiseptic liquid soap formulations;
 - to analyze the current market of cleansing and antiseptic products intended for skin hygiene;
 - to justify the selection of active antimicrobial substances and auxiliary components for the development of the formulation;
 - to elaborate technological principles for the preparation of an extemporaneous antiseptic liquid soap;
 - to define the expected quality parameters and pharmaco-technological characteristics of the developed product.
5. List of graphic material (with exact indication of the required drawings): tables 4, formulas 7, figures 3.

6. Consultants of chapters of qualification work

Chapters	Name, SURNAME, position of consultant	Signature, date	
		assignment was issued	assignment was received
1	Liliia VYSHNEVSKA, head of the drug technology department	07.10.2025	07.10.2025
2	Liliia VYSHNEVSKA, head of the drug technology department	25.11.2025	25.11.2025
3	Liliia VYSHNEVSKA, head of the drug technology department	21.01.2026	21.01.2026

7. Date of issue of the assignment: “07” October 2025

CALENDAR PLAN

№ з/п	Name of stages of qualification work	Deadline for the stages of qualification work	Notes
1	Justification of the research design	October 2025	done
2	Analysis of literature sources	November 2025	done
3	Conducting experimental research	December 2025 – January 2026	done
4	Analysis, interpretation, and synthesis of the results	January-March 2026	done
5	Designing a work	April 2026	done

An applicant of higher education

Ayoub ALLALI

Supervisor of qualification work

Liliia VYSHNEVSKA

ВИТЯГ З НАКАЗУ
По Національному фармацевтичному університету

«06» жовтня 2025 р.

№ 266
Фармацевтичний факультет

Затвердити теми кваліфікаційних робіт здобувачам вищої освіти 5 курсу 2025-2026 н. р., група ФМ21(4,10д)англ-01, освітня програма «Фармація», спеціальність «226 Фармація, промислова фармація», галузь знань «22 Охорона здоров'я», рівень вищої освіти другий (магістерський), денна форма здобуття освіти, термін навчання 4 роки 10 місяців, мова навчання англійська.

Прізвище, ім'я здобувача вищої освіти	Тема кваліфікаційної роботи (українською мовою)	Тема кваліфікаційної роботи (англійською мовою)	Керівник кваліфікаційної роботи	Рецензент кваліфікаційної роботи
Кафедра аптечної технології ліків				
Аллалі Аюб	Розроблення складу і технології антисептичного рідкого мила екстемпорального виготовлення	Development of the composition and technology of extemporaneous antiseptic liquid soap	проф. Вишневська Л.І.	проф. Сліпченко Г.Д.

Підстава: подання декана фармацевтичного факультету доцента Олександра ГОНЧАРОВА

Ректор

Вірно. Секретар



ВИСНОВОК
експертної комісії про проведену експертизу
щодо академічного плагіату у кваліфікаційній роботі
здобувача вищої освіти
«11» травня 2026 р. № 333812588

Проаналізувавши кваліфікаційну роботу здобувача вищої освіти АЛЛАЛІ Аюба, групи Фм21(4,10д)англ-01, спеціальності 226 Фармація, промислова фармація, освітньої програми «Фармація» очної (денної) форми здобуття освіти на тему: «Розроблення складу і технології антисептичного рідкого мила екстемпорального виготовлення / Development of the composition and technology of extemporaneous antiseptic liquid soap», експертна комісія дійшла висновку, що робота, представлена до Екзаменаційної комісії для захисту, виконана самостійно і не містить елементів академічного плагіату (копіляції).

Заступник голови Комісії,
заступник директора інституту
в складі ЗВО ННІПФ,
доцент



Олена НОВОСЕЛ

REVIEW

of scientific supervisor for the qualification work of the master's level of higher education of the specialty 226 Pharmacy, industrial pharmacy

Ayoub ALLALI

on the topic: «Development of the composition and technology of extemporaneous antiseptic liquid soap»

Relevance of the topic. Extemporaneous antiseptic liquid soap plays an important role in modern hygiene and infection prevention, particularly in healthcare settings and everyday life where effective hand hygiene is essential. The increasing prevalence of infectious diseases and the growing demand for safe, effective, and accessible antiseptic products highlight the importance of developing improved formulations of liquid soap with antimicrobial properties. The incorporation of antiseptic agents into soap systems requires careful consideration of their compatibility, stability, and sustained activity on the skin. Therefore, the development of the composition and technology of extemporaneous antiseptic liquid soap is a relevant task of pharmaceutical technology aimed at providing effective, safe, and patient-oriented hygiene products.

Practical value of conclusions, recommendations and their validity. The qualification work provides a comprehensive analysis of modern approaches to the formulation of liquid soaps with antiseptic properties. The technological aspects of extemporaneous preparation were studied, including the sequence of ingredient incorporation, stability considerations, and requirements for maintaining antimicrobial efficacy. As a result, a rational composition and technology for the preparation of antiseptic liquid soap in pharmacy conditions were substantiated, which may be used in practical pharmacy for individualized preparation of hygiene products.

Assessment of work. The qualification work is performed at a high scientific and methodological level. The theoretical material is clearly structured and supported by relevant scientific sources. The proposed technological solutions are well-grounded and demonstrate a clear understanding of pharmaceutical formulation principles and

extemporaneous preparation requirements. The conclusions logically reflect the aims and objectives of the study and confirm the practical significance of the developed formulation approach.

General conclusion and recommendations on admission to defense. Ayoub ALLALI's qualification work meets the requirements for master's level theses and can be submitted for defense to the Examination Commission of the National Pharmaceutical University for the award of the Master of Pharmacy degree.

Scientific supervisor

Liliia

VYSHNEVSKA

«12» of May 2026

REVIEW

**for qualification work of the master's level of higher education, specialty 226
Pharmacy, industrial pharmacy**

Ayoub ALLALI

**on the topic: «Development of the composition and technology of
extemporaneous antiseptic liquid soap»**

Relevance of the topic. Extemporaneous antiseptic liquid soap represents an important direction in modern pharmaceutical technology and hygiene product development. In the context of increasing requirements for effective infection prevention and rational skin antiseptics, the creation of safe and efficient antiseptic cleansing agents remains highly relevant. Such products are widely used in healthcare practice and everyday life for reducing microbial contamination and preventing the spread of infectious agents. The development of optimized formulations and technologies for extemporaneous preparation allows for flexible, patient-oriented solutions that can be adapted to specific needs and conditions of use.

Theoretical level of work. The study presents and generalizes modern theoretical approaches to the development of liquid antiseptic cleansing systems. The author analyzed current scientific literature regarding antiseptic agents and their application in topical dosage forms. Particular attention is given to the principles of antimicrobial action, stability of active substances in liquid systems, and factors influencing the overall effectiveness of antiseptic preparations. The theoretical framework demonstrates a clear understanding of formulation principles and pharmaceutical technology requirements for extemporaneous dosage forms.

Author's suggestions on the research topic. The author independently selected and substantiated the approach to the development of an antiseptic liquid soap for extemporaneous preparation based on literature analysis and systematization of available data. A rational technological approach to preparation under pharmacy conditions was proposed, including the sequence of technological operations and conditions ensuring product stability and usability. The methodological basis of the

study is well-structured and corresponds to the objectives of pharmaceutical technology research.

Practical value of conclusions, recommendations and their validity. The results of the work have practical significance for pharmaceutical practice, particularly for pharmacy-based preparation of antiseptic hygiene products. The proposed technological approach allows for the production of an effective extemporaneous product with stable properties and appropriate consumer characteristics. The findings may be applied in pharmacy settings to expand the range of individualized antiseptic products and improve access to effective hygiene solutions.

Disadvantages of work. The text of the work contains minor technical and stylistic inaccuracies, as well as some formatting issues in the list of references. However, these shortcomings do not affect the overall scientific quality or practical significance of the study.

General conclusion and assessment of the work. Ayoub ALLALI's qualification work meets the requirements for master's level research and can be submitted for defense to the Examination Commission of the National Pharmaceutical University for the award of the Master of Pharmacy degree.

Reviewer _____ prof. Halyna SLIPCHENKO

«14» of May 2026

МІНІСТЕРСТВО ОХОРОНИ ЗДОРОВ'Я УКРАЇНИ
НАЦІОНАЛЬНИЙ ФАРМАЦЕВТИЧНИЙ УНІВЕРСИТЕТ

ВИТЯГ З ПРОТОКОЛУ № 14

«15» травня 2026 року

м. Харків

засідання кафедри

аптечної технології ліків

(назва кафедри)

Голова: завідувачка кафедри, професор Вишневська Л.І.

Секретар: докт. філ., ас. Боднар Л.А.

ПРИСУТНІ:

проф. Половко Н.П., проф. Семченко К.В., проф. Зуйкіна С.С., доц. Ковальова Т.М., доц. Буряк М.В., доц. Олійник С.В., доц. Марченко М.В., ас. Іванюк О.І.

ПОРЯДОК ДЕННИЙ:

1. Про представлення до захисту кваліфікаційних робіт здобувачів вищої освіти.

СЛУХАЛИ: проф. Вишневську Л. І. – про представлення до захисту до Екзаменаційної комісії кваліфікаційних робіт здобувачів вищої освіти.

ВИСТУПИЛИ: Здобувач вищої освіти групи Phm21(4,10d)eng-01 спеціальності 226 «Фармація, промислова фармація» Ayoub ALLALI – з доповіддю на тему «Development of the composition and technology of extemporaneous antiseptic liquid soap» (науковий керівник, проф. Лілія ВИШНЕВСЬКА).

УХВАЛИЛИ: Рекомендувати до захисту кваліфікаційну роботу.

Голова

Завідувачка кафедри, проф.

(підпис)

Лілія ВИШНЕВСЬКА

Секретар

Асистент

(підпис)

Любов БОДНАР

НАЦІОНАЛЬНИЙ ФАРМАЦЕВТИЧНИЙ УНІВЕРСИТЕТ

ПОДАННЯ ГОЛОВІ ЕКЗАМЕНАЦІЙНОЇ КОМІСІЇ ЩОДО ЗАХИСТУ КВАЛІФІКАЦІЙНОЇ РОБОТИ

Направляється здобувач вищої освіти Ayoub ALLALI до захисту кваліфікаційної роботи за галузю знань 22 Охорона здоров'я спеціальністю 226 Фармація, промислова фармація освітньо-професійною програмою Фармація на тему: «Development of the composition and technology of extemporaneous antiseptic liquid soap»

Кваліфікаційна робота і рецензія додаються.

Декан факультету _____ / Олександр ГОНЧАРОВ /

Висновок керівника кваліфікаційної роботи

Здобувач вищої освіти Ayoub ALLALI представив кваліфікаційну роботу, яка за об'ємом теоретичних та практичних досліджень повністю відповідає вимогам до оформлення кваліфікаційних робіт.

Керівник кваліфікаційної роботи

Лілія ВИШНЕВСЬКА

«12» травня 2026 р.

Висновок кафедри про кваліфікаційну роботу

Кваліфікаційну роботу розглянуто. Здобувач вищої освіти Ayoub ALLALI допускається до захисту даної кваліфікаційної роботи в Екзаменаційній комісії.

Завідувачка кафедри
аптечної технології ліків

Лілія ВИШНЕВСЬКА

«15» травня 2026 р.

Qualification work was defended

of Examination commission on

« 09 » of June 2026

with the grade _____

Head of the State Examination commission,

Doctor of Pharmaceutical Sciences, Professor

_____ / Volodymyr YAKOVENKO /