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# The Profile of Pempek as a Determining Factor of Quality, Originality and Ethnicity

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**Abstract.** Pempek is a traditional ethnic food originated from Palembang, South Sumatra, Indonesia. Currently, there is not exist any profiles which could be used as a determining factor for quality, originality, and ethnicity of pempek. The objective of this research was to obtain the chemical profile of pempek as a determining factor of quality, originality and ethnicity. The samples were collected from the ten famous branded vendors in Palembang. The fish used in making pempek of the samples are snake head fish, Spanish mackerel, and the mix of snake head and Spanish mackerel. The type of pempek used in this experiment was steamed cook pempek lenjer (cylindrical) type. The analysis was performed at a KAN accredited laboratory. It was found that the energy content of pempek used in this experiment was in the range of 125 to 160 kkal/100 g sample and all the pempek used had a 0% of fat. All pempek used had 17 types of amino acid, and all of them had an essential amino acid. The significant finding was that the concentration of glutamic acid was 200% of the concentration of common concentration which indicated that all the vendors used artificial mono-sodium glutamate to improve the taste of pempek. It was concluded that the chemical profile found on this research could be used as database for creating a standard of identity of pempek.

## 1. Introduction

A Traditional food product is the food product which retain its local originality which is different from other food, in the same category, by means of its traditional ingredients, composition, in general processed and produced naturally, and has a specific taste. The ingredients as a whole or partial must come from a certain geographical area with a unique composition as a characteristics of the product and processed in a certain way with gastronomic heritage by means of keeping the intrinsic characteristics such as chemical, physical, and organoleptic [1-3]

Pempek as a specialty traditional food product which meets the traditional criteria for traditional food product so that it could be call as a Traditional Food Product Pempek (TFPP) has become an important part of cultural identity, history, and lifestyle especially in South Sumatera[3]. TFPP is available in many variations as a result of development made from three basic dough types namely cylindrical dough, batter dough and skin dough. The TFPP variations of the three doughs can be classified based on raw materials (flour, fish meal and fish-flour), processing (boiled / steamed, fried and grilled) and shapes (cylinders, spherical and curly).



Unfortunately, the Pempek available right now could not be consumed anytime and anywhere because of the limitation on the method of processing, transportation, inconsistency of quality [4]. Due to its nature of semi moist product, TFPP has a limited marketing access. The consumer-based innovative development to improve the marketing access and its industrialization need to be done while maintaining the specificity of traditional quality characteristics.

Consumer-based development innovation while maintaining the peculiarities of traditional quality characteristics to overcome the limitations of TFPP in order to increase market access as well as lead to industrialization is necessary because innovation is the key to product success in the face of market competition and responding to consumer demands[5].

Traditional specialty quality characteristics is the factor which need to be maintained in the development process of traditional food in order to retain its origin and ethnicity which determine the consumers preference. In the case of Pempek, the traditional quality characteristics have not been decided which was the prerequisite in the development of traditional food product [6]. The identification of quality characteristics of traditional food pempek should be performed in lieu of the basis in the criteria in the TFPP development.

The identification of sensory quality as a form of intrinsic subjective measurement needs to be complemented by objective (instrumental) measurement because both have a strong correlation to describe the actual profile of pempek quality. The correlation of objective and subjective measurements facilitates the control of food quality in the industry, predicts the consumers response to the preferences and acceptance of the product as a whole, well understands what happens when food is enjoyed in the mouth, improves and optimizes food quality measurement[7].

The objective of this research is to obtain the chemical profile of pempek as a determining factor of quality, originality and ethnicity

## 2. Material and methods

The analysis was performed at the KAN accredited laboratory in Bogor. Pempek used in this research was a cylindrical pempek (*pempek lenjer*) bought from 10 famous pempek vendor in Palembang which varied in the type of fishes used. The type of fishes used by these vendors were snake head fish and mackerel fish [8]

The mineral was analyzed using IRRI methods (1976), amino acids were measured using the 18-5-17/MU/SMM-SIG UPLC method; moisture content, ash, and fat were measured with the SNI 01-2891-1992 point 5.1 method; protein with the method of 18-8-31/MU/SMM-SIG Kjeltec; and carbohydrate was measured with the method of 18-8-9/MU/SMM-SIG.

The quantitative data were tabulated and analyzed descriptively.

## 3. Result and discussions

Pempek is included in the ethnic food category because it comes from the acculturation of cultural heritage [8] which is made from local raw materials with traditional technology and can be accepted culturally and socially by the wider community [9,10]. Ethnicity is a form of uniqueness [11] resulting from a two-way process namely pempek arising from regional cultural works (Palembang) and pempek being unique to the region [12]. So that the ethnicity of Pempek meets the elements of geographical indication (GI) / originality which is the quality of Pempek is associated with the area of origin and is marketed using the name of the area of origin.

Pempek position as an ethnic food is very strategic, because the development for the future foods will experience a shift from meeting energy needs to meeting health needs and a means of communication of traditions/culture and the merging of traditional technological value content with modern science [13,14]. The measurement of the composition of pempek nutrition is a mandatory in order to give a limit on the originality and ethnicity in terms of nutritional quality because it has some variations in production techniques and the proportion of formulations of ingredients and also an attention must be made to the recommended daily amount for the consumer [15].

The study on the quality range of ethnic foods previously have been carried out on Cantonese rice, nachos, falafel, kebabs and Italian sarmale [16]. While research on the relationship of nutritional content with adequate intake of ethnic food nutrition has been carried out by [16–21].

The proximate analysis of the commercial pempek used in this experiment were shown in Tables 1 and 2. The average pempek moisture content is between 60-67% (wet basis), carbohydrate 24-30%, protein 6.3-6.9%, mineral 1.1 - 2.1% and 0% fat content or not detected due to the small amount of fat. Proximate composition could be used as a simple average formulation during the process of making pempek, so that the difference in proximate composition between Pempek made of snake head fish and of mackerel fish and mixed of snake head and mackerel fish was the difference in fish species and process conditions [22]. The fishes used, as a raw material, in the process of making pempek were not uniform in the size and condition of process.

**Table 1.** Proximate analysis of pempek from 10 vendors

<b>Vendors code</b>	<b>WW</b>	<b>SDM</b>	<b>C</b>	<b>EL</b>	<b>CD</b>	<b>NN</b>	<b>PR</b>	<b>SLM</b>	<b>BR</b>	<b>SWD</b>
<b>Fish used*</b>	<b>S+M</b>	<b>S</b>	<b>M</b>	<b>M</b>	<b>M</b>	<b>M</b>	<b>S</b>	<b>M</b>	<b>S</b>	<b>M</b>
Total Energy (kkal/100g)	125.5	137.2	144.5	153.9	159.6	151.4	153.9	132	131.9	161.1
Energy from fat (kkal/100g)	0	0	0	0	0	0	0	0	0	0
Moisture (%)	67.5	63.3	61.9	59.3	58.2	60.5	59.3	65.4	65.3	58.1
Ash (%)	1.2	2.4	2.0	2.2	1.9	1.7	2.2	1.6	1.8	1.6
Total fat (%)	0	0	0	0	0	0	0	0	0	0
Protein (%)	6.9	5.7	9	7.6	7.0	5.5	5.6	6.1	7.7	4.9
Carbohydrate (%)	24.5	28.6	27.1	30.9	32.9	32.4	32.9	26.9	25.2	35.4

\* S: Snakehead fish, M: Mackerel fish

**Table 2.** Average of pempek proximate analysis

<b>Fish used*</b>	<b>S+M</b>	<b>S</b>	<b>M</b>
Total Energy (kkal/100g)	125.5	140.98	150.42
Energy from fat (kkal/100g)	0	0	0
Moisture (%)	67.46	62.637	60.558
Ash (%)	1.165	2.1183	1.8375
Total fat (%)	0	0	0
Protein (%)	6.91	6.3417	6.6808
Carbohydrate (%)	24.465	28.903	30.924

The chemical composition of mackerel is influenced by the fishing location, season, and fishing time [23,24]. Moisture content of mackerel fish ranged from 65.59% to 70.89% in 2013 and from 65.40% to 76.96% in 2014. Fats ranged from 0.97% to 5.73% in 2013 and from 0.71% to 5.94% in 2014. Protein levels ranged from 19.09% to 28.12% in 2013 and from 16.82% to 20.36% in 2014; ash ranged from 3.29% to 4.44% in 2013 and from 3.04% to 3.68% in 2014. Proximate composition could be used as a physiological indicator of mackerel [25].

The chemical composition of fish such as snake head fish is also influenced by the place of cultivation, an aquaculture or from the wild one. The snake head fish from the wild has higher muscle moisture content and a lower concentration of protein, fat and ash if it compare to the aquaculture one.

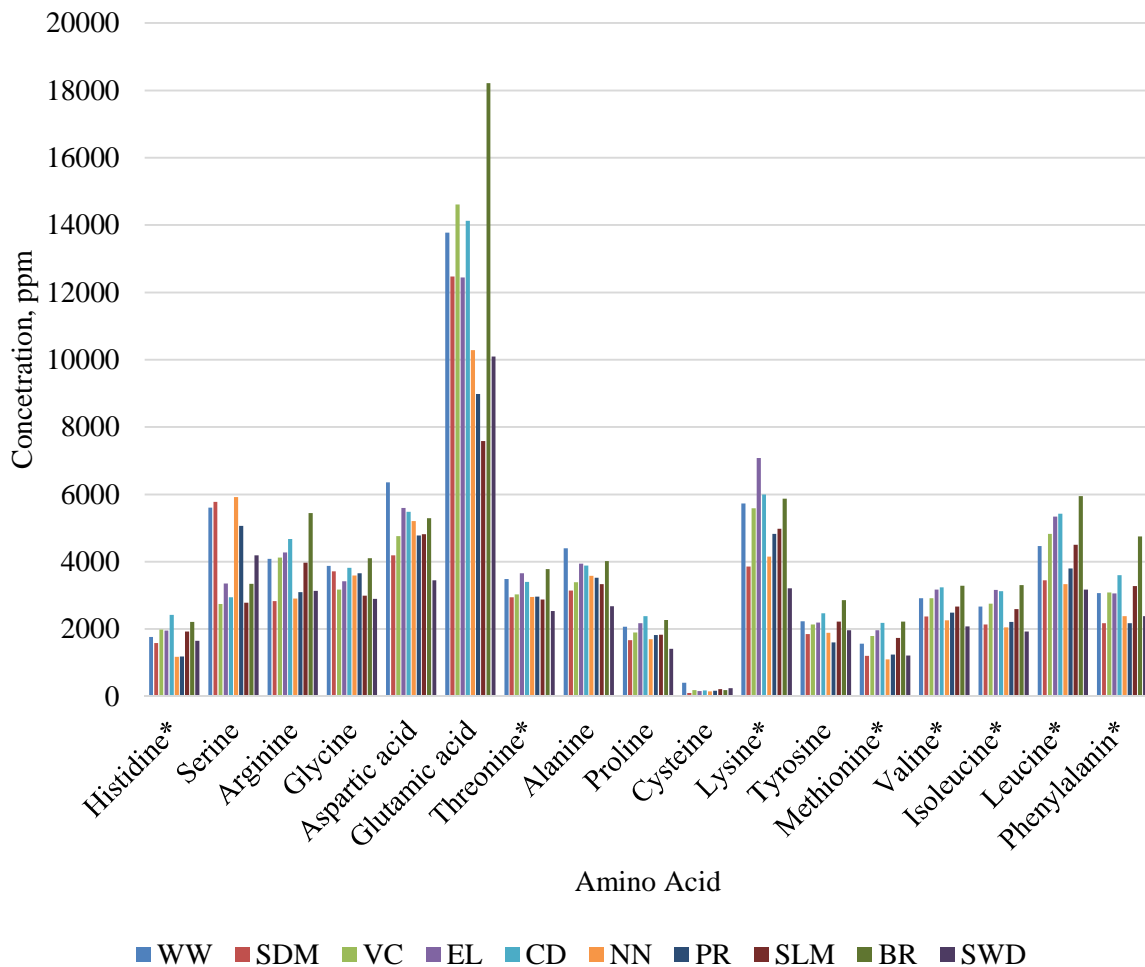
The chemical composition of snake head fish from the wild also depending on the availability of biota in the waters and the way the fish search for its food. The snake head fish from the wild has to work hard in hunting its food which made the concentration of fat in its muscle as an energy source is lower than the aquaculture one. In general, snake head fish has a relatively high protein content which is  $15.6 \pm 0.2\%$ , ash content of  $0.89 \pm 0.07\%$ . Snake head fish also contains albumin as the main ingredient, fat, glucose and some minerals Zn, Cu, and Fe [26].

Pempek could become an alternative source for amino acids. The amino acid composition of 10 commercial pempek in Palembang is presented in Figure 1. The amino acid analysis shows that pempek used in this experiment contained eight types of essential amino acids which were histidine, threonine, lysine, methionine, valine, isoleucine, leucine, and phenylalanine; and nine types of non-essential amino acids which were serine, arginine, glycine, aspartic acid, glutamic acid, alanine, proline, cysteine, and tyrosine (Table 3). The highest concentration of essential amino acids is lysine (mackerel fish) and the non-essential amino acid is glutamate (snake head fish). The muscle of snake head fish has a relatively high concentration of glutamic acid. The presence of both essential and non-essential amino acids in pempek is important and has a potential to meet the health needs of people [27]. However, in the pempek used in this experiment it was found that the concentration of glutamic acid is more than double the concentration of other amino acids which indicated that all the pempek vendors surveyed on this research added a significant amount of monosodium glutamate to the pempek dough they made. The intention of adding a quite high glutamic acid was for increasing the flavor and the umami taste of pempek.

**Table 3.** Essential and non-essential amino acids

Amino acids	Type of fish* use for pempek		
	S	M	SM
<b>Essential</b>			
Histidine	1660.568	1851.052	1759.305
Threonine	3224.728	3075.386	3484.89
Lysine	4852.193	5167.101	5725.215
Methionine	1554.278	1664.949	1568.19
Valine	2714.13	2719.927	2912.09
Isoleucine	2550.803	2602.698	2663.39
Leucine	4399.67	4431.987	4462.485
Phenylalanine	3031.793	2964.212	3068.42
<b>Non-Essential</b>			
Serine	4729.373	3655.255	5603.4
Arginine	3789.06	3846.065	4088.405
Glycine	3823.02	3315.123	3879.65
Aspartic acid	4751.957	4883.183	6358.725
Glutamic acid	13223.34	11522.05	13775.47
Alanine	3563.138	3467.74	4397.04
Proline	1918.258	1898.499	2065.025
Cysteine	147.295	186.5667	405.74
Tyrosine	2103.928	2143.088	2233.47

\* S: Snakehead fish, M: Mackerel fish



**Figure 1.** The concentration and type of amino acid found the pempek used

The content of essential amino acids such as isoleucine, leucine and valine are very important branched-chain amino acid (BCAA), which are simple amino acids that are used to form muscle tissue and balance the release of hormones and brain function. In addition, the content of methionine, glycine and isoleucine is lower than the content of aspartic acid, glutamate acid and lysine shows that Pempek contains amino acid albumin characteristics (Bovine Serum Albumin and Human Serum Albumin) which means it has a health function of restoring tissue [26].

Amino acid glycine is one of the major components of human skin collagen, along with amino acids proline, arginine, serine, isoleucine and phenylalanine to form a polypeptide that will promote the regrowth and healing of tissues in the skin [27]. Glutamic acid could reduce the excess consumption of alcohol, accelerated wound healing in the intestine, improve mental health, and reduce depression. Aspartic acid has a role that can act as a gluconic precursor, pyrimidine precursor, and urea biosynthesis, and can be utilized when handling chronic fatigue and can increase energy.

The mineral content of commercial pempek per 100 g is shown in Table 4. There were three types of minerals, namely Ca, Na and Fe. The average Ca content was greater than Na, and Na is greater than Fe. The types of fish used did not provide a significant difference to the three types of minerals. Ca concentration in the snake head fish was found in the range of 58-63 mg/100g sample, Na concentration between 50-52 mg/100g and the concentration of Fe in the range of 0.6 mg/100g. Pempek made from mackerel fish has a concentration of mineral Ca in the range of 60-65 mg/100g, Na in the range of 45-52 mg/100g and Fe in the range of 0.53-0.65 mg/100g. Pempek made by using a

mixture of snake head and mackerel fish the concentration of Ca and Na were in the range of pempek made from snake head fish and mackerel fish while the concentration of Fe was higher compared to pempek made from single type of fish. The variations in mineral content could be caused by several factors such as processing conditions involving various ingredients in different compositions. [20].

**Table 4.** The average concentration of minerals in pempek

<b>Fish*</b>	<b>S+M</b>	<b>S</b>	<b>M</b>
<b>Ca (mg/100g)</b>	59.91	62.057	62.525
<b>Na (mg/100g)</b>	47.42	51.477	48.633
<b>Fe (mg/100g)</b>	0.71	0.6433	0.5783

#### 4. Conclusions

The quality, originality and ethnicity of Pempek can be limited by chemical composition as a function of raw materials, formulations and processes. These limits are:

- The moisture content was 60-67% (wb), carbohydrates 24-30%, protein 6.3-6.9%, minerals 1.1-2.1% and fat 0%.
- The pempek has at least eight types of essential amino acids (histidine, threonine, lysine, methionine, valine, isoleucine, leucine, phenylalanine) and nine types of non-essential amino acids (serine, arginine, glycine, aspartic acid, glutamic acid, alanine, proline, cysteine, tyrosine).
- The concentration of Ca, Na, and Fe were in the range of Ca 58-65 mg/100g, Na 45-52 mg/100g and Fe 0.53-0.65 mg/100g, respectively.

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