Formulation and evaluation of body splash from Java preanger Arabica coffee (*Coffea arabica* L.) oil

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**Abstract.** Java preanger Arabica coffee (*Coffea arabica* L.) is a distinctive coffee from Priangan having special property as a natural fragrance. The essential oil in java preanger arabica coffee (*Coffea arabica* L.) beans contains Abhexon, Furaneol, Sotolon, and Pentandion. The purpose of this study was to find out the percentage of the coffee extract concentration contributes to a good fragrance and how to formulate a safe and stable body splash preparation. The research began with material collection, determination, coffee roasting production, soxletation with ether solvents, dosage formulations with one percent, three percent, and six percent concentrations and evaluations including organoleptic test, pH, viscosity, quality test of the body splash preparations (spreadability, endurance, spot, and adhesion tests), irritation test, sharpness test and preference test. The results showed that the formula with the three percent Java preanger Arabica coffee (*Coffea arabica* L.) oil concentration was a safe, stable and the scent was favored because it was not too strong and left no stains.

1. **Introduction**

Cosmetics are materials that are rubbed, poured, spread, sprinkled, sprayed, inserted into, or used in the human body to cleanse, maintain, and increase attraction or change appearance without affecting human body structure and function [1]. Cosmetic preparations according to Brauer EW and the Princlus of Cosmetics for Dermatologists are classified as toiletries, skin care, make up, and fragrance. One of the fragrance cosmetic preparations is body splash [2].

At present, body splash has been widely used by countless group of people. Unfortunately, its manufacture uses too many synthetic fragrance ingredients such as benzyl alcohol, alcohol, benzyl salicylate that cause side effects such as allergic reactions. To avoid these side effects, the source of natural body splash is chosen, one of which is Arabic coffee beans [3,4].

It is commonly acknowledged that Arabica coffee beans contain polysaccharides, lignin, pectin, protein, caffeine, trigonelline, nicotinic acid, diterpen coffee bean oil, minerals, chlorogenic acid, quinic acid, melanoidin which pharmaceutically serves as an antioxidant, antihypertensive, antiviral hepatitis B, anti-diabetic, hepatoprotector [4]. Roasted Arabica coffee beans contain such volatile compounds as abhexon, furaneol, sotolon, pentandion that characterize the aroma of coffee [5,6].

This study generated a formulation and evaluation of body splash preparation from Java preanger Arabica coffee (*Coffea arabica* L.) bean oil.
2. Methods
The initial stage of the research was to collect resources; that is Java preanger arabica coffee beans that had been dried and collected from Sumedang district. It was then confirmed at the Indonesian Institute of Sciences (LIPI).

Furthermore, phytochemical screening involving the examination of alkaloid compounds, flavonoids, saponins, quinones, tannins, steroids and triterpenoids was carried out. Coffee beans were then medium-roasted to produce the desired scent. The results were then soxhletated and tested for the organoleptic oil characterization which encompassed the shape, scent, color, specific gravity, refractive index, saponification number, acid number and peroxide number [7].

The body splash formula was prepared with the concentration variations of Arabica preanger coffee extract (1%, 3% and 6%). The formula for the Body Splash preparation is presented in Table 1. Preparations were made by developing carbomers, other ingredients such as coffee bean oil, diisopropanolamine, PEG-40 HCO and benzophenon-2 each dissolved in ethanol. They were all slowly mixed. Afterward, copolymer styrene / vp was added and they were stirred until they are homogeneous [8].

The evaluation of preparations included organoleptic testing, pH testing, viscosity testing, body splash preparations quality testing (spreadability, durability, spot and adhesion tests), irritation test, sharpness test and preference test. The observation was done in 28 days of storage [9].

Table 1. Body splash formulation of arabica coffee beans oil (Coffea arabica L.) Java preanger.

| No | Materials          | Concentration (%) |
|----|-------------------|-------------------|
|    |                   | F1<sup>a</sup>    | F2<sup>b</sup> | F3<sup>c</sup> |
| 1  | Coffee Beans Oil  | 1                 | 2              | 3              |
| 2  | Ethanol           | 50                | 50             | 505            |
| 3  | PEG 40           | 5                 | 5              | 5              |
| 4  | Diisopropanolamin| 0,1               | 0,1            | 0,1            |
| 5  | Carbomer 941     | 0,1               | 0,1            | 0,1            |
| 6  | Benzophenon-2    | 0,05              | 0,05           | 0,05           |
| 7  | Styrene          | 0,01              | 0,01           | 0,01           |
| 8  | Aquadest         | Add 100           | Add 100        | Add 100        |

Notes
<sup>a</sup> Body splash formula containing 1% Arabica Coffee Beans oil
<sup>b</sup> Body splash formula containing 3% Arabica Coffee Beans oil
<sup>c</sup> Body splash formula containing 6% Arabica Coffee Beans oil

3. Results

3.1. Result
In study used Arabica coffee (Coffea arabica L.) beans. Based on the determination results carried out at the Indonesian Institute of Sciences (LIPI), it was identified that the plants used in the study were Java preanger arabica coffee (Coffea arabica L.) originating from the Gentianales familia, Coffea arabica L species.

Phytochemical screening results discovered positive results for alkaloid compounds, phenols, flavonoids, tannins, quinones, steroids / triterpenoids, and negative results on saponins.

Furthermore, the extraction of roasted Arabica coffee beans which have been pollinated by using the soxhletation method using diethyl ether solvents was then evaporated using a rotary evaporator to remove the solvent [7].

The result of soxhletation of roasted arabica coffee beans is oil which are characterized including shape, odor, color, specific gravity, refractive index, saponification number, acid number, and peroxide number. The results of the examination has met the specifications of the Roasted Coffee Oil Natural Sourcings and the Typical Properties of Hallstar Roasted Coffee Oil [10].
Table 2. Results of evaluation body splash for arabica coffee beans oil (*Coffea arabica* L.) Java preanger.

| No | Evaluation            | Formula       |
|----|-----------------------|---------------|
|    |                       | F1<sup>a</sup> | F2<sup>b</sup> | F3<sup>c</sup> |
| 1  | Organoleptic          |               |               |               |
|    | a. Color              | Yellow        | Brown         | Dark Brown    |
|    | b. Odor               | Typical Coffee| Typical Coffee| Typical Coffee|
|    | c. Consistency        | Watery        | Watery        | Watery        |
| 2  | pH test               | 5.7           | 5.6           | 5.5           |
| 3  | Viscosity             | 16.93         | 18.56         | 20.50         |

Notes

<sup>a</sup> Body splash formula containing 1% Arabica Coffee Beans oil
<sup>b</sup> Body splash formula containing 3% Arabica Coffee Beans oil
<sup>c</sup> Body splash formula containing 6% Arabica Coffee Beans oil

Table 3. Results of evaluation body splash for arabica coffee beans oil (*Coffea arabica* L.) Java preanger.

| Spreadibility test | Formula       |
|-------------------|---------------|
|                   | F1<sup>a</sup> | F2<sup>b</sup> | F3<sup>c</sup> |
| Diameter          | 6.25 cm       | 5.02 cm        | 4.2 cm         |
| Scent             | Typical Coffee| Typical Coffee+| Typical Coffee++|
| Color             | Not Stained   | Light yellow   | Yellow         |

Notes

<sup>a</sup> Body splash formula containing 1% Arabica Coffee Beans oil
<sup>b</sup> Body splash formula containing 3% Arabica Coffee Beans oil
<sup>c</sup> Body splash formula containing 6% Arabica Coffee Beans oil

Table 4. Results of evaluation body splash for arabica coffee beans oil (*Coffea arabica* L.) Java preanger.

| Durability Test   | Formula       |
|-------------------|---------------|
|                   | F1<sup>a</sup> | F2<sup>b</sup> | F3<sup>c</sup> |
| Filter Paper      | 3 Hours       | 10 Hours       | 24 Hours       |
| Skin              | 1.3 Hours     | 2.6 Hours      | 3.6 Hours      |

Notes

<sup>a</sup> Body splash formula containing 1% Arabica Coffee Beans oil
<sup>b</sup> Body splash formula containing 3% Arabica Coffee Beans oil
<sup>c</sup> Body splash formula containing 6% Arabica Coffee Beans oil

Table 5. Results of evaluation body splash for arabica coffee beans oil (*Coffea arabica* L.) Java preanger.

| Spot Test        | Formula       |
|------------------|---------------|
|                  | F1<sup>a</sup> | F2<sup>b</sup> | F3<sup>c</sup> |
| Diameter         | 5.02 cm       | 4.10 cm        | 3.5 cm         |
| Scent            | Typical Coffee| Typical Coffee+| Typical Coffee++|
| Color            | Not stained   | Light yellow   | Yellow         |

Notes

<sup>a</sup> Body splash formula containing 1% Arabica Coffee Beans oil
<sup>b</sup> Body splash formula containing 3% Arabica Coffee Beans oil
<sup>c</sup> Body splash formula containing 6% Arabica Coffee Beans oil
Table 6. Results of evaluation body splash for arabica coffee beans oil (Coffea arabica L.) Java preanger.

| Adhesion Test | Formula | F1<sup>a</sup> | F1<sup>b</sup> | F1<sup>c</sup> |
|---------------|---------|---------------|---------------|---------------|
| Diameter      |         | 3.1 cm        | 3.27 cm       |               |
| Scent         |         | Typical Coffee+| Typical Coffee++|               |
| Color         |         | Light yellow  | Yellow        |               |

Notes

<sup>a</sup> Body splash formula containing 1% Arabica Coffee Beans oil
<sup>b</sup> Body splash formula containing 3% Arabica Coffee Beans oil
<sup>c</sup> Body splash formula containing 6% Arabica Coffee Beans oil

Figure 1. Body splash from arabica for arabica coffee beans oil (Coffea arabica L.) Java preanger. f1: body splash formula containing 1% arabica coffee beans oil, f2: body splash formula containing 3% arabica coffee beans oil, f3: body splash formula containing 6% arabica coffee beans oil.

The sharpness test was given to 20 respondents and the results showed that the F3 formula with a concentration of 6% was decidedly sharp. This is because the higher the concentration of coffee bean oil is, the higher sharpness increases.

3.2. Discussion

The results of organoleptic evaluation were carried out by observing color, scent, and texture. The three observed dosage formulas showed no change in color (yellow, brown and dark brown), odor (typical coffee) or consistency (watery). This indicated that the formulation of body splash preparations for Arabica coffee (Coffea arabica L.) bean oil was stable in the 28-day storage (table 2).

The results of the pH test of body splash preparations containing arabica coffee beans oil (Coffea arabica L.) java preanger discovered that the higher the concentration of coffee bean oil is, the lower pH decreases (pH 5.7, pH 5.6, pH 5.5). This is as a result of the acidic pH of Arabica coffee beans oil (Coffea arabica L.). The longer the storage lasts, the lower pH decreases. This is due to the oxidation process during the storage. The result is that the generated formula are in the skin pH range (4.5-6.5) which means that it is safe to use (table 2).

The results of the viscosity test of body splash preparations containing arabica coffee beans oil (Coffea arabica L.) java preanger showed that the higher the concentration of coffee bean oil is, the higher the viscosity will become (16.93, 18.56, 20.50). This is due to the higher concentration of coffee bean oil. The longer the storage lasts, the lower viscosity decreases. This is due to the nature of the acidic preparation that affects viscosity (table 2).

In table 3 the results of spreadibility tests include diameter, scent, and color. The higher the concentration of arabica coffee bean oil (Coffea arabica L.) java preanger is, the lower the dispersion...
power becomes. This is influenced by the high concentration of coffee bean oil, whereas the concentration of solvents (alcohol and water) decreases. The higher the concentration of java preanger arabica coffee bean oil is, the sharper the smell is. This is because the concentration of coffee bean oil is getting higher and the higher the concentration gets, the thicker the color will get, this is due to the dark brown color of bean oil.

Durability test was carried out on two treatments; through filter paper and skin. Formula F3 provided the most durable results, compared to other formulas and according to existing literatures. This is due to the high concentration of Arabica coffee beans oil (Coffea arabica L.) java preanger. Fragrance preparations with a concentration of 1-3% lasted less than 2 hours, and preparations with concentrations of 3-8% lasted approximately 2-3 hours (table 4).

Spot test results showed that all the body splash preparations had fragrance resistance under the sun. However, the scent produced was getting weaker and as the concentration of arabica coffee beans oil (Coffea arabica L.) java preanger increases, the aroma becomes increasingly sharper (table 5). The adhesion test results showed that all body splash formulations have higher adhesion as the concentration of arabica coffee beans oil (Coffea arabica L.) java preanger increases (table 6). The results of the irritation test using the open patch test method using albino male rabbits showed that all preparations; F1, F2 and F3 did not cause erythema or edema reactions in rabbits. This is because the active ingredients and excipients used are proven to be safe, inert, and non-irritating. The next stage was the preference test, the results of the preference tests performed to 20 respondents found that F2 with a concentration of 3% arabica coffee beans oil (Coffea arabica L.) java preanger was preferred because the scent was not too strong and left no stain when applied.

Fragrance test was administered to 20 respondents, the results showed that F3 with 6% concentration of Arabica coffee beans oil (Coffea arabica L.) java preanger was so fragrant. This is because the higher the concentration of coffee bean oil is, the more the fragrance pervades.

4. Conclusion
Based on the aforementioned results, it was concluded that the evaluation of Body Splash preparations with the active ingredient of arabica coffee beans oil (Coffea arabica L.) Java preanger has convincingly discovered that F1 formula with a concentration of 3% coffee oil was the safest, most stable, most adhesive, fragrant and preferred formula.

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References
[1] Amasa W, Santiago D, Mekonen S and Ambelu A 2012 Are cosmetics used in developing countries safe? Use and dermal irritation of body care products in Jimma Town, Southwestern Ethiopia J. Toxicol. 2012
[2] Berger R G 2007 Flavours and fragrances: chemistry, bioprocessing and sustainability (Springer Science & Business Media)
[3] Anon 1903 The tea & coffee trade journal. Tea coffee trade J. v.
[4] Chu Y-F 2012 Coffee: emerging health effects and disease prevention vol 59 (John Wiley & Sons)
[5] Toledo P R A B, Pezza L, Pezza H R and Toci A T 2016 Relationship between the different aspects related to coffee quality and their volatile compounds Compr. Rev. Food Sci. Food Saf. 15 705–19
[6] Kiattisin K, Nantarat T and Leelapornpisid P 2016 Evaluation of antioxidant and anti-tyrosinase activities as well as stability of green and roasted coffee bean extracts from Coffea arabica and Coffea canephora grown in Thailand J. Pharmacogn. Phyther. 8 182–92
[7] Ghosh P and Venkatachalapathy N 2014 Processing and drying of coffee–a review Int. J. Eng. Res. Technol 3 784–94
[8] Schrader K and Domsch A 2005 *Cosmetology - Theory & Practice Vol.II* (Augsburg: Verlag Fur Chemische Industrie)

[9] Rakhmawati A 2015 Kandungan Kimia Minyak Daun Kecombrang (Etlingera Elatior) Dan Pemanfaatannya Sebagai Parfum

[10] Aziz T, KN R C and Fresca A 2009 Pengaruh pelarut heksana dan etanol, volume pelarut, dan waktu ekstraksi terhadap hasil ekstraksi minyak kopi *J. Tek. Kim.* **16**