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Peel-off mask formulation from bintangur (*Calophyllum inophyllum* L.) leaf ethanol extract and its antibacterial activity

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ABSTRACT
One of the most widely distributed plant species in Bangka Belitung is Bintangur (*Calophyllum inophyllum* L.) which is a genus of the Clusiaceae family. Bintagur leaf has the potential as a mask against acne-causing bacteria because it has high bioactivity such as antioxidants and antibacterials. This study aims to use of Bintangur leaves made in mask preparations as acne antibacterial activity. Bitangur leaf extract masks were made by mixing the raw materials in the form of PVA 10 g; HPMC 1 g; glycerin 6 g; TEA 0.5 g; methylparaben 0.1 g; propylparaben 0.025 g; 30 ml distilled water and ethanol extract of Bintangur leaf formulation 0% 0 g; formulation 1% 0.5 g; 2% formulation 1 g and 3% formulation 1.5 g. Bintangur leaves extract mask in formulations F3 and F2 was the highest concentration producing an inhibition zone to inhibit the growth of *Staphylococcus aureus* and *Propionibacterium acnes* bacteria which were in the medium category.

KEYWORDS
Bitangu leaf; face mask; antioxidant; peel-0ff gel; antibacterial

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Introduction

One of the most widely distributed plant species in Bangka Belitung is Bintangur (*Calophyllum inophyllum* L.) which is a genus of the *Clusiaceae* family. Phytochemical studies of the genus *Clusiaceae* show that plants contain lots of flavonoids, steroids, tannins, phenol hydrocarbons, saponins, triterpenoids and various bioactivities such as antioxidants, analgesics, anticancer, antibacterial, chronic fatigue disease and haemorrhoids (Violet, 2018).

Propionibacterium acnes, *Staphylococcus epidermis* (Mulyani et al, 2017) and *Staphylococcus aureus* (Sarlina et al, 2017) these three bacteria are bacteria that trigger the growth of acne. To reduce the growth of acne, a drug or formula that is antibacterial is needed. Acne treatment generally requires a long period of time so that it can cause some side effect such as skin irritation and antibacterial resistance (Nuraeni & Lukmayani, 2021). The resistance antibiotics on isolated bacteria of acne vulgaris there are various types. Cloxacillin and Neomycin have the highest resistance to acne bacteria with 100% and 80% resistance. And there are many other synthetic drugs that have antibacterial acne resistance above 50% such as Cephalexin, Erythromycin, Cephalothin, Gentamicin, Kanamycin (Hassanzadeh et al., 2008; Sukertiasih et al, 2021). So we need an effective antibacterial source that is able to treat acne such as Bintagur leaves in the form of masks. The peel-off gel mask is one of the mask preparations that have a comforting effect to the user. A homogeneous gel-shaped mask with the right formulation can hold the active substances contained (Pratiwi et al, 2018).

Based on the literature review, Bintagur leaf has the potential as a mask against acne-causing bacteria because it has high bioactivity such as antioxidants and antibacterials. Based on the literature study, several xanthone derivatives were obtained from the isolation of Bintagur, such as rheediaxanthone A, macluraxanthone, caloxanthone C, inophinnin, inophinone, phylattrin, pyranojacareubin, soulattrin, 4-hydroxyxanthone, trapezifolixanthone, and brasixanthone B. These compounds are reported to be active as antioxidants, antibacterials, and have good cytotoxic properties against bacteria NCI-H23, K562, and HeLa cells (Siau et al, 2015). Of course this is an added value for the development of antibacterial in the future. Therefore, in this study, aims to use of Bintangur leaves made in mask preparations as antibacterial activity. So that the utilization of the potential of local plants in Bangka Belitung is maximized.

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Methods

Extraction

The powder of Bitangur leaves was weighed as much as 150 g mixed with 750 mL of 96% ethanol solvent for maceration in a closed container for 2x24 hours at room temperature. Then filtered and concentrated using a rotary evaporator.

Mask formulation

All raw materials are weighed which includes PVA 10 g; HPMC 1 g; glycerin 6 g; TEA 0.5 g; methylparaben 0.1 g; propylparaben 0.025 g; 30 ml distilled water and ethanol extract of Bintangur leaf formulation 0% 0 g; formulation 1% 0.5 g; 2% formulation 1 g and 3% formulation 1.5 g. In cup 1 put PVA and distilled water then heated until PVA expands. For cup 2, add HPMC and cold distilled water until the HPMC expands completely. In cup 3, add glycerin, methylparaben, and propylparaben and dissolve with distilled water. Then all the ingredients in plates 1, 2 and 3 are mixed successively into the mortar and stirred until homogeneous. Next, add the extract for the 1%, 2% and 3% formulations (Tambunan, 2019).

Evaluation of masks

An organoleptic test was carried out by looking at the colour, shape and smell of the mask preparation. The homogeneity test was carried out by applying the mask preparation to the cup and then observing whether there were coarse grains. The pH test was carried out by immersing the preparation using a pH meter. The drying time test is carried out by applying it to the skin and then recording how long it takes for the preparation to dry (Tambunan, 2019). The dispersion test was carried out by weighing a 1 gram preparation placed between 2 glass centres and then placing a load on a 100 g glass (Fauziah et al, 2020).

Antibacterial test

The first step in the antibacterial test was media preparation. As much as 1.6 g of 2 band 3 g of agar dissolved in 200 ml of distilled water, then stir and heat it. The cup to be used is wrapped in HVS paper and put in the clear paper. Then sterilized by inserting tools and materials into the autoclave for 1-2 hours until the temperature rises to 121 ^{0}C (Ariyani et al, 2018).

Media preparation is done by putting the material into a petri dish and then allowing it to harden. Apply the bacteria to the media. Then it was incubated for 24 hours at 37 ^{0}C (Ariyani et al, 2018).

The second stage is to make an extract solution with a concentration of 25%, 50%, 75% and 100% from mask formula in DMSO. Then soak the disc paper in the extract solution for 15 minutes. After that, the paper discs were placed in the culture media for Staphylococcus epidermal bacteria, Propionibacterium acnes and Staphylococcus aureus. Then incubated for 24 hours at 37 ^{0}C. Then measure the clear zone formed using a calliper. Amoxicillin was used as a positive control and DMSO as a negative control (Ariyani et al, 2018).

Results and Discussion

The peel-off gel mask was made with 4 concentration variations with the addition of ethanol extract of Bintangur leaf, namely F0 = 0%, F1 = 1%, F2 = 2% and F3 = 3% (table 1).

Table 1. Results of Masks Evaluation

No	Formulation	Colour	Shape	Homogeneity	pH	Spreadability	Dry time
1	F0	White	Semi-solid	Homogeneous	6,29	4,5 cm	20 min
2	F1	brown	Semi-solid	Homogeneous	6,20	4,25 cm	21 min
3	F2	brown	Semi-solid	Homogeneous	6,05	4,95 cm	22 min
4	F3	brown	Semi-solid	Homogeneous	6,01	4,5 cm	24 min

The results of the peel-off gel mask test have a semi-solid form, have a distinctive leaf odor in all formulations except F0 where the greater the concentration of the added extract, the sharper the aroma produced and has a brownish colour and white colour for F0. The purpose of testing the pH on the mask is to determine the pH of the mask. The mask should not be too alkaline or too acidic because it can cause scaly skin and skin irritation (Tambunan, 2019). The pH that can be accepted by the skin ranges from 5-7 (Troy & Beringer, 2006; Fauziah et al, 2020). The more ethanol extract from Bintangur leaf is added, the resulting pH will decrease. So it can be said that all the pH mask formulations meet the requirements.

Based on observations, the formulation of the ethanol extract of Bintangur leaf mask at concentrations of 0%, 1%, 2% and 3% were all homogeneous because there were no coarse grains. Where good dispersion ranges from 5-7

(Fauziah, 2020). This is because the resulting mask is too thick. Test the drying time to see how long the mask takes to dry on the skin. The dry time of the mask is 15-30 minutes (Fauziah et al, 2020). The time required for each formulation to dry varies, namely F0 = 20 minutes, F1 = 21 minutes, F2 = 22 minutes and F3 = 24 minutes. So that the drying time obtained is still in accordance with the literature.

Antibacterial test

Antibacterial testing aims to test and determine the presence or absence of inhibition of the ethanol extract of Bintangur leaf and the mask of the ethanolic extract of Bintangur leaf against the growth of *Staphylococcus epidermis, Propionibacterium acnes* and *Staphylococcus aureus* bacteria. The formation of a clear zone around the paper disc against bacteria indicates the presence of antibacterial activity. The method used in this test is disc diffusion, which uses a mask preparation of Bintangur leaf ethanol extract with a concentration of 0% for F0, 1% for F, 2% for F2 and 3% for F3. Bintangur leaf ethanol extract mask has antibacterial activity marked by the formation of an inhibition zone.

Table 2. Antibacterial Test Mask from Bintangur Leaf Ethanol Extract

Extract Mask Formulation	Inhibition zone diameter (mm)		
	SE	PA	SA
F0 (0%)	0,66	0,7	1,0
F1 (1%)	7,78	2,08	4,0
F2 (2%)	2,79	7,51	7,0
F3 (3%)	7,51	7,65	9,52
Positive Control	10,79	12,08	36,66
Negative Control	0	0	0

Description : SE : *Staphylococcus epidermis*
PA : *Propionibacterium acnes*
SA : *Staphylococcus aureus*

FTIR Analysis

The results of the FTIR analysis of the extract and mask of the ethanol extract of Bintangur leaf can be seen in the Figure 1.

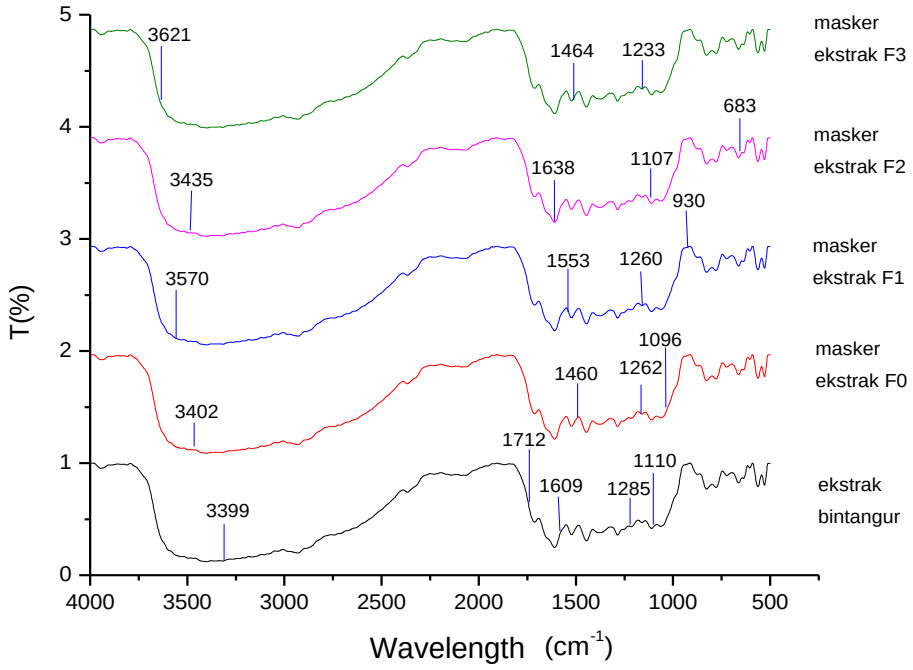

Figure 1. FTIR analysis result

Based on the results of the analysis of the functional groups in the star extract, it was found that the O-H group at wave number 3399, C=O wave number 1712, C=C aromatic at wave number 1609, C-O alcohol group at 1285 and aromatic C-H at wave number 1110 which indicates the presence of flavonoid compounds. on the extract. The

presence of tannin compounds was seen as a C=O ester group at wave number 1712, an O-H group at 3399, and C=C aromatic at a wave group 1609. The presence of steroid compounds in an aromatic C=H group with a number 1110, a C=O group found in wave number 1712, and C=C aromatic at wavelength 1609.

Conclusion

Bintangur leaf ethanol extract mask in formulations F3 and F2 was the highest concentration producing an inhibition zone to inhibit the growth of Staphylococcus aureus and Propionibacterium acnes bacteria which were in the medium category and for the formulations F1 and F3 the highest concentrations were to inhibit the growth of Staphylococcus epidermal bacteria which were in the category currently. Which was included in the very strong category.

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