

Research Article

Nova Paint: Development of Non-Toxic Face Paint from Microalgae as Natural Pigments and *Persicaria Odorata* As Natural Preservative

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Abstract: Face painting is popular for various purposes such as recreational, educational, religious, cultural and entertainment. The practice backdated from Paleolithic times, used for ritual purposes. Nowadays, school student use face painting in art, craft, performance and demonstrations. The aim for the preparation of non-synthetic face paint is to develop washable and non-toxic paint for applying colours to human skin. It must be safe, washable and removable. Paint pigment is mainly based on acrylic paints that has strong adhesive power which lead to complex cleaning process and irritant to human skin. Traditionally, face paint produced from toxic, synthetic colour pigment made of substances such as arsenic, mercury and lead. The utilization of microalgae as natural colours is a result of growing knowledge of the negative effects of synthetic colourants. Algae contains a wide range of photosynthetic pigments such as chlorophyll, carotenoids, and phycobili-proteins, which exhibit colours ranging from green, blue, yellow, brown, and red. An alga is not a plant, animal or fungi, but called phytoplankton. It has beneficial biological activities such as antioxidant, anti-microbial and classified as non-toxic and approved as GRAS (Generally Recognized as Safe) by the Food and Drug (FDA) of United States of America. *Persicaria odorata* (Kesom Leaf) extract used as natural preservative. The formulation requires homogenizing the ingredients of both oil phase and water phase. This formulation is feasible which resulted well in both chemical and physical stability which conforms to human skin, thus, it is marketable and can be commercialized for everyone.

Keywords: Face paint; Microalgae; GRAS; *Persicaria odorata*.



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1. INTRODUCTION

Definition of Term: The term "face paint" or "face painting" will be understood to be specifically for the use of a colourant applied to human skin. Most face paints, contain a preservative to prevent decay during storage, and also to prevent the buildup of moulds or funguses. Various types of parabens are the most common preservatives for body paint.

Problem Statement: Usually, face paint produced is from synthetic colour pigment made of substances such as arsenic, cadmium, mercury and lead. These can be toxic in large amounts and frequent uses. Other natural ingredients sometimes in cosmetics like rubber (latex) in face and body paints, cobalt and nickel, have caused people to develop sensitivities. Products which are utilized as body paint or the like must, of course, be safe for use and be non-toxic in any respect.

Objective: To formulate safe formulation by using algae and natural non-paraben preservative.

Hypothesis: Natural colour pigment derived from plants are safe to replace the synthetic substances in coloured pigments of face paint.

Past Research: A washable non-toxic body paint material in solid form but need a moistened applicator activates the dry cake for use in body painting or other activities. This study worked on body paint which is formed using two different weight polyethylene glycol waxes together with stearic acid, calcium carbonate, talc, titanium dioxide, guar gum, a preservative and a colourant. The material is formed by initially mixing dry granular form ingredients at room temperature. Once mixed, the material is subjected to a melt at approximately one hundred fifty degrees centigrade to form a paste which is poured within a mold to cool forming a dry cake.

Project Background: Design criteria includes comfort in application and wearing, durability over time, appearance, resistance to perspiration, ease of application and removal too. The face paint is nearly odorless, and it will not cause any health hazards such as skin irritation or due to possible ingestion of material. Logistic concerns such as capability of being used and stored in all climatic conditions without degrading, expendable item with no environmental hazard due to the disposal.

Most microalgae species are approved by the U.S. Food and Drug Administration (FDA) as GRAS (Generally Recognized as Safe) (Shabudeen, Ashok & Indhumathi, 2015). Algae pigments are being used numerously as materials for industrial applications such as textile dyes, cosmetics, and pharmaceutical products (Beulah, Jenet & Arun, 2023).

2. METHOD & MATERIAL

In this innovation, we provide a natural, non-toxic, body paint that is washable. The experimental step starts with the extraction of algae to provide the desired coloured pigments. The formulation of the face paint is then carried out by adding the derived coloured pigments from the respective species of algae. The body paint is odorless and contains algae pigments to give the paint a variety of colors and visual effects. The formulated face paint is then being evaluated to test both chemical and physical properties as to conform its suitability for human skin.

Figure 1 is an explanation in graphic of the sequence of the experiment works.

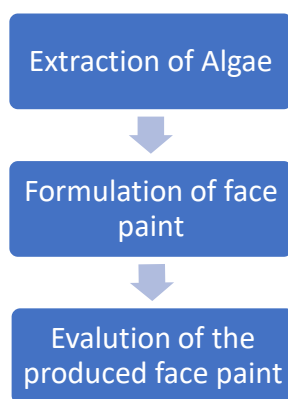


Figure 1. Sequence of experiment works

2.1 Experimental

2.1.1 Extraction of algal pigments

2.1.1.1 Materials

Chemicals, reagents and apparatus. *Chlorella vulgaris*, *Spirulina* and *Haematococcus* are the only species of microalgae being studied for this project, were collected from Department of Bioprocess Technology, Faculty of Biotechnology and Biomolecular Sciences, Universti Putra Malaysia. All other reagent/chemical used as analytical grade.

2.1.1.2 Method of extraction

Soxhlet extraction. The dried macroalgae powders were loaded into a separate thimble and treated for 5 cycles with three different solvents, namely acetone, methanol and chloroform, at their boiling points. The extracted solvents were separated using a rotary evaporator.

2.1.2 Formulation of face paint

Table 1. Formulation of face paint

Ingredient	Gram (g)
(A)	
Oil (sunflower seed oil: coconut oil: medium triglycerides (4:3:3))	40.00
Stearic acid	5.25
Palmitic acid	1.75
Beewax	1.0
Tween 80	7.13
Tween 20	2.37
(B)	
Distilled water	35.00
Vegetable glycerin	5.00
Kojic acid	1.00
Maltodextrin	0.50
Paraben free preservative	0.50
Xanthan gum	3.0
<i>Persicaria odorata</i> (daun kesom)	0.5
Algae	2.0

2.1.3 Procedure for cream (face paint) development

For the face paint formulation, all the ingredients for the preparation of oil phase (A) were mixed together in a beaker and heated at 70°C to dissolved all the substances. Then the ingredients for the preparation of water phase (B) were mixed together in another empty beaker and heated at same temperature similar to the oil phase. Both oil phase and water phase were mixed together by pouring the water phase from the beaker into the beaker containing oil phase. The mixture was then mixed by using an IKA Ultra-Turrax T-25 Digital Homogenizer (Daigger Scientific Inc, Vernon Hills, Illinois) at 8000 rpm for 5 minutes to complete the process.

2.1.4 Analysis of the formulated face paint

2.1.4.1 Organoleptic test

Observation is made in terms of shape, color and smell of the cream.

2.1.4.2 pH test

Using the digital pH meter, the gel sample should be at skin's pH which is 4.5-6.5.

3. FINDINGS

Evaluation of the formulated face paint with algae pigment colourants as below:

Table 2. Evaluation of formulated face paint

Replication	pH cream
Sampel-1	5.39
Sampel-2	5.10
Sampel-3	5.09

3.1 Organoleptic test

Observation is made in terms of shape, color and smell of the paint produced at different concentration of algae extract. There is no significant change to shape, color and smell of the paint dosage before and after the stability test.

3.2 pH test

This is a chemical test and aims to analyze whether the paint has the appropriate pH value and suitable to skin. Decreasing pH value of face paint dosage on following days due to oxidation and hydrolysis but it is still conformed to skin pH value which is 4.5-6.5.

4. DISCUSSION

The chosen algae extract as antimicrobial agent compared to other bioactive product is due to cheap cultivation of the algae as they do not require big space of land. Meanwhile, the humectants or moisturizers chose is glycerin; vegetable-based glycerin. Free paraben is used as preservative to give products a longer shelf life that can prevent the growth of mould and other harmful bacteria. Naturally the solvent must be non-alcoholic, as a practical matter, distilled water is preferred which is free from trace elements, salts and microorganisms. It is determined that from the result that the paint formulation is good in chemical stability which conform to skin's pH value and also physical stability such as appearance.

5. CONCLUSION

Face paint composition is prepared according to delicateness of skin and against irritation. Previous research done extensively has proved that algae have antimicrobial activity and wound healing effect, thus the extracts can be incorporated in face paint formulation with no side effects. A new addition of natural substance which is algae extracts as coloured pigments and *Persicaria odorata* (*daun kesom*) as preservative in non-toxic face paint is found to provide safe and cost effective for various industry. However, further study must be carried out on the quantity optimization of the microalgae coloured pigments in the face paint as the need to produce the desired concentration of the colours.

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