



Trends in Formulation of Night Cream Containing Essential Oil

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Abstract

Night creams play a pivotal role in skincare routines by safeguarding against nocturnal moisture loss and promoting a smooth, wrinkle-free complexion. However, conventional formulations of night creams often incorporate synthetic active substances, potentially leading to adverse effects over prolonged use. Addressing this concern involves substituting these synthetic compounds with natural ingredients, particularly essential oils, renowned for their diverse skincare benefits encompassing anti-acne, anti-aging, anti-wrinkle, and moisturizing properties. A systematic review was conducted to establish a foundation for future investigations, focusing on the integration of essential oils in night cream formulations. The outcomes revealed that various night cream formulations, enriched with essential oils derived from natural ingredients such as rosemary oil, camellia oil, clove oil, geranium oil, lemongrass oil, rosehip oil, and sandalwood oil, demonstrate remarkable efficacy in preserving skin moisture. The versatility of essential oils has been showcased in the development of night creams, boasting diverse beneficial effects across skincare concerns. This systematic investigation highlights the potential of essential oil-based night creams, which have recently gained traction in the global market. The burgeoning introduction of these products signifies an escalating demand for such skincare solutions and points towards promising prospects for future advancements in essential oil-based night creams.

Keywords: essential oils, formulation, natural product chemistry, night cream, patchouli oil, skincare

1. INTRODUCTION

The skin, as evident, plays a significant physiological role in protection, regulation, and sensation, profoundly impacting an individual's psychological well-being. To shield our skin from external aggressors and preserve our appearance for overall health and well-being, the practice of caring for the skin is referred to as a skincare routine. This regimen is crucial for maintaining healthy, attractive skin. Proper skincare safeguards the epidermis, sustains overall skin hydration, and bolsters a robust skin barrier. Sustaining healthy and functional skin is pivotal for our well-being, with protection, cleansing, and moisturizing serving as key components in an effective skincare routine, ensuring the skin's quality and integrity (Ahmed et al. 2020; Surber et al. 2018).

A clinical study investigating the efficacy of two advanced skincare routines versus a simpler routine over a 12-week period concluded that the comprehensive skincare

regimen substantially and exponentially improves various aspects of facial skin instantly and over time, in contrast to the simpler routine. This is evident in the considerable enhancements in skin hydration and brightness, along with noticeable improvements in facial wrinkles and fine lines. The advanced skincare regimen comprises cleanser, toner, eye cream, serum, day cream, and night cream (Syaharani et al. 2023; Isnaini et al. 2023; O'Connor et al. 2020).

Night cream, or the application of moisturizers before bedtime, plays a crucial role in maintaining skin hydration and averting premature aging. While you sleep, skin cells undergo a reparative phase to address the damage accrued throughout the day (Lyons et al. 2019). Simultaneously, the skin experiences a loss of moisture, potentially leading to dryness upon waking. Regardless of one's skin type, nocturnal moisture loss is a universal occurrence, influenced by the body's circadian rhythm. Research published in the *Journal of Investigative Dermatology* indicates that the skin

barrier's efficacy diminishes during the night, increasing permeability and facilitating molecular movement. Consequently, data suggests that trans-epidermal water loss (TEWL) tends to be higher overnight compared to daytime (Yosipovitch et al. 1998). TEWL signifies the evaporation of skin moisture, not only causing dryness but also exerting additional effects. The appearance of fine lines and wrinkles can be influenced by moisture loss through the skin barrier. Another study suggests that the skin barrier exhibits increased permeability during the night. This implies that skincare products, such as facial moisturizers, applied during your nighttime skincare routine can be more effectively absorbed by the skin's surface compared to other times of the day (Yosipovitch et al. 1998). Therefore, it's an opportune moment to incorporate your skincare regimen, including the use of a night cream.

The distinction between day cream and night cream lies in their intended purposes. Day creams are formulated to protect the skin from UV rays, pollution, and environmental stressors encountered during the day. They contain SPF for sun protection and antioxidants to combat free radicals and photoaging. Typically lightweight, day creams are quickly absorbed and allow the skin pores to breathe, intended for use beneath makeup. Conversely, night creams primarily focus on moisturizing and repairing the skin, promoting a supple, wrinkle-free appearance. High-quality night creams incorporate antioxidants and wrinkle-reducing ingredients, contributing to slowing down the aging process (Mohiuddin, 2019). Examples of synthetic antioxidants include butyl hydroxy anisole (BHA), butyl hydroxytoluene (BHT), propyl gallate, and tertiary butylhydroquinone (TBHQ) (Xu et al. 2021). These synthetic antioxidants may lead to side effects such as lung and liver damage or carcinogenicity (Fitriana, 2015). Consequently, these adverse effects have stimulated research into plant-derived antioxidants. One avenue involves substituting synthetic active ingredients with essential oils in night cream formulations.

Essential oils, aromatic essences derived from natural sources, find application in pharmaceuticals, food, perfumery, hygiene, and beauty products when concentrated (Isnaini et al. 2022). This oil stands as a superior alternative to synthetic chemical preservatives, exhibiting fewer adverse effects on humans or the environment (Naeem et al. 2018). EOs (Essential Oils) and EOCs (Essential Oil Components) have garnered recent popularity as constituents in skincare products. The utilization of their biological properties, including antimicrobial, anti-inflammatory, and antioxidant characteristics, is increasingly favored in skincare products. This review aims to lay the groundwork for upcoming studies, concentrating on incorporating essential oils into formulations for night creams.

2. CREAMS

Cream is a semi-solid preparation presented as a thick emulsion containing no less than 60% water. These formulations contain one or more active compounds dissolved or dispersed within a suitable base, typically an oil-in-water emulsion or an aqueous microcrystalline

dispersion of long-chain fatty acids or alcohols. These bases are water-washable and meet cosmetic and aesthetic standards. Creams are uniform and comprise opaque emulsion systems. Their consistency and rheological properties are contingent upon the emulsion type, either water-in-oil (W/O) or oil-in-water (O/W), as well as the characteristics of the solids within the internal phase (Maqbool et al. 2017).

Creams are categorized into two types: oil-in-water (O/W) creams, comprising small oil droplets dispersed in a continuous phase, and water-in-oil (W/O) creams, consisting of tiny water droplets dispersed in an ongoing oily phase (Gani et al. 2020; Isnaini et al. 2019). The selection of the emulsifying agent and the proportions of each liquid phase are pivotal in determining which phase, aqueous or oil, becomes the dispersed phase. Hence, an oil-in-water (O/W) emulsion refers to a situation where oil forms droplets dispersed throughout the aqueous phase. Conversely, the water-in-oil (W/O) emulsion is fashioned when water serves as the dispersed phase while oil acts as the dispersion medium. Creams infused with oil are less greasy and easier to rinse off with water, making them more appealing and cosmetically agreeable. Although water-in-oil creams present more challenges in formulation compared to oil-in-water creams, many medications blended into creams tend to be hydrophobic and, consequently, will release more readily from the latter. Furthermore, water-in-oil creams are typically more hydrating (Mohiuddin, 2019). Based on their intended use, distinct characteristics, and emulsion type, various cream types exist as follows:

- Make-up cream (O/W emulsion): Vanishing creams, Foundation creams
- Cleansing cream, cleansing milk, cleansing lotion (w/o emulsion)
- Winter cream (W/O emulsion)
- All-purpose cream and general creams
- Night cream and massage creams
- Skin protective cream
- Hand and body creams

Night cream is a product intended to remain on the skin throughout the night, replenishing essential nutrients lost during the day. The general requirements for an effective night cream are as follows:

- Provides essential nutrients to the skin throughout the night
- The oil phase needs to be in continuous contact with the skin and forms a protective film quickly without cleansing
- Causes dispersed water particles to be trapped in the oil and makes the product more resistant to washing off.
- Night cream has the ability to moisturize the skin.

The benefits of using night cream include reducing the likelihood of skin problems, minimizing various blemishes, preventing skin sagging, soothing the skin, aiding in maintaining youthful skin, and combating wrinkles.

However, additional benefits are determined by the active ingredients present in the night cream.

3. ESSENTIAL OILS

For thousands of years, diverse cultures have utilized essential oils for medicinal purposes. These oils are highly concentrated hydrophobic liquids containing volatile chemical components derived from plants, renowned for their rapid evaporation at room temperature. They are predominantly found in oil glands or sacs situated at various depths within fruit peels, particularly in the flavedo portion and cuticles (Mahato et al. 2019). EOs encompass aromatic chemicals extracted from various parts of plants, including leaves, barks, seeds, flowers, and peels (Tongnuanchan and Benjakul, 2014; Muhammad et al. 2022).

EOs have recently surged in popularity as active components within skincare products. The increasing trend involves harnessing the biological capabilities of these molecules, which encompass antibacterial, anti-inflammatory, and antioxidant properties, aiming to sustain youthful, healthy-looking skin while fortifying it against environmental affects (Desiyana et al. 2023; Aburjai and Natsheh, 2003; Maryam et al. 2023; Isnaini et al. 2022). Specifically, incorporating EOs in skincare regimens aids in upholding the protective function of the stratum corneum and preserving the skin's microbiota, crucial for maintaining skin health (Beri et al. 2018; Wińska et al. 2019). Table 1 provides an overview of potential applications of various essential oils in skincare.

Table 1. Some potential applications of essential oils in skin care

Essential Oil	Plant	Application	References	
Citronella grass	<i>Cymbopogon nardus</i>	Anti-acne	Lertsatitthanakorn et al. 2006	
Palmarosa	<i>Cymbopogon martini</i>		Mahant et al. 2021	
Artemisin	<i>Artemisia annua</i>		Tao et al. 2021	
Geranium	<i>Geranium rotundifolium</i>		Sinha et al. 2014	
Geranium	<i>Geranium rotundifolium</i>	Anti-aging	Nawarathne et al. 2019	
Patchouli	<i>Pogostemon cablin</i>		Sinha et al. 2014	
Nutmeg	<i>Myristica fragrans</i>		Rahmi et al. 2021	
Citronella	<i>Cymbopogon nardus</i>		Rahmi et al. 2021	
Clove	<i>Syzygium aromaticum</i>		Rahmi et al. 2021	
Shell Ginger	<i>Alpinia zerumbet</i>		Be Tu and Tawata, 2015	
Lemon	<i>Citrus lemon</i>		Ben Hsouna et al. 2017	
Lavender	<i>Lavandula officinalis</i>		De Andrade et al. 2021	
Sage	<i>Salvia officinalis</i>		De Andrade et al. 2021	
Rosehip	<i>Rosa canina</i>		Phetcharat et al. 2015	
Carrot	<i>Daucus carota</i>		Singh et al. 2019	
Patchouli	<i>Pogostemon cablin</i>		Anti-wrinkle	Rahmi et al. 2021; Lin et al. 2014
Nutmeg	<i>Myristica fragrans</i>			Rahmi et al. 2021
Citronella	<i>Cymbopogon nardus</i>			Rahmi et al. 2021
Clove	<i>Syzygium aromaticum</i>	Rahmi et al. 2021		
Ylang-ylang	<i>Cananga odorata</i>	Tan el al. 2015		
Carrot	<i>Daucus carota</i>	Singh et al. 2019		
Neroli	<i>Citrus sinensis</i>	Ao et al. 2008		
Rosehip	<i>Rosa canina</i>	Phetcharat et al. 2015		
Rosehip	<i>Rosa canina</i>	Moisturizer	Dabrowska et al. 2019; Fukada et al. 2019; Mohebitabar et al. 2017	
Sandalwood	<i>Santalum spicatum</i>		Saraf, 2012	
Chamomile	<i>Matricaria chamomilla</i>		Varothai et al. 2013	
Geranium	<i>Geranium rotundifolium</i>	Oily skin	Happy et al. 2021	
Neroli	<i>Citrus sinensis</i>		Ao et al. 2008	
Ylang-ylang	<i>Cananga odorata</i>		Tan el al. 2015	

Mechanism of Action of Essential Oils as Antimicrobials

The antibacterial efficacy of essential oils (EOs) or specific microbial strains relies significantly on their mechanism of action. Gram-positive bacteria, characterized

by the absence of the lipopolysaccharide layer found in gram-negative bacteria, exhibit reduced susceptibility to EOs. Consequently, EOs can more easily penetrate gram-positive bacteria than gram-negative bacteria. Notably, the

presence of lipoteichoic acid aids in the permeation of EOs into the cells of gram-positive bacteria. Extensive research describes that the bioactive constituents within EOs adhere to the cell surface and infiltrate the phospholipid bilayer of the cell membrane. This infiltration causes damage to the membrane, disrupting the cellular metabolic processes and ultimately resulting in cell demise. As a consequence of this membrane damage, critical intracellular components such as cell membrane integrity undergo alteration, ultimately leading to cell malfunction or death (Rai et al. 2017).

Mechanism of Action of Essential Oils as Antioxidant

Excessive free radicals induced by UV radiation can induce oxidative stress, leading to damage in healthy cells and a decline in collagen levels, thereby accelerating skin cell aging (Prajaputra et al. 2023). Antioxidants play a crucial role in neutralizing the impact of free radicals by filling their electron vacancies, offering protective benefits against skin damage caused by these radicals. The

mechanism underlying essential oils involves donating a hydrogen atom (H) to a free radical, resulting in the formation of a more stable compound. This action effectively mitigates the harmful effects of free radicals, contributing to the skin's defense against oxidative stress.

4. ESSENTIAL OIL USED IN THE FORMULATION OF CREAM

The essential oil employed in the formulation of the cream serves a pivotal role in its composition. Essential oils are concentrated, hydrophobic liquids extracted from plants, containing volatile aromatic compounds. They contribute distinct characteristics to the cream, such as fragrance, therapeutic properties, and potential skincare benefits. Depending on the specific oil chosen, it can offer various effects, including but not limited to moisturization, soothing properties, antioxidant activity, or antimicrobial effects. The essential oil used in formulating the cream, as presented in Table 2.

Table 2. The essential oil utilized in the cream's formulation

Essential Oil	Plant	Properties	Active compounds	Excepiant	References
Rosemary	<i>Rosmarinus officinalis</i>	Anti-wrinkle	Carnosol and carnosic acid	Sweet almond oil, nonionic emulsifying wax, white soft paraffin, methyl paraben, propyl paraben, tween 80, glycerine, distilled water.	Alzomor et al., 2015
Camellia	<i>Camellia japonica</i>	Anti-oxidant, anti-aging	β -amyrin, cycloartenol, lanosterol, lupeol, β -sitosterol, squalene	Olive oil, stearic acid, TEA, cetyl alcohol, propylene glycol, propyl paraben, methyl paraben, aquadest.	Arifin et al. 2022
Nutmeg	<i>Myristica fragrans</i>	Anti-aging	Sabinene, 4-terpeneol, myristicin	Stearic acid, vaseline album, TEA, PEG, methyl paraben, aquadest	Djarami et al. 2020
Clove	<i>Syzygium aromaticum</i>	Anti-acne/ anti-microbial	Eugenol, eugenol acetate, and caryophyllene	Cetaceum, cera alba, liquid paraffin, sodium tetra borate, and distilled water	Pranawati et al. 2016
Geranium	<i>Geranium rotundifolium</i>	Anti-aging	Citronellol, geraniol, α -pinene, trans- β -ocimene, dihydrotage- tone, cis-tagetone, neo-allo-ocimene, and 1,8 cineole	Bees wax, stearic acid, cetyl alcohol, olive oil, span 60, tween 60, aloe vera gel.	Lohani and Pierfrancesco, 2022
Citronella	<i>Cymbopogon nardus</i>	Anti-acne, anti-aging, anti-wrinkle	Citronellal, citronellol, and geraniol	Tween 60, span 60, cetly alcohol, stearyl alcohol, sodium benzoate, glycerine, α -tocopherol, aquadest	Singh et al. 2012; Nareswati et al. 2023
Rosehip	<i>Rosa canina</i>	Anti-aging	Linoleic acid, linolenic acid and oleic acid	Liquid paraffin, lanolin, stearic acid, cetyl alcohol, propylene glycol, glycerin, tween 60, TEA, methyl paraben, water	Ayub and Bipul, 2017

Essential Oil	Plant	Properties	Active compounds	Excepiant	References
Sandalwood	<i>Santalum spicatum</i>	Anti-aging	α -bisabolol, (E)-farnesol, nuciferol, α -santalol, β -santalol	Stearic acid, sodium lauryl sulfate, propylene glycol, dimethicone, cetyl alcohol, methyl paraben, propyl paraben, glycerine, TEA, aquadest	Misra and Dey, 2013
Patchouli	<i>Pogostemon cablin</i>	Moisturizer	Pachoulol	Steric acid, cetyl alcohol, sorbitol, propylene glycol, TEA, methyl paraben, glycerine, distilled water	Waruwu, 2022




5. NIGHT CREAM PRODUCTS AVAILABLE IN MARKET GLOBALLY

Night cream products available globally offer a diverse range of formulations designed for nocturnal skincare. These products aim to address various skin concerns during the night, such as hydration, rejuvenation, and targeting specific skin issues like aging signs or dryness. Night creams often contain a blend of active ingredients, including essential oils, vitamins, peptides, and hyaluronic acid, tailored to provide

retention, promote collagen production, and enhance skin repair processes during sleep. They cater to different skin types, offering options for oily, dry, combination, or sensitive skin. Global markets offer a wide array of night creams from renowned skincare brands, each highlighting unique formulations, textures, and targeted benefits, providing consumers with a multitude of choices to suit their specific skincare needs. Several night creams containing essential oils are displayed in Table 3.

Table 3. Night cream products available in market globally

Products	Essential Oils	Ingredients
OVI Earth Organic Night Cream 	Primrose oil, rosehip oil, ylang ylang oil, lavender oil, geranium oil, and ylang ylang oil	Purified water, shea butter, cetearyl olivate/sorbitan olivate, cocoa butter, Hemp oil, olive oil, cetyl stearyl alcohol, evening primrose oil , tocopherol, sunflower oil infused with comfrey and calendula, gluconolactone, sodium benzoate, rosehip oil , rosemary extract , ylang ylang oil , geranium oil , lavender oil , chamomile oil
Indya Skin care Honey & Clove Oil Scar Reduction Face Cream 	Clove oil and cinnamon oil	DM Water Q.S., Soya Oil, Glycerin, Aloe Vera Gel, Honey, Shea Butter, Glyceryl Monostearate, Cetearyl Alcohol, Sunflower Oil, Clove Oil , Cinnamon Oil , Potato extract, Hibiscus Extract, 2-Phenoxyethanol, N-Capryloyl Glycine & N-Undecylenoyl Glycine, Fragrance Oil
Hey Georgeous Night Moisturizer 	Rosehip oil, rosemary oil, and evening primrose oil	Antioxidant micro-clustered water, jojoba oil, rosehip seed oil , shea butter, cetearyl olivate and sorbitan olivate (olive oil emulsifier), pomegranate, pumpkin and carrot, resveratrol, green tea extract, squalane, evening primrose oil , rosemary oil extract, lecithin, xanthan gum, citric acid, essential oils of rosemary, lavender, bergamot, radish root ferment filtrate natural preservative system

Products	Essential Oils	Ingredients
<p>Siaralux Night Cream</p> 	Lavender oil	Water, squalane, glycerine, butylene glycol, polyacrylate-13, paeonia lactiflora root extract, trehalose, sodium hyaluronate, saccharide isomerate, dimethylmethoxy chromanol, niacinamide, calcium pantothenate, sodium ascorbyl phosphate, tocopheryl acetate, pyridoxine HCl, lavender oil , phenoxyethanol, ethylhexylglycerine, xanthan gum, maltodextrin, sodium starch octenyl succinate, silica, polyisobutene, potassium sorbate, polysorbate 20, citric acid, sodium citrate, sodium benzoate
	Lavender oil, rosemary oil, and primrose oil	Water, glycerine, capric triglyceride, cetearyl alcohol, propanediol, shea butter, squalane, dicapryl carbonate, glyceryl stearate, cellulose, cetearyl glucoside, passiflora edulis seed oil, pelargonium graveolens flower oil, rose flower oil, lavender oil , soybean oil, jojoba seed oil, rosemary leaf oil , evening primrose oil , zinc gluconate, sodium polyacrylate starch, silica, adenosine, caprylyl glycol, citric acid, xanthan gum, tocopherol, salicylic acid, benzoic acid, Ci77007/ultramarines, linalool, geraniol, citral, citronellol
<p>The Body Shop Oil of Life</p> 	Camelina oil, rosehip oil, nigella oil, Geranium oil, rosemary oil, and lavender oil	Capric triglyceride, olive oil, jojoba seed oil, camelina sativa seed oil , rosa canina fruit oil , camellia oleifera seed oil , nigella sativa seed oil , fragrance, tocopherol, pentaerythrityl tetra-di-t-butyl hydroxyhydrocinnamate, limonene, linalool, citronellol, linalool, geraniol, pelargonium flower oil , rosemary oil , origanum majorana flower oil, anthemis nobilis flower oil, coumarin, lavender oil , citral, citrus peel oil

4. CONCLUSIONS

Based on the aforementioned literature review, it is evident that essential oils serve a multifaceted role, extending their utility beyond medicinal applications to the field of cosmetics. These oils are meticulously formulated to ensure stability and non-volatility, thus rendering them suitable for cosmetic use. The primary objective behind formulating products based on essential oils revolves around creating natural-looking and safe alternatives in contrast to synthetic chemicals. Notably, essential oils exhibit remarkable potential in the creation of night creams, offering a diverse array of beneficial effects such as anti-acne, anti-aging, anti-wrinkle, and moisturizing properties. The recent surge in the introduction of numerous essential oil-based night cream products into the global market signifies a notable demand for these formulations, highlighting a promising avenue for future advancements and growth in this segment of skincare products.

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