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AMINO ACID AND FATTY ACID PROFILING OF LOCAL FERMENTED RICE POWDER (BEDAK SEJUK) AND ITS SOAKING WATER

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ABSTRACT

This research was done to determine the amino acids and fatty acids profiles in bedak sejuk and its soaking water. The results of shows 16 out of 17 types of amino acids detected in both bedak sejuk and soaking water. The amino acids detected were aspartic acid, serine, glutamic acid, glycine, histidine, arginine, threonine, alanine, proline, tyrosine, valine, methionine, lysine, isoleucine, leucine, and phenylalanine. Glutamic acid was found to be the highest concentration in bedak sejuk at 10.33 g/g × 10^{-3} (w/w) and the lowest was methionine at 0.36 g/g × 10^{-3} g (w/w). In soaking water samples glutamic acid and methionine were the highest and lowest concentrations at 1.31 g/g × 10^{-3} and 0.055 g/g × 10^{-3} (w/w), respectively. As for fatty acid profiles, only seven out of 37 types of fatty acid tested were discovered in the soaking water while 17 were detected in bedak sejuk. The highest concentration of fatty acids in bedak sejuk was linoleic acid at 44.336% (w/w) followed by palmitic acid at 34.791% (w/w) and oleic acid was the highest concentration at 21.561% (w/w) in soaking water.

Key words: Bedak sejuk, rice cosmetics, amino acid, fatty acid, rice fermentation

INTRODUCTION

Bedak Sejuk has been used for many generations by Malaysian women as traditional cosmetic. It is produced via the process of natural rice fermentation where rice is soaked in tap water in a closed container for a certain period until a white paste appears. The paste is filtered repeatedly until a white powder is formed and the final product is called as bedak sejuk. Bedak sejuk is said to promote beautiful skin, treats acne, and acts as whitening agent for skin (Sulaiman, 2015). It is assumed there are substances presence in bedak sejuk that gives such benefits for the skin. Such active components could be amino acids and fatty acids.

The cosmetic industry is fast moving and rapidly comes out with various options of their ingredients and products to fulfil the customers' demand. Among the popular choices is amino acids. In cosmetic formulation, various types of amino acids are used mainly for the skin and hair moisturiser. It also has an antioxidant property, used in oral hygiene products and scented cosmetics, balances the pH, and acts as a buffer to all other cosmetic products. Several amino acids are found in cosmetic products are arginine, cysteine, and glycine. The concentration of arginine reported in the cosmetic products are ranged between 2.0 × 10^{-5}% and 18% (w/w), while glycine is in the range of 5 × 10^{-4}% to 4% (w/w) present in facial mask and haircare products (FDA, 2013; Gottschalck & Bailey, 2010).

The demand of consumer for sustainable and natural based cosmetic products is increasing. This increases the possible market for natural raw material like fatty acid, carotenoid, squalene, tocopherol, tocotrienol, and phenolic compounds that are mostly available in the agrotechnology industry. These natural substances have high active

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biological activity to maintain the integrity of skin and tissue, fast reproduction of new tissues and cell, and inhibit the proliferation of cancer cells (Górnaś & Rudziñska, 2016). There are a few of fatty acids that have high potential to be marketed in the cosmetic industry such as linoleic acid, squalene, and phytosterol. Linoleic acid has been reported to be used for its therapeutic properties as it has the ability to repair cell and tissue in a good manner. Squalene is used as an antioxidant and emollient cream that works as the protective layer of the skin so that it retains moisture while phytosterol has good skin recovery properties as it has a similar structure as cholesterol. Due to this, it is widely used to control skin diseases like scabies, psoriasis, and eczema (Huang *et al.,* 2009; de Jesus Raposo *et al.,* 2013; Fatima *et al*, 2013).

The industry of bedak sejuk in Malaysia is more towards production rather than experimental data. In terms of scientific studies, there is none yet about the composition, empirical evidence based on the production, and the benefits of bedak sejuk. Malaysian research and development of bedak sejuk is still in the early stages. Prior research on bedak sejuk were only done regarding the effects of soaking on rice and the influence of fermentation on the particle size changes (Dzulfakar & Tan Kofli, 2016; Dzulfakar *et al.,* 2015). Therefore, this study was done to determine the amino acids and fatty acids profiles, as well as the concentration of free fatty acid in bedak sejuk and its soaking water.

MATERIALS & METHODS

Preparation of bedak sejuk

Approximately 250 g of local rice (Indica – Jasmine brand, Malaysia) composed of 5% crushed rice was soaked in tap water at 1:1 ratio (w/v). The rice and the container were not needed to be cleansed or sterilised prior to the soaking. The rice was left to ferment naturally at room temperature. The soaking or fermentation process proceeded for 14 days. A sample of bedak sejuk along with soaking water were taken at the end of the process. The duplicate samples were separated using a cloth and dried at room temperature.

Determination of amino acid profile

The determination of amino acid profile was done based on the method from AccQ. Tag Waters (Waters Corporation, 2014) in the certified laboratory of UKM Unipeq. The bedak sejuk sample underwent a hydrolysis process using AccQ.Tag Waters Derivatization Kit and profiled using the high performance liquid chromatography (HPLC) equipped with a fluorescent detector (FID). This step was repeated for the sample of soaking water.

Determination of fatty acid profile and free fatty acid concentration

Fatty acid was extracted from bedak sejuk and soaking water using the standard method of IUPAC 2.301 (IUPAC, 1992) at UKM Unipeq. The profiling was done using the gas chromatography equipped with fluorescent ion detector (GC-FID). Thirty-seven types of fatty acids were determined. The concentration of free fatty acids was detected using method of MPOB p2.5 (MPOB, 2004).

RESULTS AND DISCUSSION

Determination of amino acid profile in bedak sejuk and soaking water

For 100 g of bedak sejuk sample, 16 amino acids were detected as shown in Table 1. Based on the analysis, only hydroxyproline was not detected (ND) due to its concentration of less than 0.001g in bedak sejuk. The highest amino acid detected was glutamic acid with a concentration of 10.33 g/g × 10^{-3} (w/w) and the lowest amino acid detected was methionine at 0.36 g/g × 10^{-3} (w/w).

The highest concentration of amino acid detected in soaking water was glutamic acid with a concentration of 1.31 g/g × 10^{-3} (w/w) and the lowest was methionine at 0.055 g/g × 10^{-3} (w/w). The concentration of glutamic acid in the soaking water was lower than its concentration in bedak sejuk. It can be concluded that the application of bedak sejuk is more effective than applying the soaking water as the amount of amino acid in bedak sejuk is higher rather than that of soaking water. Amongst the popular amino acids used in the industry, arginine (Lin *et al.,* 2018; Downing *et al.,* 1986;

Table 1. Amino acid composition in Bedak Sejuk

Type of amino acid	Concentration of amino acid g/g (× 10^{-3} [w/w])
Hydroxyproline	ND (<0.001)
Aspartic acid	4.445
Serine	2.700
Glutamic acid	10.330
Glycine	2.145
Histidine	1.055
Arginine	3.640
Threonine	1.820
Alanine	3.565
Proline	2.485
Tyrosine	1.075
Valine	3.335
Methionine	0.360
Lysine	2.605
Isoleucine	2.540
Leucine	4.485
Phenylalanine	2.495

Table 2. Determination of amino acid profile in soaking water

Type of amino acid	Concentration of amino acid g/g ($\times 10^{-3}$ [w/w])
Hydroxyproline	ND (<0.001)
Aspartic acid	0.650
Serine	0.345
Glutamic acid	1.310
Glycine	0.375
Histidine	0.170
Arginine	0.820
Threonine	0.200
Alanine	0.545
Proline	0.390
Tyrosine	0.210
Valine	0.485
Methionine	0.055
Lysine	0.260
Isoleucine	0.310
Leucine	0.550
Phenylalanine	0.290

CIRR, 2012) and lysine (Downing *et al.,* 1986; CIRR, 2012) are the most highly used. Based on the results, both were detected in bedak sejuk. Amino acid acts as an antioxidant compound and provides a protective layer to prevent moisture loss from the skin. Glutamic acid as the highest concentration amino acid found in this research can be studied in the future for its properties towards skin, aside from other amino acids detected.

Determination of fatty acid profile and concentration of free fatty acid in bedak sejuk and soaking water

The total amount of fatty acids in bedak sejuk was 0.14 g (w/w). Based on Table 3, there were 17 fatty acids detected in bedak sejuk. The highest fatty acid was linoleic acid (cis) with a concentration of 44.336% (w/w) followed by palmitic acid at 34.791% (w/w). The fatty acid with the lowest concentration detected was pentadecanoic at

Table 3. Determination of fatty acid profile in bedak sejuk and soaking water

Structure	Fatty acid methyl ester	Fatty acid concentration (% [w/w])	
		Bedak sejuk	Soaking water
C4	Butyric	0.000	0.000
C6	Caproic	0.000	0.000
C8	Caprylic	0.505	0.000
C10	Capric	0.570	0.000
C11	Undecanoic	0.000	0.000
C12	Lauric	5.016	0.258
C13	Tridecanoic	0.844	0.000
C14	Myristic	4.094	0.232
C14:1	Myristoleic	0.000	0.000
C15	Pentadecanoic	0.318	0.000
C15:1	*cis*-10-Pentadecenoic	0.000	0.000
C16	Palmitic	34.791	11.510
C16:1	Palmitoleic	0.689	0.000
C17	Heptadecanoic	0.000	0.000
C17:1	*cis*-10-heptadecanoic	0.000	0.000
C18	Stearic	6.965	2.916
C18:1n9t	Elaidic (trans)	0.000	0.000
C18:1n9c	Oleic	34.468	21.555
C18:2n6t	Linolelaidic (trans)	0.000	0.000
C18:2n6c	Linoleic (cis)	44.336	3.174
C18:3n6	g-Linolenic	0.000	0.000
C18:3n3	a-Linolenic	1.417	0.000
C20	Arachidic	1.047	0.351
C20:1n9	*cis*-11-Eicosenoic	1.163	0.000
C20:2	*cis*-11-14-Eicosadienoic	1.178	0.000
C20:3n6	*cis*-8,11,14- Eicosatrienoic	0.000	0.000
C20:3n3	*cis*-11,14,17-Eicosatrienoic	0.641	0.000
C21:0	Heneicosanoic	0.000	0.000
C20:4n6	Arachidonic	0.000	0.000
C20:5n3	*cis*-5,8,11,14,17-Eicosapentaenoic	0.000	0.000
C23:0	Tricosanoic	0.000	0.000
C22	Behenic	0.000	0.000
C22:1n9	Erucic	0.000	0.000
C22:2	*cis*-13,16-Docosadienoic	0.000	0.000
C22:6n3	*cis*-4,7,10,13,16,19-Docosahexaenoic	0.000	0.000
C24:0	Lignoceric	1.958	0.000
C24:1	Nervonic	0.000	0.000

0.318% (w/w). Based on the method of MPOB p2.5 (MPOB, 2004), the free fatty acid detected was lauric acid with a concentration of 0.085% (w/w). Linoleic acid is used in the industry as it has good properties for tissue and cell regeneration (Ajinomoto, 1987; Ptchelintsev, 2017) and based on this research, the concentration of linoleic acid in bedak sejuk was the highest among all. The total amount of fat in soaking water was 0.04% (w/w). Based on the result, only seven out of 37 types of fatty acid were detected in soaking water compared to bedak sejuk which was 17. Among the seven types of fatty acids, oleic acid was recorded to have the highest concentration among all at 21.561% (w/w) while myristic acid recorded the lowest concentration at 0.232% (w/w) similar to findings in Taira (1983). The total amount of free fatty acid (lauric acid) using the methodology from MPOB p2.5 was 0.035% (w/w). This concentration value is low due to longer soaking times as several fatty acid contents will be decreased due to storage (Taira & Itani, 1988; Zhou *et al.,* 2003).

CONCLUSION

This research was done to determine the amino acid and fatty acid profiles as well as free fatty acid concentration in bedak sejuk and its soaking water. This is to prove scientifically that the components in bedak sejuk, amino acids and fatty acids, give benefits to the skin as claimed by the users. Sixteen amino acids were detected in bedak sejuk and its soaking water. The highest amino acid detected in bedak sejuk had the concentration of 10.33×10^{-3} g (w/w). There were many types of fatty acids detected in bedak sejuk rather than in soaking water. Seventeen types of fatty acids were detected in bedak sejuk and only seven types of fatty acid were detected in soaking water. The highest fatty acid concentration in bedak sejuk was linoleic acid (cis) with the concentration of 44.336% (w/w). The presence of these amino acids is the scientific proof that bedak sejuk has the potential benefits to the skin.

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