

A Review on, Formulation and Evaluation of Orange Peel Herbal Soap

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Abstract: Orange peel, the outer layer of the fruit of *Citrus sinensis*, contains many beneficial phytochemicals. Orange peel contains many active compounds including flavonoids, phenolics and essential oils. These compounds are of interest due their antioxidant and antimicrobial activity. Orange peel often goes to waste. Using orange peel in herbal cosmetics could therefore be a great opportunity. This review will look at how orange peel could be used in herbal soap. Orange peel extract contains many phytochemical compounds. Different ways of formulating orange peel extract into soap will be discussed alongside important factors to consider. Physical and physicochemical properties of the formulated soap can be determined by looking at color, aroma, pH, foaming, stability, moisture content and free alkali. Further testing could be carried out to determine antioxidant activity, antimicrobial activity and skin compatibility. While using orange peel in soap could be a useful way of adding value to fruit waste, a suitable experiment is required to ensure it works well, remains stable and is safe. [1,7,9,10].

Keywords: Orange peel; Herbal Soap; Formulation; Evaluation; Phytochemicals; Antioxidant activity; Antimicrobial activity

I. INTRODUCTION

Soaps are used to clean dirt, excess oil and any other unwanted substances from the skin. Conventional soaps will contain surfactants, oils/fats, scent and other compounds to produce suitable physical and chemical properties. There has been an increase in interest towards using plant-based ingredients in cosmetics and therefore researchers are looking into using natural materials. [13,14]

Herbal soaps contain natural ingredients derived from plants such as extracts, powders and essential oils. These ingredients are chosen based on their chemical content, compatibility with the soap base, stability and desired use. [13,14]

Orange (*Citrus sinensis*) is a member of the Rutaceae family. The peel contains useful phytochemicals such as flavonoids, phenolics and volatile oils. Research has shown citrus peels to be an important source of bioactive compounds and can be recovered from fruit waste [1]. [1,2,7]

Using orange peel extract or powder in soap could be a way of adding value to orange peel in cosmetics. However, it depends on the quality of the plant material, concentration, formulation, soap base and correct quality control testing. [1,9,10,13]

II. AIM

To look at the potential use of orange peel in herbal soap formulation.

III. OBJECTIVES

1. Describe the key phytochemical compounds within orange peel.

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DOI: 10.48175/IJARSCT-40409



2. Discuss the potential benefits of using orange peel in herbal soap.
3. Identify suitable ways to formulate orange peel extract and herbal soap.
4. Identify key physicochemical factors to consider when evaluating.
5. Discuss the potential antioxidant and antimicrobial properties of orange peel formulations.
6. Identify any gaps in research regarding formulation stability, quality and skin compatibility.

IV. BOTANICAL INFORMATION

Biological name: Citrus sinensis Family: Rutaceae Common name: Sweet orange Part used: Fruit peel Key constituents: Flavonoids, Phenolics, Volatile Oils, Pectin and other phytochemicals. [1,2,7]

Orange peel is produced in large amounts from both domestic use and juice production. Using the correct processing techniques, orange peel could be used as a source of ingredients for cosmetics and other value-added products. [1,9,10]

Orange peel will vary depending on the type of orange, ripeness, growing conditions, storage and extraction methods. Therefore, it cannot be assumed that the chemical composition will be the same in each batch [9,10]

V. PHYTOCHEMICAL CONSTITUENTS OF ORANGE PEEL

There are various different types of natural constituents found within orange peel: [1,2,7]

5.1 Flavonoids

Flavonoids are plant derived constituents studied for their antioxidant properties. Hesperidin and related flavonoids can be found within citrus peel. This makes orange peel a good candidate to look at within suitable cosmetic formulations. [1,7]

5.2 Phenolic Compounds

They may exhibit antioxidant properties. The levels of phenolics will depend on the extract conditions and constituent of the peel. [7,9,10]

5.3 Essential Oils

The peel also contains volatile oils such as D-limonene. These give it its typical citrus scent however may be lost during processing and storage. This means they may not be stable in the final soap. [1,24]

5.4 Pectin

Pectin is a natural polysaccharide found within citrus peel. There has been lots of research done into the uses of pectin in food, pharmaceutical and other formulations. This is why the pectin found within orange peel has made it interesting to look into the recovery of fruit waste. [1,2]

The constituents and potential uses of citrus peel have been discussed in detail in published research [1,2]. [1,2,7]

VI. POTENTIAL IMPORTANCE OF ORANGE PEEL IN HERBAL SOAP

6.1 Antioxidant Properties

There are some constituents found within orange peel that have shown antioxidant properties. An antioxidant assay can be performed on the extract and final product to determine if there are measurable antioxidant properties. [1,7]

However, this may not show to have any benefit to the skin when used normally. [25]

6.2 Antimicrobial Properties

Some extracts and constituents may show antimicrobial properties. This will depend on the makeup of the extract, concentration, organism and conditions. [24]

If antimicrobial properties are going to be looked into then the soap should be tested using an appropriate method. Don't assume it will have antimicrobial properties just because there is orange peel in the formulation. [13,14]

6.3 Natural Scent

There are volatile constituents within the peel giving it its characteristic citrus scent. This could be looked into as a way of adding a natural citrus scent to your formulation. The final scent will depend on how it is processed and what other ingredients are being used. [1,24]



6.4 Fruit Waste Recovery

Using orange peel in cosmetic formulations could provide a way of recovering value from a commonly wasted fruit. The peel should be processed, quality controlled and investigated to determine if this would be a good idea. [1,9,10]

VII. ORANGE PEEL HERBAL SOAP FORMULATION

A suitable soap base should be chosen and the orange peel should be prepared correctly. [13,14]

7.1 Preparing Orange Peel

Fresh orange peel can be obtained from suitable, clean sources. Wash the peel to remove any dirt from the surface. Dry the peel under controlled conditions. This can then be ground down into a powder or further processed. [9,10]

It should be dried and stored appropriately to prevent it from degrading. Record how it was dried to allow for consistency. [9,10]

7.2 Orange Peel Extract

An appropriate extraction method can be used depending on what phytochemicals you want to extract and what equipment is available. [9,10]

Record what plant material was used, type of solvent, conditions for extracting, filtering and concentrating/storing. The solvent should be chosen carefully to ensure you are getting the right constituents. The extract should then be analyzed to determine if it has the relevant qualities. [9,10]

7.3 Choosing Soap Base

Choose a suitable soap base depending on what product you want to produce and what formulation method is available. Ensure it is compatible with your orange peel and has suitable physical and physicochemical properties. [13,14]

7.4 Adding Orange Peel

Add the prepared extract/powder to the chosen base using an appropriate formulation method. Different concentrations can be tried to see what affect they have on the appearance, texture, scent, pH, foaming properties and stability. [13,14]

The formulation should be produced under appropriate lab supervision. Any ingredients needed, amounts and conditions should be recorded in the method. [13,14]

VIII. ORANGE PEEL HERBAL SOAP ANALYSIS

Analysis should be carried out to determine if the soap produced meets the required quality. The following analysis can be carried out depending on the formulation method and standards. [13,14,23]

8.1 Appearance

Look at the appearance of the soap. [13,14]

You can record:

- Color
- Scent
- Appearance
- Texture
- Uniformity

Ensure you are consistent with your observations. [13,14]

8.2 pH

The pH of a suitable soap solution can be measured using a calibrated pH meter or appropriate method. [13,14]

This will give you an idea of the acidic/basic nature of your formulation. The acceptable pH will depend on the type of product and what standards you are following. This will not tell you if it is non-irritating or suitable for all skin types [13,14,25]



8.4 Foam Stability

A soap sample can be left to stand for a certain amount of time and the quantity of foam can be determined. Comparisons should be made at the same concentration of soap, under the same conditions of water, agitation and period of time. [13,14]

8.5 Moisture Content

A suitable method should be used to determine the moisture content. This can impact on the hardness of the soap, how it stores and its overall physical stability. The results should be interpreted based upon what type of soap you have and the required quality standards. [13,14]

8.6 Free Alkali

Determining the amount of free alkali can be an important quality control test. Too much free alkali can cause issues with the suitability of the formulation. A suitable method should be used and compared against the relevant specification. [13,14]

8.7 Total Fatty Matter

This is an important quality parameter for conventional soaps. It can give information on the fatty matter content of the soap. The method and acceptance criteria should depend on the type of soap. [13,14]

8.8 Stability Studies

A stability study can be carried out to see if there are any changes in appearance, smell, feel and other relevant factors. The conditions and length of the study should be decided beforehand. Any changes should be recorded. [23]

8.9 Antioxidant Activity

If this is part of your research aim, a suitable laboratory method can be used to determine this property. If technically possible, the final formulation can be tested alongside the extract. Include details about the method, concentration, controls and observations. Do not assume there is activity without experimentation. [7]

8.10 Antimicrobial Activity

This can be determined using a suitable microbiology method with appropriate positive and negative controls. Include details about the microorganisms, concentrations, method and results. Just because there is an orange peel ingredient in the soap, this does not necessarily mean it will have antimicrobial activity. [24]

8.11 Skin Compatibility

Appropriate safety assessments should be carried out. Initial physiochemical tests cannot be used to determine skin compatibility. Any testing on human skin must be done under appropriate ethical guidelines and with qualified supervision. [25]

IX. LITERATURE REVIEW

There is published research which can help. [1,13,14]

9.1 Chemical Composition of Citrus Peel

A review was carried out by Liu et al looking at the chemical composition of citrus peels and their potential uses. Different flavonoid, essential oil and other bioactive compounds were discussed. This shows there is a scientific rationale behind looking at orange peel as a source of valuable components [1]. [1,2,7]

9.2 Polyherbal Soap Formulation

A formulation and evaluation of a polyherbal soap containing sandalwood and orange-peel extract was carried out by Pawar et al. They looked at different parameters including organoleptic properties, pH, foam height, foam stability, skin irritation and thermal stability. This is a relevant example of how orange-peel soaps can be investigated using quality parameters [3]. [13]

9.3 Herbal Soap Formulation

A herbal soap was formulated and evaluated using various plant derived ingredients. Physiochemical parameters were looked at including pH, moisture content, foaming properties and total fatty matter. This is relevant to the formulation of orange peel herbal soap however results cannot be directly applied [4]. [14]



9.4 Orange Peel Based Soap

Recent publications have looked specifically at herbal soaps containing orange peel extract/powder. This shows the topic has already been researched. Therefore, a new project shouldn't say orange peel herbal soap hasn't been researched before but instead look at a specific question to answer. This could be looking at different concentrations of orange peel, the quality of the extract, stability of the formulation or the relationship between concentration and properties [5,6,13,14]

X. EXPECTED OUTCOME

This study should give information on whether incorporating orange peel extract/powder into a herbal soap would be feasible. [13,14]

The different formulations can be compared based on their appearance, smell, feel, pH, foaming, foam stability, moisture content and other chosen parameters. If appropriate lab facilities are available, antioxidant/antimicrobial tests can be carried out. However, the best formulation can only be determined once results have been obtained. No formulations can be said to be superior, effective or safe without enough evidence. [13,14,23]

XI. CONCLUSION

Orange peel can be a useful source of plant derived components. It contains flavonoids, phenolics and volatile oils. Using it in a herbal soap can be a good way to look at natural cosmetic ingredients and a common waste product from fruit. Careful consideration must be taken when formulating a suitable orange peel herbal soap. The raw materials should be prepared appropriately, formulation designed correctly and quality parameters assessed. Appearance, pH, foaming, moisture content, free alkali and stability can be used to help characterize the final product. Further investigation may be needed to determine antioxidant activity, antimicrobial activity and skin compatibility. Overall orange peel herbal soap would be a suitable choice for pharmaceutical formulation research however conclusions should be based on experimental evidence and limitations should be clear. [1,7,13,14,23,25]

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