

I. INTRODUCTION

A. Background

Indonesia, Vietnam and other tropical countries have a hot climate and excellent sources of sunlight. Prolonged exposure to sunlight that emits ultraviolet (UV) radiation can lead to severe consequences for the skin, such as burning cells, black spots and premature aging (Sari, 2015). Cosmetic products that protect and nourish the skin must meet the market's demands. However, there is a worrying concern about the sustainability and safety of the product, and consumers have become aware of the level of skin care they need. The adverse effects harsh chemicals used in beauty products can have on them. For instance, sodium lauryl sulfate (SLS) or sodium lauryl ether sulfate (SLES), phthalates, fragrances, lead and formaldehyde can be used and found in many personal care products with different features. Still, there are adverse effects on human health through skin absorption or accidental digestion; these chemicals harm the hematopoietic, nervous system, kidney, gastrointestinal tract, reproductive function, cardiovascular, immune, respiratory and endocrine systems, especially fetal health (Liang, 2020). This awareness, combined with the increased environmental consciousness, implies that cosmetic brands and manufacturers will have to adopt more sustainable production processes and components to meet the customers' needs and thrive in the industry. Therefore, interest in organic, sustainable, environmentally friendly personal care products will continue developing (Amberg and Fogarassy, 2019).

In order to overcome the problem mentioned above, beauty and cosmetic products that use active substances from natural sources are highly recommended (Anindita and Masluhiya, 2017). These active substances are usually phytochemicals, minerals and vitamins, considered natural protection to prevent skin damage by free radicals and might be effective in inhibiting the process of melanin formation and pigmentation due to hormones. Currently, the manufacture of cosmetic products is overgrowing, peel-off gel mask is one type of skin care treatment that is popular nowadays due to their simple usage, and it is able to impact directly to the skin with functions that include cleaning the pores, moisturizing and nourishing facial skin. Peel-off gel masks are practical because they easily peel off and lift like an elastic membrane (Rum, Suherman, and Idar, 2021). Moreover, this mask can help the skin improve hydration and treat skin issues like wrinkles, aging, acne and large pores. It cleanses and moisturizes the skin and helps relax

facial muscles as a cleanser, freshener, moisturizer and softener for facial skin (Luthfiyana, Nurhikma, and Hidayat 2019; Vieira *et al.* 2009).

Indonesia is the country that grows and exports the commodity tubers; according to the statistical data on the figure, the crop production in 2020, roots and tubers production in Indonesia was 21.5 million tonnes (FAO 2021). However, the quick spoilage of fresh tubers that causes losses in quality and quantities also recede the selling value of these crops. Jicama, Porang, and Purple Sweet Potato tubers contain a significant amount of carbohydrates and starch, particularly with various applications such as additives, gelling agents, thickeners, film former and emulsifiers in food, pharmaceuticals and cosmetics industries. Moreover, each tuber has its distinctive features. For instance, Jicama contains various active substances considered natural sunscreen to protect and inhibit the aging process of the skin (Lukitaningsih, 2014). Porang is rich in soluble glucomannan (Wulan *et al.*, 2021). Purple sweet potato is an essential source of natural anthocyanin pigments and can be used for anti-oxidation and anti-inflammation functions (Jansen and Flamme 2006; Li *et al.*, 2019). Aloe vera has been used for centuries for its benefits in health, beauty, medicine and particularly in skin care properties with the mechanism of actions including healing, protection function from UV and gamma radiation, anti-inflammatory, moisturizing, anti-aging and antiseptic effects (Amar Surjushe *et al.*, 2008)

In addition, the study of formulating a peel-off gel mask by utilizing natural ingredients, namely jicama, porang, purple sweet potato and aloe vera, is still new, and fewer previous studies are concerned about it. Therefore, it is necessary to study it with the specific objectives are to formulating and evaluating the effects of the different starch from jicama, porang and purple sweet potato on forming the base for the peel-off gel; to determine an appropriate concentration of aloe vera gel in order to create some of the features for the final product such as moisturizing or relaxation; the financial analysis will be carried out at the last stage of the research to give the conclusion about the applicability and feasibility of the product.

B. Objectives

The goal of developing the new beauty product is made from natural sources, especially the commodity tubers (jicama, porang, purple sweet potato) and aloe vera, to enhance the selling value and create the added-value product of these crops. The product will be created by conducting the research with three objectives:

(1) To know the effect of each tuber's starch with different concentrations on the peel-off gel bases' characteristics and select the appropriate concentration for each tuber to make the peel-off gel bases.

(2) To investigate the effects of different concentrations of aloe vera gel added into the bases that have been found out in the first object.

(3) To select the best final product's formula for the research from the second stage, MADM-SAW method was applied to give the final decision.

(4) To analyze the financial feasibility on the final product of the peel-off gel mask research to see its applicability in the beauty and cosmetic industry.

C. Benefits of research

The benefits of this research are:

1. Utilizing starch from the commodity tubers to create a new add-valued product for the industrial field will help increase the selling value and function of these tubers and enhance farmers' income.
2. Assisting in developing further research on using natural ingredients as active substances in the manufacture of cosmetic products that are growing rapidly, and these products are safe, sustainable and environmentally friendly, which approach to reduce the impact of global warming issue.