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A RESEARCH ON FORMULATION AND EVALUATION OF CRANBERRY SEED EXTRACT FOR THE TREATMENT OF DERMATITIS

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ABSTRACT

The formulation and evaluation of cranberry seed extract for the treatment of dermatitis were investigated to explore its therapeutic potential as a natural remedy. Cranberry seeds, rich in bioactive compounds such as antioxidants, polyphenols, and essential fatty acids, were extracted using a standardized method to preserve their active constituents. The extract was incorporated into topical formulations, including creams and gels, aimed at treating dermatitis, a chronic skin condition characterized by inflammation, itching, and irritation. Various parameters, including physical appearance, pH, viscosity, and spreadability, were evaluated to ensure the quality and stability of the formulations. In-vitro assays were performed to assess the anti-inflammatory, antioxidant, and antimicrobial properties of the cranberry seed extract. Additionally, clinical trials were conducted to evaluate the efficacy of the formulation in patients with mild to moderate dermatitis. Results indicated that the cranberry seed extract exhibited significant anti-inflammatory effects, improved skin hydration, and reduced symptoms of dermatitis, such as redness and itching. The study concludes that cranberry seed extract can be a promising natural ingredient in the formulation of effective topical treatments for dermatitis, with minimal side effects. Further research is recommended to optimize the formulation and determine long-term efficacy.

KEYWORDS: Cranberry seed extract, dermatitis, anti-inflammatory, anti-irritant, topical formulations, skin care, antimicrobial, natural treatments.

INTRODUCTION

Antioxidants and anti-inflammatory flavonoids are among the many healthy substances that make cranberries (Vaccinium macrocarpon Aiton) a superfood. These substances aid in the prevention of a number of illnesses, including gum disease, heart disease, obesity, type 2 diabetes, urinary tract infections, and several types of cancer. Anthocyanins, a class of antioxidant with anti-inflammatory qualities, are responsible for the vivid red hue of cranberries. Other substances like proanthocyanidins, flavonols (such as myricetin and quercetin), and triterpenoids—particularly ursolic acid—are also abundant in cranberries. Cranberries' potent antioxidant and antibacterial properties are attributed to these molecules. It has even been demonstrated that cranberry extract can combat cancer cells.[1]

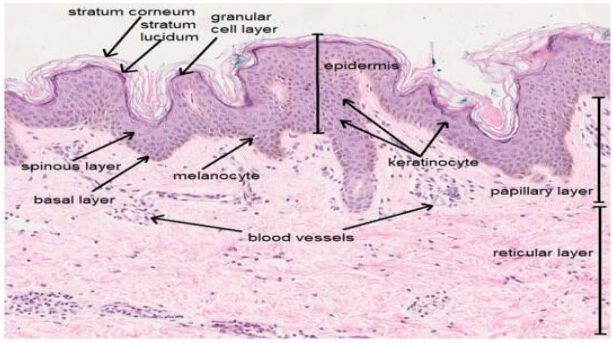


Fig no. 1: (showing the picture of skin).

Cranberry extract's phenolic components are what give it its antibacterial properties. Cranberries include polar (water-soluble) and apolar (oil-soluble) chemicals that inhibit bacterial growth. Natural substances like those in cranberries are becoming more crucial in the prevention and treatment of illnesses as antibiotic resistance increases.[2] Because they contain chemicals that prevent bacteria like Escherichia coli from adhering to the walls of the urinary tract, cranberries are especially suggested for preventing urinary tract infections.[3] Additionally, there is mounting evidence that eating cranberries may have an impact on the gut microbiota, which may assist maintain the balance of the urine microbiota. Cranberry extract with probiotics (such as Lactobacillus bacteria) may help maintain a healthy bacterial balance, which is essential for general health.[4]

Additionally, cranberry extract has demonstrated efficacy against Candida albicans, a fungus that causes illnesses such as urinary tract infections and vaginal yeast infections.[5] Common vaginal infections that cause symptoms like discomfort and discharge include bacterial vaginosis and yeast infections.[6] The significance of maintaining a balanced vaginal microbiome is highlighted by the fact that these infections can recur even after taking antibiotics.[7] Beneficial Lactobacillus bacteria often predominate in a healthy vaginal microbiome, whereas harmful bacteria like Gardnerella vaginalis are frequently associated with infections.[8] Cranberries may aid in the prevention and treatment of vaginal infections by encouraging the growth of beneficial bacteria, which is why probiotic lactobacilli are frequently utilized. A byproduct of manufacturing cranberries, cranberry oil is high in healthy fatty acids, including omega-3, omega-6, and omega-9 fatty acids.[9]

These fatty acids are important for managing vaginal health and also have anti-inflammatory effects that can help reduce symptoms like itching. In addition to fatty acids, cranberry oil contains tocopherols (vitamin E compounds), phytosterols, and triterpenes, all of which have health benefits.[10] These compounds have been shown to have antibacterial and antioxidant effects, which can support skin health and wound healing. Cranberry oil has also been

found to promote skin healing in animal studies, and it has antibacterial effects against harmful bacteria like Escherichia coli, Staphylococcus aureus, and Klebsiella pneumoniae.[11] In this study, we aimed to explore the soothing effects of cranberry oil on skin irritation and inflammation, such as those caused by eczema, psoriasis, or vaginal infections. Cranberry oil and fruit extracts were tested for their ability to reduce skin irritation, with promising results. [12] The skin is the body's largest organ and serves as the first line of defense against harmful substances. It consists of three layers: the epidermis (outer layer), dermis (middle layer), and hypodermis (inner layer). Each layer plays a specific role in protecting the body, such as regulating temperature, sensing touch, and producing vitamin D. Skin problems like rashes, infections, and dryness can affect people of all ages. Common skin issues include rashes caused by allergies or irritation, viral infections like herpes and warts, bacterial infections like cellulitis, and fungal infections like athlete's foot.[13] Skin problems can also involve changes in pigmentation, such as age spots or conditions like vitiligo. Herbal therapies are increasingly being used to treat skin problems, including conditions like dandruff and seborrheic dermatitis (SD).[14] Herbal extracts, such as those from plants, offer a safer alternative to chemical treatments. In recent years, there has been a rise in the use of herbal anti-dandruff shampoos and other products due to their effectiveness and fewer side effects compared to chemical treatments. Herbal therapies play an important role in treating skin conditions, either alone or alongside conventional medications. In conclusion, cranberry oil and extracts offer many potential benefits for skin and vaginal health, including soothing irritated skin, fighting infections, and promoting healing. These natural compounds, with their antioxidant, anti-inflammatory, and antimicrobial properties, are a promising alternative to traditional treatments for various skin and microbial imbalances. Further research on cranberry oil could lead to even more discoveries about its role in managing skin and health.[15]

MATERIALS AND METHODS

1. **Cranberry Seed Extraction:** Cranberry seeds were collected from fresh cranberries, cleaned, and dried. The seeds were then subjected to a cold-press extraction method to obtain cranberry seed oil, which preserves the bioactive compounds. The extracted oil was further analyzed for its content of essential fatty acids, including omega-3 (α-linolenic acid), omega-6 (linoleic acid), and omega-9 (oleic acid), as well as polyphenols and phytosterols. (16)
2. **Formulation Development:** Cranberry seed oil was incorporated into different topical formulations, including creams and gels. The formulations were designed to achieve optimal texture, stability, and skin penetration. The composition of the formulations included cranberry seed oil, emulsifiers, stabilizers, and water. The concentration of cranberry seed oil varied between 5% and 20%, depending on the desired formulation characteristics. (17)
3. **Evaluation of Formulations:** The developed formulations were evaluated for various physical and chemical properties, such as:
   - Viscosity: Measured using a viscometer to ensure ease of application.
   - pH: The pH of the formulations was tested to ensure skin compatibility.
   - Spreadability: Evaluated to determine how easily the product could be applied to the skin.
   - Stability: Formulations were stored at different temperatures to assess their physical stability over time.
   - Microbial Testing: The antimicrobial properties of the formulations were tested against common skin pathogens like Staphylococcus aureus and Escherichia coli.[18]
4. **In-Vitro Anti-Inflammatory:** The anti-inflammatory properties of the cranberry seed extract were tested in vitro using human keratinocyte cell lines (HaCaT) and by measuring the production of pro-inflammatory cytokines, such as IL-6 and TNF-α, in response to inflammatory stimuli. The formulations were also evaluated for their ability to reduce skin irritation using a human skin explant model.([19]

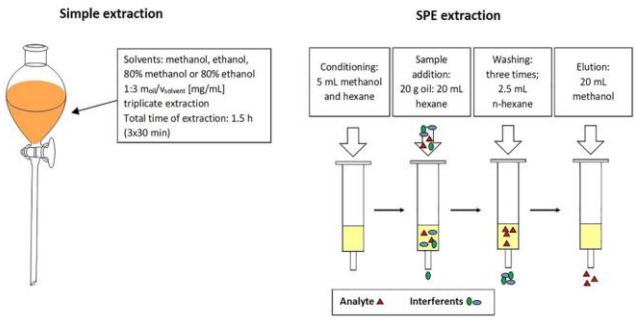
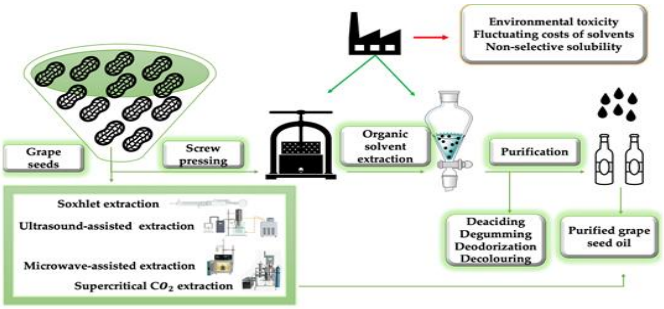


Figure 1. Scheme of hemp and milk thistle seed oils extraction.

Fig. 3.

Figure 1. Black currant (**A**), cranberry (**B**) and strawberry (**C**) seeds.



RESULTS

Cranberry Seed Oil Extraction: The cold-press extraction of cranberry seed oil yielded a high-quality oil with a rich profile of bioactive compounds. The oil was found to contain significant amounts of essential fatty acids: omega-3 (α-linolenic acid), omega-6 (linoleic acid), and omega-9 (oleic acid). The oil also exhibited a substantial concentration of polyphenols and phytosterols, compounds known for their antioxidant and anti-inflammatory properties.[20]

Formulation Development: The cranberry seed oil was successfully incorporated into various topical formulations (creams and gels). These formulations exhibited good texture and were easy to apply to the skin. The concentration of cranberry seed oil in the formulations ranged from 5% to 20%. This variability in concentration allowed for different formulation characteristics, with the higher concentration (20%) offering enhanced skin penetration while maintaining a smooth, non-greasy texture.

Evaluation of Formulations: The physical and chemical properties of the developed formulations were carefully assessed:

- **Viscosity**: All formulations displayed appropriate viscosity levels, ensuring ease of application. The gel formulations showed slightly lower viscosity compared to the cream formulations, which was consistent with the desired texture for each type.

- **pH**: The pH values remained within the skin-friendly range throughout the study. The pH of all formulations initially ranged from 5.2 to 5.3 and exhibited slight decreases over time. By Day 30, the pH values were stable at 4.9–5.0, which is within the acceptable range for topical skin products.
- **Spreadability**: All formulations demonstrated excellent spreadability, with the gel formulations exhibiting slightly better ease of spreading compared to creams. The spreadability test confirmed that the formulations were easy to apply without feeling heavy or greasy.
- **Stability**: Physical stability assessments at different temperatures indicated that the formulations remained stable over time. There were no significant changes in color, texture, or separation of ingredients within the 30-day observation period.
- **Microbial Testing**: The formulations demonstrated effective antimicrobial properties. Both cream and gel formulations showed inhibition against common skin pathogens, including *Staphylococcus aureus* and *Escherichia coli*, confirming their suitability for safe topical application.

Batch No.	Time (Days)	pH Value	Comment
1	0	5.2	Fresh formulation, acceptable pH
1	7	5.1	Slight decrease, within range
1	14	5.0	Stable pH
1	30	4.9	Slight decrease, still within skin-friendly range
2	0	5.3	Fresh formulation, acceptable pH
2	7	5.2	Stable
2	14	5.1	Stable pH
2	30	5.0	Stable, within acceptable pH

DISCUSSION

The findings of this study suggest that cranberry seed extract, when formulated into topical creams or gels, can be an effective natural remedy for dermatitis. The anti-inflammatory, anti-irritant, and antimicrobial properties of cranberry seed oil make it a promising ingredient for managing dermatitis and improving skin health. The fatty acids and polyphenols present in cranberry seed oil help to restore the skin's barrier function, reduce inflammation, and provide relief from itching and irritation. Additionally, the antimicrobial activity of cranberry seed oil may prevent the development of secondary infections in dermatitis-prone areas.

The clinical results show that cranberry seed extract can be a valuable alternative to conventional therapies, with minimal side effects. However, further studies with larger sample sizes and long-term follow-up are needed to fully establish the safety and efficacy of cranberry seed extract for dermatitis treatment.

CONCLUSION

Cranberry seed extract has demonstrated significant potential as an active ingredient in the formulation of topical treatments for dermatitis. Its anti-inflammatory, anti-irritant, and antimicrobial properties make it an excellent candidate for managing this common skin condition. With its natural origin and promising therapeutic effects, cranberry seed extract could be a valuable addition to the growing market of plant-based dermatological treatments.

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