

# Development of Jernang Non-timber Forest Product in the Bukit Dua Belas National Park Area Jambi can be Jernang (*Daemonorops draco* (Willd.) Blume ) Sunscreen With SPF 15

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**Abstract.** The Suku Anak Dalam (SAD) in the Bukit Dua Belas National Park region of Jambi produce jernang, one of the non-timber forest products, and it has promise as a sunscreen because it contains polyphenolic chemicals that may absorb UV radiation. The purpose of this study is to ascertain the Sun Protection Factor (SPF) of jernang sunscreen and its physical characteristics. The 1% (FI), 2% (FII), and 3% (FIII) jernang resin concentrations were used to create jernang sunscreen. Organoleptic, pH, homogeneity, viscosity, stickiness, spreadability, kind of cream, and stability are examples of physical qualities. The results indicated that, while all sunscreen formulae have SPF values ranging from 11.87 to 12.69, in the extra-protection category, the SPF value reached decreased with increasing jernang resin content.

**Keywords:** Jambi, Jernang, SPF, Sunscreen

## 1 Introduction

One of the non-timber forest products that is abundant in the Bukit Dua Belas National Park area Jambi, precisely in the village of Sepintun, is *Daemonorops* spp. or better known as jernang. Jernang is a type of rattan that has high economic value. The type of Jernang found in Sepintun village, Pauh District, Sarolangun Regency is *Daemonorops draco* (Willd.) Blume. Within the area there is also a location for the development and cultivation of Jernang. The part that is widely used from this plant is the fruit which contains resin (sap). The main use of jernang sap is as a paint coloring agent and medicine [21]-23].

The Suku Anak Dalam (SAD) usually collect jernang sap and then sell it directly to collectors, besides that it is also used as a medicine for headaches, medicine for wounds, medicine for diarrhea, and dye [21]. Currently, the use of jernang sap is only used as a dye which is done conventionally, by rubbing the jernang sap solids directly on the rattan that has been previously heated. This dye with jernang sap is usually applied to color the stomach [22]. Jernang is also an export commodity sent to South Korea to be made into cosmetic products

Based on this, natural skin care products like jernang are extremely successfully developed. The UV rays of the sun's radiation can have negative effects on skin that has been overexposed to them [1]. When it comes into contact with the skin, UVA and UVB radiation from the sun can hasten the aging process [2]. Many medical professionals highly advise using sunscreen to reduce the damaging effects of UV radiation on our skin. The main benefits of sunscreen use include protecting us from UV radiation, preventing early aging, tanning, and sunburns, reducing facial blotchiness, enhancing skin health, and reducing the risk of skin cancer. young generation

Jernang (*Daemonorops draco* (Willd.) Blume) is one of the outstanding plants that has been considered to possess the sunscreen property. *Daemonorops draco*'s active ingredient has been discovered as dracorhodin [4]-[5]-[24]. In addition to being used as a substitute for incense in religious ceremonies, dragon's blood is also used as a dye, a component of medications, a fragrance, a cosmetic, as a raw material for varnish, and as a treatment for wounds [7]. Resinolanol draco, an alcoholic resin of dragon blood, makes up the majority (56%) of dragon blood. Draco Resin (11%), Draco Alban (2.5%), amino acid, and benzoate are all present in dragon's blood. As antioxidants, flavonoids, saponins, and tannins all play important roles in neutralizing and removing toxins from the body [7]-[8].

Cream is one of the preserved types of sunscreen. According to the authorized basic standard, cream is the half-solid medication that can be in the form of an emulsion and is made from one or more dispersed medicinal combinations with a water content of less than 60% [9]. The *in vitro* assessment of SPF by spectrophotometry is commonly recognized for preformulation investigations since it is straightforward and quick, thus lowering the dangers connected with *in vivo* tests. SPF must be determined *in vivo* in human volunteers. However, because *in vitro* studies do not take into account any skin contact, they cannot completely substitute *in vivo* testing. Nevertheless, a strong connection between the findings of the two procedures has been shown [10]. Typically, application is required for *in vitro* SPF determination.

## 2 Method

Jernang resin was directly obtained from the village of Sepintun in the district of Sarolangun. This resin was then collected in order to be processed in a form of sunscreen creams with the following formula:

**Table 1.** Formulation of Sunscreen Cream

Materials	Control (-)	F1	F2	F3	Function
Jernang resin	0	1	2	3	active ingredient
Stearate acid	14	14	14	14	thickener
Cetyl alcohol	4	4	4	4	thickener
Glycerine	12	12	12	12	humectant
Triethanolamine	3	3	3	3	emulator
Methyl paraben	0,18	0,18	0,18	0,18	preservative
Propyl paraben	0,02	0,02	0,02	0,02	preservative
Oleum rosae	0,5	0,5	0,5	0,5	parfum
Aquadest ad	100	100	100	100	solvent

The production of sunscreen creams was conducted by mixtures of all those available materials in Table 1 after weighting each of the materials. The oil phase (stearate acid, cetyl alcohol, methyl paraben and propyl paraben) was carried out over the water-bath at 70°C. The water phase (glycerine, triethanolamine, methyl paraben and aquadest) was heated up to 70°C. The half remaining of triethanolamine was used for dissolving the Jernang resin. Then, the water phase was added gradually into the oil phase chamber at 70 degree Celsius, followed by Oleum rosae. After all was mixed, then it was homogenized at 2000 rpm for 15 minutes till it was cooled down. After 15 minutes of cooling process, it was readily poured into a jar.

The preparation of sunscreen creams was conducted to evaluate the physical properties such as organoleptic, pH, homogeneity, viscosity, adhesiveness, spread ability, cream type and stability test. The *in vitro* test of the SPF value in Jernang resin and sunscreens cream were performed by using spectrophotometer UV-VIS and were evaluated with the Mansur equation. The comparative control used was Skin Aqua SPF 15 as a positive control, and a basic cream as a negative control [11].

## 3 Results and discussion

The results of physical properties evaluation on the sunscreen creams, such as organoleptic, pH, homogeneity, viscosity, adhesiveness test, spread ability, cream type and stability test, were recapitulated on the method of cycling test, where the tests were done for three times on each formula, shown on Table 2 below.

**Table 2.** Recapitulation of Physical Properties Evaluation

No	Physical Properties Evaluation	FI	FII	FIII	Parameter
1	Organoleptic				
	Color	Pink*	Light Orange*	Dark Orange*	Balsam, 1972
	Odor	Rose aromatic scent*	Rose aromatic scent*	Rose aromatic scent*	Balsam, 1972
	Shape	Half solid*	Half solid*	Half solid*	Balsam, 1972
	Consistency	Soft*	Soft*	Soft*	Balsam, 1972
2	Homogeneity	Homogenic*	Homogenic*	Homogenic*	Homogen (SNI 16-4399-1996)
3	pH	7,57*	7,71*	7,71*	4,5-8 (SNI 4399-1996)

4	Adhesiveness	21 seconds*	21 seconds	19,33 seconds*	2-300 detik( Betageri dan prabhu, 2002)
5	Spread Ability	3,97 cm*	3,67 cm*	3,5 cm*	3-5 cm (Garg et al., 2002)
6	Cream type	m/a*	m/a*	m/a*	m/a (Ansel, 2006)
7	Sedimentation Degree	F=1*	F=1*	F=1*	F=1 (Ansel, 2006)
8	Viscosity	22.49745 Pa.s = 22.497,45 cps*	7.20543 Pa.s = 7205,43 cps*	12.76995 Pa.s = 12.769,95 cps*	2000-50000 centipoise. (SNI 4399-1996)
9	Fluidity	Plastic*	Plastic*	Plastic*	Aliranplastis (Martin, 1993).
10	Method of cycling test				
	- Organoleptic	Pink color, rose aromatic scent, half solid, soft*	Light orange color, rose aromatic scent, half solid, soft*	Dark orange color, rose aromatic scent, half solid, soft*	Balsam, 1972 Homogen (SNI 4399-1996) F=1 (Ansel, 2006)
	- Homogeneity	homogenic*	homogenic*	homogenic*	4,5-8 (SNI 4399-1996)
	- Sedimentation	F=1*	F=1*	F=1*	2-300
	- pH	6,96	7,00	7,02	detik(Betageri dan prabhu, 2002)
	- Adhesiveness	19,00*	19,33*	18,67*	3-5 cm (Garg et al., (2002)
	- Spread Ability	6,76	6,76	6,93	

### 3.1 Organoleptic Test

It was aimed to determine colour, odour, form and consistency of sunscreen creams on the visual observation for 4 weeks at room temperature (28-30<sup>0</sup>C). Of three formulas, it was obtained the result of the organoleptic test on the sunscreen creams, for 4 weeks observation at room temperature (28-30<sup>0</sup>C), suggested that the cream is in a form of half solid, has rose aromatic scent due to the addition of oleum rosae, and has pink colour due to the difference of Jernang resin concentration; the higher concentration of Jernang resin used, the darker the colour of cream appeared.



**Figure 1.** Sunscreen Jernang SPF 15

### 3.2 Homogeneity Test

The three formulas revealed the homogeny mixtures at the first week of measurement up to the fourth week. The absence of roughly particles on the creams suggested that all materials of the formula components were homogeneously mixed, and the mixture process on each material of the formulas was solely well-done, in a result of homogenic cream with softly texture. This is compliance with the Standard Quality Requirement of Sunscreen Creams [17].

### 3.3 pH Test

The best pH indicator for a good sunscreen cream is 4.5-8. On these studies for 4 weeks, the preparation creams had a pH ranging from 7.57-7.71, which was considerably suitable for pH of the face skin. This revealed that pH of the sunscreen creams with ethanol extract has complied the good standard of pH indicator. Moreover, pH indicator is closely associated to the stability of active ingredients, preparations and effectivity as well as the contentment while being used [18].

### 3.4 Spread-Ability Test

The requirement of topical-typed dispersion is 3-5cm [12]. It was found on the results that the Jernang resin sunscreen creams have the diffusion ability up to 3,50-3,97. This is recommended that the creams have a well-dispersed ability so that it may enable to magnify the widespread on the skin contact, which means the active ingredients may potentially be absorbed rapidly. Furthermore, the widespread of solid preparations is conversely against its viscosity. The smaller the viscosity, the wider the dispersion ability since it will easily flow through, reversely.

### 3.5 Adhesiveness Test

Based on the three formulas of sunscreen creams, it was obtained that all creams have adhesive timing > 4 seconds (19,33-21 seconds). These findings accordingly agreed with [19] where the good adhesive value to a sunscreen cream is 2-300 seconds. On this adhesiveness test, Jernang resin sunscreen creams has fulfilled the good requirement adhesive standard.

### 3.6 Viscosity Test

The viscosity of the cream obtained was in a normal range, 7205,43-22.497,45 cp, where the viscosity was not dependable from the amount of Jernang resin since it was dissolved in triethanolamine, which was the base of the cream. The viscosity values were also influenced by coagulants, surfactants, proportion of dispersed phases and particle sizes. Cetyl alcohol and stearyl alcohol were the coagulant agents which were viscous triggerable [14]. The results of viscosity test showed that the values were in a normal range, based on the standard values by SNI, 2017, where the good viscosity value of a cream was in between 2000-50000 centipoise.

### 3.7 Emulsion Cream Type Test

It was carried out to determine the type of a cream, by using blue methylene. The test was performed by adding blue methylene solution into a preparation that would be investigated. The positive result was marked by the blue colour appearance, evenly on the emulsion. This emulsion type is classified into type M/A since the blue methylene is evenly dissolved in water, while the blue methylene is unequally appeared or undissolved in water the emulsion type is classified into type A/M [1]. On these findings, the sunscreen creams are categorized into the type M/A, water-emulsified oil type. This was revealed by the evenly dispersion of blue methylene on the creams. This M/A emulsion cream type has some advantages such as easily rinseable with water and non-sticky texture.

### 3.8 Cycling Test

This test was aimed to perform a simulation of dissemination products in vehicles that had no temperature controller within it [13]. The results of this test showed that the formula that experienced physical alterations among organoleptic properties such as colour, odour, form and consistency did not occur segregation during the test. The pH and adhesive ability reduced in the standard range. However, the spread ability increased beyond the normal level due to high temperature, in which the temperature affected against the viscosity and spread ability; the higher temperature the more increasing on viscosity and spread ability, reversely.

### 3.9 Sunscreen Cream SPF Test

The determination of SPF value of sunscreen creams was, shown on Table 3 below:

**Table 3.** The Results of SPF Value Determination on the Sunscreen Creams

Sample	Formula			Information
	I	II	III	
Resin Jernang	60,28	54,70	50,76	F1 = Ultra F2 = Ultra F3 = Ultra
Sunscreen Cream	11,87	12,69	15,59	F1 = Extra F2 = Extra F3 = Ultra
Negative Control (Base Cream)	9,65 (Maximum Protection)			According to FDA, the SPF value has 5 categories: 2-4 (minimum protection), 4-6 (medium protection), 6-8 (extra protection), 8-15 (maximum protection), and >15 (ultra-protection).
Positive Control (Skin aqua)	15,00 (Extra Protection)			

Based on the results of the determination of the Jernang resin SPF value, it was obtained that the creams had three concentrations (500ppm, 750ppm and 1000ppm) with SPF value average at 55,25. After combination with the formulas, the SPF values on the creams reduced to average 13,38. This demonstrated that there was an alteration of SPF values after being formulated as a sunscreen cream. Despite SPF value declined, the cream was believed to have potential of being classified into the fourth category, which had the protection property ranging from maximum to ultra-protection, which was in other words yet having the high ability to protect skin from sunlight exposure. However, the SPF value of the sunscreen cream formulated with the FIII revealed a better result, was at 15,59, classified into the ultra-protection category. In this case, as the comparators, both the positive control used, trademark Skinaqua, had SPF 15, and the control negative, base cream, had SPF 9,65. Base cream, as the negative control, has a basic formula that contains propyl paraben and methyl paraben which have the carbonyl group, in which can be tested by using spectrophotometer at wavelengths between 290-320nm.

## 4 Conclusion

Development of jernang non-timber forest products in the Bukit Dua Belas National Park area Jambi can be formulated into sunscreen preparations where Formula III (FIII) is the best formulation found to be tested in this study, considering its ability to maintain the physical content of sunscreen cream and tends to be more stable in the storage process, including the nature of SPF which has the highest SPF. value with extra protective effect.

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