

# Antioxidative Properties and Sensory Evaluation of Perlis Sunshine Mango Seed Flour Body Scrub

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**Abstract.** The aim of this work was to utilize Perlis Sunshine Mango Seed Flour (MSF) as natural active ingredient in body scrub for skin care cosmetology. The body scrubs were prepared in two forms i.e. rough salt and oil-in-water (O/W) emulsion. Both types of body scrub were formulated as based and containing Perlis Sunshine MSF. The determination of total phenolic content (FC-reagent method), ascorbic acid content (HPLC) and total antioxidant activity (DPPH method) of the body scrubs were evaluated for the possible application in dermo-cosmetic field. The O/W MSF body scrub extract contains  $6.65 \pm 0.16$  GAE mg/g of total phenolic content (TPC) with  $32.29 \pm 2.60\%$  of DPPH activity inhibition. The rough salt MSF body scrub extract had shown highest ascorbic acid content compared to other body scrubs. For the sensory analysis, most of the body scrubs testers satisfied with the O/W body scrubs compared to rough salt body scrubs in all the attributed tested.

## 1. Introduction

Mango (*Mangifera indica* L) is a tropical seasonal fruits which grown over tropical countries and sub-tropical regions. Perlis Sunshine Mango can be obtained in Perlis and the production of mangoes is two times per season [1]. Mango fruit is the second largest in tropical crop behind fruit bananas [2]. Ripe mangoes are used to make frozen mango products, canned fruits products, pickles and beverages in food industries. Industrially, the edible parts of mango fruits are used to process mango products while peels and seeds are dispensed as waste. The vast amount of these industrial wastes is a pollution source to the environment [3].

Mango by-products, especially seeds and peels are recognized as natural organic wastes which contain high level of nutrients that can be utilized [4]. Economic losses is a factor come to the food industries if the huge amount of industrial waste did not utilized effectively. Economic losses occur due to high expenses cost for solving the industrial waste and low recovery obtained to the industry. Therefore, it is necessary and important to reuse the plant by-products from environmental and economic perspective [3].

Mango seed and mango peel has been studied and utilized to produce biscuit flour products. Mango seed powder contain high protein, total phenolic and ash contents, whereas mango peel powder contain high level of crude fiber and antioxidant activity. Both mango seed and peel powder can help in prevention of diseases due to their natural and unharmed bioactive substances [5]. However, mango



seed flour has been reported to have extremely bitter taste. Hence, the utilization of mango seed flour in pharmaceutical and cosmetic aspects are much more recommended compared to food industry.

Antioxidant compounds are an essential formulate recipe for cosmetic products such as body scrub due to it provides a protection against reactive oxygen species (ROS) deleterious effect to the human skin. Thus, the mango seeds flour have a potential as a value added to the body scrub formulation by enhancing the function value of the body scrub products. Therefore, this study is focus on the utilization of mango seed flour in the formulation of body scrub and to evaluate the consumer acceptance of the products.

## 2. Materials

### 2.1. Chemicals

2,2-diphenyl-1-picrylhydrazyl free radical (DPPH) was purchased from Merck. Follin-Ciocalteu reagent was purchased from Sigma-aldrich Co. Glycerol, gallic acid, ascorbic acid (99%) and methanol were purchased from HmbG.

### 2.2. Plant Materials

Perlis Sunshine *Mangifera indica* seed powder was purchased from local farmers around Perlis.

## 3. Procedures

### 3.1. Body Scrub Formulation

There are two types of formulations had been used to prepare the body scrub i.e. rough salt and oil in water (O/W) emulsion. Composition for the rough salt and O/W emulsion with and without MSF are tabulated in Table 1 and 2 respectively.

**Table 1:** Composition of rough salt body scrubs.

Composition (INCI)	Function	Base	MSF
		Amount (g)	
Sodium Chloride	Abrasive	50.00	49.00
<i>Helianthus annuus</i> (Sunflower) oil	Emollient	5.00	5.00
<i>Olea europea</i> (olive) fruit oil	Emollient	5.00	5.00
<i>Jasminum officinale</i> (Jasmine) oil	Emollient/Fragrance	2.00	2.00
<i>Mangifera indica</i> seed powder	Active principle	-	1.00

**Table 2:** Composition of O/W emulsion body scrubs.

Composition (INCI)	Function	Base	MSF
		Amount (g)	
Phase A			
Glyceryl stearate SE, Glyceryl stearate, Cetearyl alcohol	Base self emulsifying	13.00	13.00
<i>Helianthus annuus</i> (Sunflower) oil	Emollient	5.00	5.00
<i>Olea europea</i> (olive) fruit oil	Emollient	5.00	5.00
<i>Jasminum officinale</i> (Jasmine)oil	Emollient/Fragrance	2.00	2.00
Phenoxyethanol	Preservative	0.50	0.50
Phase B			
Aqua	Vehicle	66.40	65.40
Disodium EDTA	Chelating	0.10	0.10
Glycerin	Moist	3.00	3.00
Phase C			
Sodium chloride	Abrasive	5.00	5.00
<i>Mangifera indica</i> seed powder	Active principle	-	1.00

### 3.2. Body Scrub Extration

Body scrub extracts were prepared by dissolving 5 g of the body scrubs in 100 mL of methanol in the beakers for 30 min and followed by sonication for 20 min. The mixtures then were filtered by using No. 1 Whatman filter paper. The collected filtrates were evaporated at 67 °C (boiling point of methanol) under vacuum by rotary evaporator for 5 to 6 min until the extracts were fully concentrated. The extracts were kept at 4 °C until further used [6].

### 3.3. Total Phenolic Compounds

The Folin-Coicalteu colorimetric method was used to determine TPC in body scrubs extracts [7]. 0.1 mL of sample extracts was added into 0.5 mL of Folin-Ciocalteu and 7.4 mL of distilled water. The mixtures were mixed thoroughly and incubate for 3 min. Then, 2 mL of sodium carbonate solution (15%) was added and it was kept in dark place for 30 min. The mixture was measured at 765 nm in a UV-VIS. The TPC was expressed as mg gallic acid equivalents (GAE)/g extract.

### 3.4. Ascorbic Acid Content

The ascorbic acid (vitamin C) content in the body scrubs were measured by using High Performance Liquid Chromatography (HPLC). 0.1 mL of each of the body scrub extracts was dissolved in 9.9 mL distilled water in a test tube. The mixtures were mixed well by using the vortex and centrifuged at 3000 rpm for 5 min at room temperature. The supernatants are collected and aliquots of the samples were filtered through a µm PTFE syringe filter before analysed with HPLC [5].

### 3.5. Total Antioxidant Activity

DPPH method was used to evaluate the total antioxidant activity of the body scrubs. A methanol solution with DPPH was used as control (2 mL DPPH solution and 1 mL of methanol). The test samples were prepared by mixing 0.1 mL of each body scrub extracts with a methanol solution of 0.1 mM DPPH under a 200 rpm speed in the dark [8]. Next, the mixtures were left to incubate for 30 minutes in the dark and the absorbance were measured at 517 nm. The percentage of free radical activities in the tested samples were calculates as following equation 1.

$$(1) \quad \% \text{ inhibition} = \left[ \frac{(A_c - A_s)}{A_c} \times 100\% \right]$$

Where,

$A_c$  = absorbance value for control

$A_s$  = absorbance value for tested sample

### 3.6. Sensory Evaluation

Twenty panelist, female, aged between 20-2 years old were randomly recruited from School of Bioprocess Engineering's students. The panelists were asked to evaluate spreading, aroma, greasiness, allergy and smoothness of the body scrubs using a three-scale assessment (good, normal and worse). The body scrubs were blind-labeled and coded with using a random three-digit number. Samples were applied individually, one after another, under normal lighting conditions at room temperature and a balanced complete block design was used to assign the presentation order. Water and tissue were provided to clean and rinse the skin between samples.

## 4. Results and Discussion

### 4.1. Total Phenolic Content (TPC) of the Formulated Body Scrubs

The total phenolic contents (TPC) of different type of body scrubs are shown in Table 3. As expected, the body scrubs containing MSF had higher total phenolic content compared to the bases body scrubs.

**Table 3:** The total phenolic content (GAE mg/g) of the body scrubs.

Samples	TPC(GAE mg/g)
Rough salt base scrub	$0.32 \pm 0.02$
Rough salt MSF scrub	$5.92 \pm 0.12$
O/W base scrub	$0.48 \pm 0.01$
O/W MSF scrub	$6.65 \pm 0.16a$

#### 4.2. Determination of Ascorbic Acid in the Formulated Body Scrubs

Ascorbic acid in the samples was determined based on the area under the peak of the HPLC chromatogram. Height of the peak was referred to high or low selectivity of the method to separate interested compound. Thus, the high and sharp peak means the interested compound had been separated efficiently from other compound [9]. The obtained results of HPLC analysis were summarized in Table 4.

**Table 4:** Ascorbic acid peak in the body scrubs from HPLC.

Samples	Retention time (min)	Area under the peak	Height of the peak
Standard ascorbic acid	3.299	3718149	177323
Rough salt base body scrub	Not detected	Not detected	Not detected
Rough salt MSF body scrub	2.582	294268	5437
O/W base body scrub	Not detected	Not detected	Not detected
O/W MSF body scrub	3.427	3565	392

For the rough salt base body scrub and O/W base body scrub, the occurrence of ascorbic acid peak in the report were absence and thus the retention time of ascorbic acid is not obtained. Hence, it can be said that both type body scrub did not containing ascorbic acid. For the rough salt MSF body scrub and O/W MSF body scrub, the retention time of ascorbic acid were 2.582 minutes and 3.427 minutes. The increasing or decreasing of retention time of the samples to the retention time of standard ascorbic acid sample can be caused by the presence of contaminants [9]. Besides, both body scrub had shown more than one peak in the chromatograms and this means there were presence of impurities in the sample and these impurities may have low level difference to diode array spectrum of ascorbic acid [10]. The content of the ascorbic acid content in both scrubs can be said very low due to the area under the peak of both body scrubs were relatively low to the area under peak of standard ascorbic acid sample. By comparing the area under the peak of both body scrubs, since the area of rough salt MSF body scrub is greater than the area O/W MSF body scrub. Thus, the rough salt MSF body scrub had containing higher ascorbic acid content than O/W MSF body scrub.

#### 4.3. Determination of Total Antioxidant Activity of the Formulated Body Scrubs

This DDPH method is depended on the reduction of free radical DPPH by antioxidant to DPPHH as in resulting absorbance decreased from DPPH [11]. The lower absorbance in the reaction mixture has indicated higher free radical activity. This means alcoholic extract of the body scrub with O/W MSF body scrub form had captured more free radicals formed by DPPH and this resulting into decrease in absorbance with increase in inhibition value [11]. As expected, all bases body scrubs had displayed a much lower potency as compared to those body scrubs containing Perlis Sunshine Mango Seed Flour (Table 5). The O/W MSF body scrub had better antioxidant potential and followed by rough salt type body scrub with Perlis Sunshine MSF.

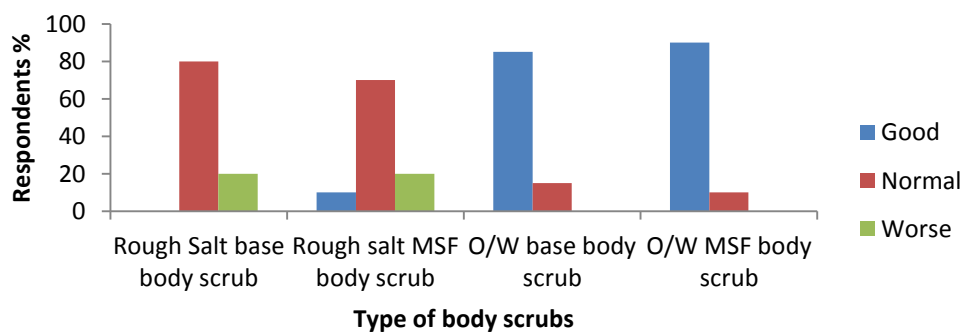
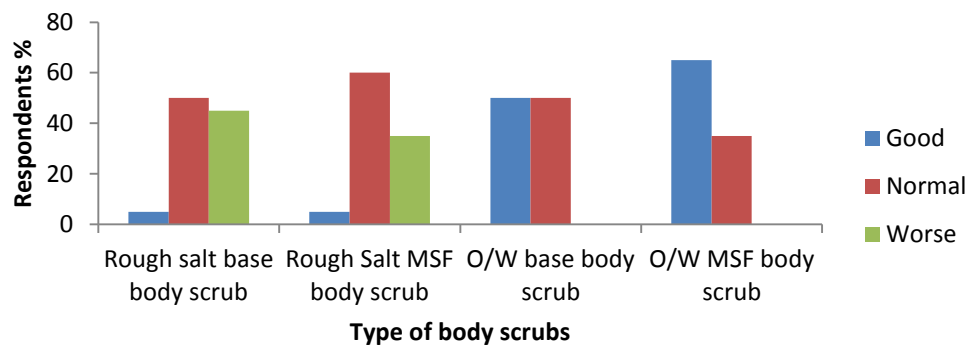
**Table 5:** DPPH activity (%) of the body scrubs.

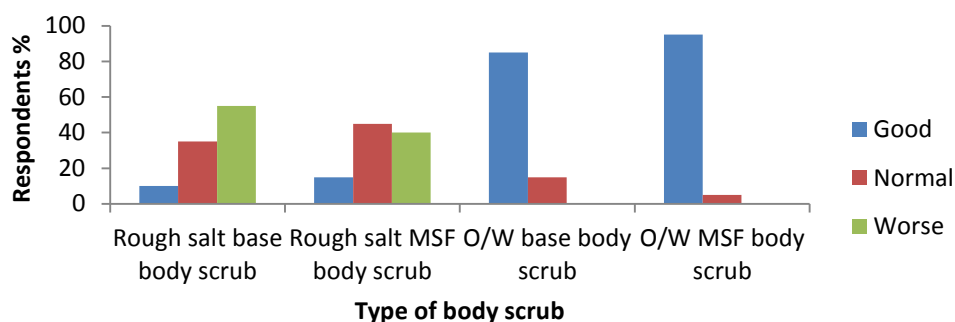
Samples	DPPH Activity (%)
Rough salt base body scrub	4.17 $\pm$ 1.04
Rough salt MSF body scrub	28.65 $\pm$ 2.08
O/W base body scrub	6.52 $\pm$ 0.52
O/W MSF body scrub	32.29 $\pm$ 2.60

Data given are mean  $\pm$  standard deviation for three different value of each sample.

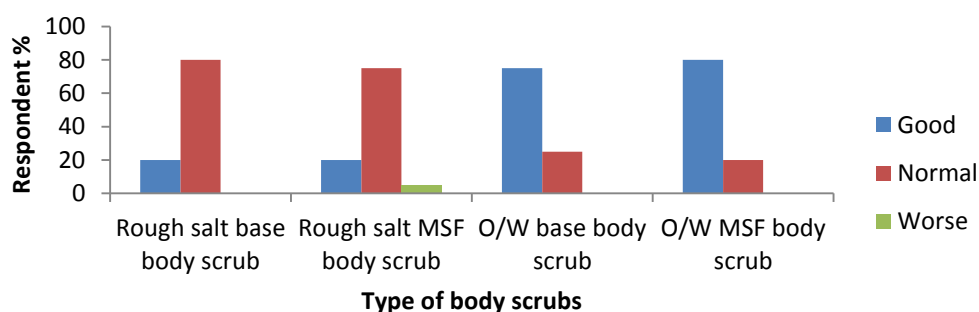
#### 4.4. Evaluation of Sensory Evaluation

The aim of the sensory evaluation was to evaluate the personal response of preference to the formulated body scrubs. The sensory evaluation is importance for the evaluation and optimization to the effects of cosmetic recipes. Twenty of body scrubs evaluation questionnaire had been collected and the data were analyzed in figures below. Most of participants considered O/W body scrubs had good performance compare to rough salt body scrubs in spreading, aroma, greasing and smoothness attributes. Major participants comment that the strong oily smell in rough salt body scrubs had covered the aroma of fragrance oil and thus most of them cannot accept the smell of the rough salt type body scrub. Besides, most of the participants comment that the greasing effect from rough salt body scrubs were too oily and sticky for them. Lastly, all participants (100 %) had stated that they were not allergy to all type of body scrubs that had been prepared. However, there were still have some comments about the O/W type body scrub from the participants. Most of participants think that the abrasive effect of O/W body scrubs to their skin were not strong enough for them and the texture of the body scrubs were a bit similar to the texture of lotion. Based on the evaluation of body scrubs above, it can be conclude that most participants were more prefer to O/W body scrubs compared to rough salt body scrub in spreading, aroma, greasing, and smoothness attributes.

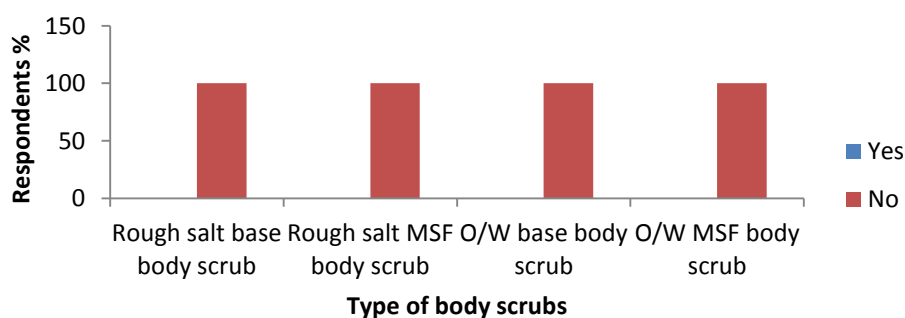
**Figure 1:** Spreading assessment to the body scrubs by participants**Figure 2:** Aroma assessment to the body scrubs by participants.



**Figure 3:** Greasing assessment to the body scrubs by participants.



**Figure 4:** Smoothness assessment to the body scrubs by participants.



**Figure 5:** Allergic assessment to the body scrubs by participants.

## 5. Conclusion

The O/W MSF body scrub content the highest total phenolic content ( $6.65 \pm 0.16$  mg/g) and better antioxidant potential ( $32.29 \pm 2.60\%$ ) compared to the other body scrubs formulation. From the HPLC peaks obtained, it shows that rough salt MSF body scrub and O/W MSF body scrub had shown tiny peak in the chromatograms; this means both body scrub contains ascorbic acid but with low content. However, in the consumer acceptance test, O/W body scrubs were more preferred compared to rough salt body scrubs in overall attributes tested.

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