



Type of the Paper (Review)

## Pempek: Traditional fishcake dish from South Sumatra, Indonesia

Reggie Surya<sup>1\*</sup>, Welsen Destifan<sup>2</sup>, David Nugroho<sup>3</sup>, and Stephanie<sup>1</sup>

<sup>1</sup> Food Technology Department, Faculty of Engineering, Bina Nusantara University, Jakarta 11480, Indonesia

<sup>2</sup> Alumnus of Chemical Engineering Department, Faculty of Engineering, Institut Teknologi Bandung, Jawa Barat 40132, Indonesia

<sup>3</sup> Department of Integrated Science, Faculty of Science, Khon Kaen University, Khon Kaen 40002, Thailand

### Abstract

*Pempek* is a traditional fishcake dish from South Sumatra, Indonesia. Its primary ingredients are narrow-barred Spanish mackerel (*Scomberomorus commerson*) and sago starch. As a dish, *Pempek* is usually served with a sweet and sour sauce called *kuah cuko*, containing palm sugar, vinegar, tamarind, and chili pepper. Historically, *Pempek* is highly influenced by Chinese cuisine. *Pempek* exists in different varieties, most of which are widely known and available in many Indonesian cities. The variation among different types of *Pempek* appears due to different additional ingredient, shape, filling, cooking method, and serving style. Some well-known types of *Pempek* include *Pempek adaan* (round shaped), *Pempek lenjer* (cylindrical shaped), *Pempek kapal selam* (egg stuffed), *Pempek keriting* (curly shaped), and *Pempek kulit* (made with fish skin). New innovations on *Pempek* recipe are also thriving owing to people's creativity. The popularity of *Pempek* has made this dish the symbol of identity and pride for the people of South Sumatra. It is also rich in historical and philosophical values that represent the South Sumatran traditional way of life. In addition, *Pempek* is currently considered to be an Intangible Cultural Heritage by the UNESCO. This review discusses the history, traditional production process, philosophy, nutritional aspects, and different varieties of *Pempek*.

### Article History

Received January 16, 2023

Accepted June 05, 2023

Published June 26, 2023

### Keywords

*Pempek*, Fishcake, South Sumatra, Indonesia, Ethnic Food.

## 1. Introduction

South Sumatra (Figure 1) is a province of Indonesia located on the southeastern part of the island of Sumatra, one of the major islands in Indonesia besides Java, Kalimantan (Borneo), Sulawesi (Celebes), and Papua. The province of South Sumatra spans almost 92,000 km<sup>2</sup> with Palembang as its capital city (1). Home to 8.5 million people in 2020, the population of South Sumatra consists of many different ethnic groups, with Palembang people being the largest ethnic group (2,3). The other ethnic groups include the Javanese, Sundanese, Minangkabau, and Chinese (3).

Historically, South Sumatra was the seat of the Buddhist Srivijaya Empire which influenced many parts of Southeast Asia from the 7<sup>th</sup> century to the late 14<sup>th</sup> century (4). At the peak of its power, the territory of the Srivijaya Empire encompassed modern-day Malaysia, Thailand, and Cambodia (4). Following the collapse of the Srivijaya Empire in the 14<sup>th</sup> century, Islam began to spread in Sumatra in the 16<sup>th</sup> century through international trading activities, thus replacing slowly Buddhism and Hinduism as the dominant religions in

\* Correspondence : Reggie Surya

 reggie.surya@binus.edu

the region (4). Today, Islam is the major religion in Indonesia (87.2%), including in South Sumatra (97.2%) (5,6). The other official religions embraced by the South Sumatrans include Christianity (Catholicism and Protestantism), Buddhism, Hinduism, and Confucianism.



Figure 1. (A) Map of Indonesia with the location of South Sumatra filled in red. (B) Map of South Sumatra with Palembang as its capital city.

*Pempek* is a widely-known traditional food from South Sumatra consumed in all regions of Indonesia (7). It is a savory fishcake delicacy made with fish and starch. *Pempek* is commonly served with sweet and sour dark-colored sauce called *kuah cuko* made of vinegar and some local spices. The dish is often eaten with noodles and diced cucumber to balance out the sourness of the vinegar. Throughout the time, *Pempek* has become the identity for South Sumatrans that is rich in historical and philosophical values (8,9). Nowadays, *Pempek* exists in different varieties and can be easily found in many cities in Indonesia. It has also been drafted to be listed as an Intangible Cultural Heritage by the UNESCO (10). Considering the importance of *Pempek* as an ethnic food of Indonesia, this review discusses the history, traditional production process, philosophy, nutritional aspects, and different varieties of *Pempek*. With regard to novelty, this is the first international review that focuses on *Pempek*, its varieties, and the values it harbors in a comprehensive and thorough manner.

## 2. Food Culture and Traditional Cuisine of South Sumatra

The food culture of South Sumatra is strongly influenced by Chinese culture initially entering the region along with the Chinese Muslim traders from the eastern coast of China in the 15<sup>th</sup> century (11). Such traders, who were mostly men, married local women and settled down in the region, thus being integrated in the local community. The acculturation between the local and Chinese food culture gave birth to the *Peranakan* or *Nyonya* cuisine (12). Since the majority of South Sumatrans are Muslim, the *Peranakan* food developed in South Sumatra is halal (allowed to be consumed according to the Sharia Islamic Law) and does not contain pork, a common ingredient found widely in traditional Chinese cuisine (13,14).

Due to the paramount role of the Musi River (750 km long) crossing the whole province and dividing it into two parts, freshwater fish and prawns are the most common ingredients used in the South Sumatran cuisine. Some popular freshwater that are often consumed on daily basis include Pangas catfish or *ikan patin* (*Pangasius pangasius*), *ikan baung* (*Hemibagrus* sp.), catfish or *ikan lele* (*Clarias batrachus*), *ikan lais* (*Kryptopterus cryptopterus*), snakehead or *ikan gabus* (*Channa striata*), carp or *ikan mas* (*Cyprinus carpio*), and gourami or *gurame* (*Osphronemus goramy*) (15). Historically, giant featherback or *ikan belida* (*Chitala*

*lopis*) was a famous endemic freshwater fish in the Musi River that was widely used in South Sumatran cuisine (16). It was valued for its succulent flavor and soft texture. However, due to overfishing, it is now considered extinct and has been immortalized as the official animal mascot of Palembang City (17). Since South Sumatra is adjacent to the Java Sea in the east, seafood is also often incorporated in South Sumatran cuisine in addition to fresh water fish.

Figure 2 shows some well-known traditional South Sumatran foods. *Pempek* (Figure 2A) is undoubtedly the most famous dish from South Sumatra. *Mi celor* (Figure 2B) is a savory & sweet noodle dish immersed in a savory sauce made from coconut milk, shrimp broth, and ground dried shrimp (*ebi*) (18). It is often served with chicken egg, beansprout, chopped leek, celery, and fried shallot. *Martabak HAR* (Figure 2C) is a popular stuffed pancake made from duck or chicken eggs, chopped leek, and other spices (19). The word HAR is an acronym for Haji Abdul Razak, the inventor of its original recipe who appeared to be a Muslim Indian trader marrying a local woman from Palembang in the past (19). Indeed, the dish is believed to be derived from *mamaks*, a multi-layered pancake originating in the state of Kerala, India (20). *Martabak HAR* is usually served with chunks of potatoes cooked in a goat curry sauce. *Pindang patin* (Figure 2D) refers to a sour and spicy fish soup made from Pangas catfish with a strong hint of tamarind (*Tamarindus indica*) (21). *Brengkes tempoyak* (Figure 2E) is made from Pangas catfish slowly cooked with traditional spices mixed with *tempoyak*, a fermented paste made from a strong-flavored fruit called durian (*Durio zibethinus*) (22,23). This food is usually cooked and served within banana leaves. *Burgo* (Figure 2F), a popular choice for breakfast among South Sumatrans, is a folded rice pancake served in savory coconut milk-based soup flavored with fish (24). *Malbi* (Figure 2G) is a South Sumatran spiced beef or goat stew braised in seasoned thick brown gravy commonly served during traditional weddings and the family celebration of the Islamic holiday Eid al-Fitr marking the end of the fasting month of Ramadan (25). *Sambals*, traditional chili pastes with additional spices, are widely consumed as condiments with all kinds of dishes. Some popular *sambals* in South Sumatra are *sambal mangga* made from sliced unripe mango (Figure 2H), *sambal kweni* made from *kweni* mango (*Mangifera odorata*), *sambal jokjok* made from tamarind, and *sambal tempoyak* (26). While the main common aspect of these *sambals* is the spiciness aspect, different fruits and herbs allow for various flavor combination and unique property of each *sambal*. *Kemplang* (Figure 2I) is South Sumatran traditional fish crackers made of narrow-barred Spanish mackerel and tapioca commonly consumed with daily meal or as snacks (27). By itself it has a mild savory flavor from the fish meat mixture, but it is also commonly consumed along with concentrated *cuko* based condiment to provide sweet and spicy contrast. In general, common Indonesian traditional foods derived from soybeans are also widely consumed in South Sumatra, including tofu, tempeh, and *oncom* (28,29). *Kue delapan jam* (Figure 2J, literally translated to 8-hour cake), is a traditional cake made from duck eggs, sugar, butter, and sweet condensed milk without any flour added (30). As its name implies, the making of this cake requires a long cooking process involving constant stirring for approximately 8 hours. Served as a delicacy during the era of the Sultanate of Palembang, *kue delapan jam* has become a must-eat during Eid al-Fitr family celebration. Its sticky texture symbolizes proximity among the members of a family while its sweet taste represents the sweet moment of togetherness shared within a family (31).

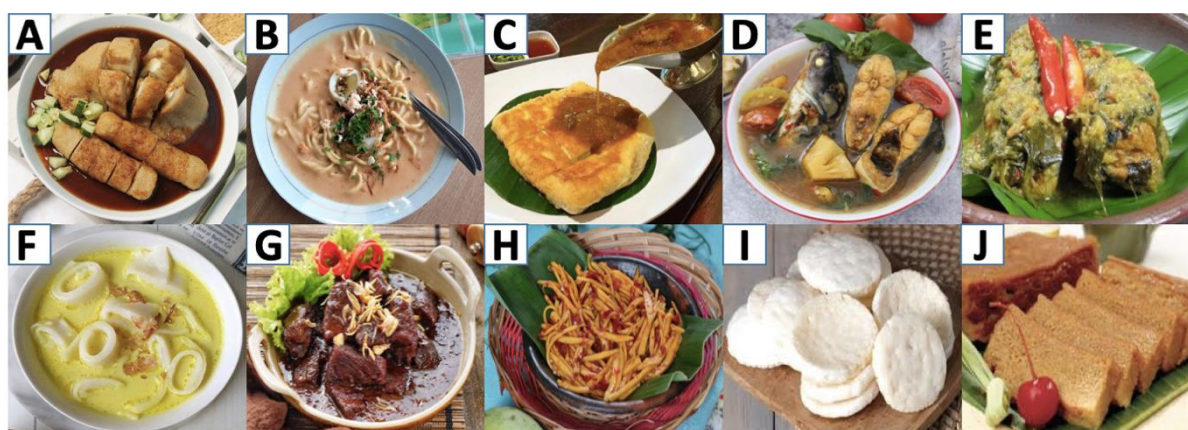


Figure 2. Some well-known dishes from South Sumatra, including (A) *Pempek*, (B) *mi celor*, (C) *martabak HAR*, (D) *pindang patin*, (E) *brengkes tempoyak*, (F) *burgo*, (G) *malbi*, (H) *sambal mangga*, (I) *kemplang crackers*, and (J) *kue delapan jam*.

### 3. History of *Pempek*

The history behind the creation of *Pempek* is unclear. According to the traditional folklore, the original *Pempek* recipe is believed to be developed by an old Chinese immigrant settling down near the Musi river in Palembang around the 16<sup>th</sup> century during the reign of the 2<sup>nd</sup> Sultan Mahmud Badaruddin in the Sultanate of Palembang-Darussalam (32). He noticed an abundance of fish caught by the local fishermen daily. With the absence of refrigeration technology at the very moment, most of the unsold fish decayed and were wasted. The indigenous people, however, had limited knowledge and techniques regarding fish processing. During that period, most fish were processed through mainly boiling, frying, and grilling instead of adding other ingredients to create new dishes. The old Chinese man bought some unsold fish at the market in the afternoon at a lower price, mixed them with sago and other spices, and created a sort of fishcake with which the local people was not familiar. He then sold the fishcakes on an ambulant cart around the village. The people referred to this old man as *apek*, a Hokkien (Chinese dialect) slang word to call an old man. Since the people wanting to buy the fishcake shouted “*pek... apek*” to attract the attention of the old man selling the fishcakes, the dish became slowly known as *Pempek* (32).

*Pempek* was suggested to be the local adaptation of Chinese fishcake (鱼饼) that has been present for more than 4,000 years in China according to Chinese traditional folklores (33). While wheat flour is used to make fishcake in China, sago starch is used to make *Pempek* in Indonesia since sago is a native Indonesian plant and the country does not grow wheat. Another theory suggested that the old man inventing *Pempek* was inspired by *ngo hiang* (五香), a sausage-like roll made from minced pork and ground fish (or prawn) seasoned with the famous Chinese five-spice powder consisting of star anise (*Illicium verum*), cloves (*Syzygium aromaticum*), Chinese cinnamon (*Cinnamomum cassia*), Sichuan pepper (*Zanthoxylum bungeanum*), and fennel (*Foeniculum vulgare*) seeds (34). Such a hypothesis is strengthened by the fact that most Chinese immigrants in South Sumatra were mainly Hokkien and Teochew people coming from Fujian and Guangdong provinces in Southern China and *ngo hiang* originated in those very areas (35). However, some historians also suggested that *Pempek* originated from an ancient cuisine called *kelasan*, a steamed dish made of the mixture of fish flesh with sago, dated as early as Srivijayan era circa 7th century (36).

#### 4. Ingredients of *Pempek*

*Pempek* dough is made from a mixture of ground fish filet with sago starch and other spices. The most common fish used to make *Pempek* dough is the narrow-barred Spanish mackerel (*Scomberomorus commerson*) (37), commonly known in Indonesia under the name of *ikan tenggiri*. It is a marine predator fish with an elongated body and razor sharp teeth that belongs to the mackerel family, Scombridae (Figure 3A). An adult narrow-barred Spanish mackerel has an average total length between 70-100 cm and an overall weight in the range of 30-80 kg, even though it can grow to a maximum length of 220 cm and weigh over 100 kg (37). Naturally, narrow-barred Spanish mackerels are ubiquitous in Indonesian waters, including the Java Sea bordering South Sumatra in the east (38). Outside Indonesia, narrow-barred Spanish mackerels can also be found in a wide-ranging marine area in Southeast Asia, north coast of Indian Ocean, east coast of Africa, and as far east as the South West Pacific Ocean (38). Nowadays, these fish are widely cultivated in Indonesia, particularly in the coastal areas of Java and in Gorontalo (Sulawesi Island). Due to its ubiquity in Indonesian waters, narrow-barred Spanish mackerels are widely used in many regions in Indonesia as local food ingredients. They can be easily found in many traditional markets or fish markets and are sold fresh or as dry-cured fermented fish. In West Java, narrow-barred Spanish mackerels are used to make *siomay*, Chinese shumai-derived steamed fish dumplings with tofu and vegetables served in peanut sauce (39). In Sumatra and Java, these fish are commonly processed as ingredients for traditional chips (40). The use of narrow-barred Spanish mackerel as a *Pempek* ingredient is pivotal since such a fish has a strong and unique flavor that is distinguishable from other fish. Using other marine fish or even fresh water fish to replace narrow-barred Spanish mackerel as a *Pempek* ingredient would be easily detected by the consumers. However, some other fish are traditionally also used to make *Pempek* dough in addition to narrow-barred Spanish mackerel, including Indonesian red snapper or *ikan kakap merah* (*Lutjanus bitaeniatus*), striped snakehead or *ikan gabus* (*Channa striata*), mackerel tuna or *ikan tongkol* (*Euthynnus affinis*), catfish or *ikan lele* (*Clarias batrachus*), Nile tilapia or *ikan nila* (*Oreochromis niloticus*), yellowback fusilier or *ikan ekor kuning* (*Caesio xanthonota*), and sulphur goatfish or *ikan kuniran* (*Upeneus sulphureus*) (41). These fish are used to enrich the flavor of *Pempek* and reduce the production cost since the market price of narrow-barred Spanish mackerel is relatively higher compared to these fish. Traditionally, in the past, *Pempek* was commonly prepared using giant featherback or *ikan belida* (*Chitala lopis*) (Figure 3B) that is now considered extinct (16,17).

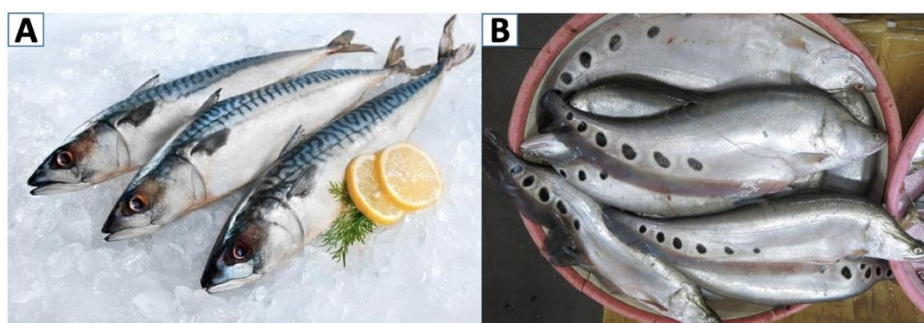


Figure 3. (A) Narrow-barred Spanish mackerel or *ikan tenggiri* (*Scomber commerson*), the most common fish used as the main ingredient of *Pempek*. (B) giant featherback or *ikan belida* (*Chitala lopis*), an extinct fish species native to the Musi River that was widely used as the main ingredient of Palembang *Pempek* in the past.

Sago is a starch extracted from the pith, or spongy core tissue of sago palms (*Metroxylon sagu*), a plant native to Southeast Asia (42). Indigenously, sago is the staple food of traditional coastal communities in Papua and Maluku islands in the eastern Indonesia (42). Today, it is also widely cultivated in other islands in Indonesia, including Sumatra, Java, and Kalimantan (Borneo). The role of sago in the formation of *Pempek* dough is to bind the water and fish meat to form a sticky and chewy dough. Sago is preferred in *Pempek* making compared to other kinds of starch or flour (e.g. wheat flour, tapioca starch from cassava, or maizena from corn) since it gives a softer and chewier texture in *Pempek* dough (43). However, tapioca starch is commonly used to replace or complement sago in *Pempek* dough to reduce production cost. Adding some tapioca into the dough can also render the *Pempeks* crispier. Sometimes, wheat flour is also added to improve the texture of *Pempek* dough, particularly if the dough is too soft and cannot be formed. Salt and flavor enhancer (monosodium glutamate/MSG) are usually added to enrich the taste of *Pempek*. Baking powder containing sodium bicarbonate ( $\text{NaHCO}_3$ ) is also often added to expand the volume of the dough during deep frying, thus resulting in bigger *Pempeks*. The proportion of fish and sago starch in *Pempek* dough is essential to determine the sensory characteristics of *Pempek*, particularly the texture. Ideally, 6-7 parts of sago should be added to 10 parts of fish (43). If the proportion of sago and fish reaches 1:1, the flavor of the fish would be covered and the dough would be brittle, too sticky, and hard to shape (43). However, using more flour and less fish to make *Pempek* dough is a common practice among ambulant vendors selling cheap *Pempek*, albeit sacrificing the taste to some extent.

*Kuah cuko* is an essential part of a *Pempek* dish. It is a sweet and sour dark-colored sauce made from palm sugar, garlic, vinegar, and salt (7). Traditionally, ground red chili pepper is also incorporated in *kuah cuko* to give a hint of spiciness since most Indonesians like to eat spicy food. However, to accommodate some people who desire unspicy *kuah cuko* or are not able to eat hot and spicy sauce, the ground red chili pepper is often separated as *sambal* (26).

## 5. Production and Serving of *Pempek*

The common steps implemented in *Pempek* production is presented in Figure 4 and Figure 5. Firstly, the fish filet is ground using blender. It is essential to use fresh fish that had not yet undergone postmortem rigidity (*rigor mortis*) to make a smooth dough. Contrary to post-rigor fish, pre-rigor fish has a higher water holding capacity that allows it to incorporate water in a better manner to make a well-mixed dough with a smoother texture (44). In addition, post-rigor fish often exhibit off-odor and rancidity due to oxidation and microbial activities yielding volatile compounds. To make a *Pempek* dough, the ground fish filet, sago, and other additional ingredients (salt, flavor enhancer, and baking powder) are mixed together (Figure 5A). Cooking oil is seldom added since Spanish mackerels are relatively high in fat. The dough is then formed into small chunks of *Pempek* (Figure 5B) that are further boiled in hot water or steamed until they harden and form partly-cooked dumplings (Figure 5C). These latter are usually stored or frozen to be deep-fried later in cooking oil just prior to serving (Figure 5D). Perfectly fried *Pempeks* exhibit an appetizing golden brownish color with a shiny and crispy surface. *Kuah cuko* is prepared by boiling water with main ingredients including palm sugar, vinegar, tamarind, salt, and dried shrimp flakes (*ebi*) (Figure 5E). Fried *Pempeks* are then cut in bite-size and showered in hot *kuah cuko* (Figure 5F). Yellow noodles

and chopped fresh cucumber can be added to the mix. *Pempek* is also often consumed with *kemplang* chips (32).

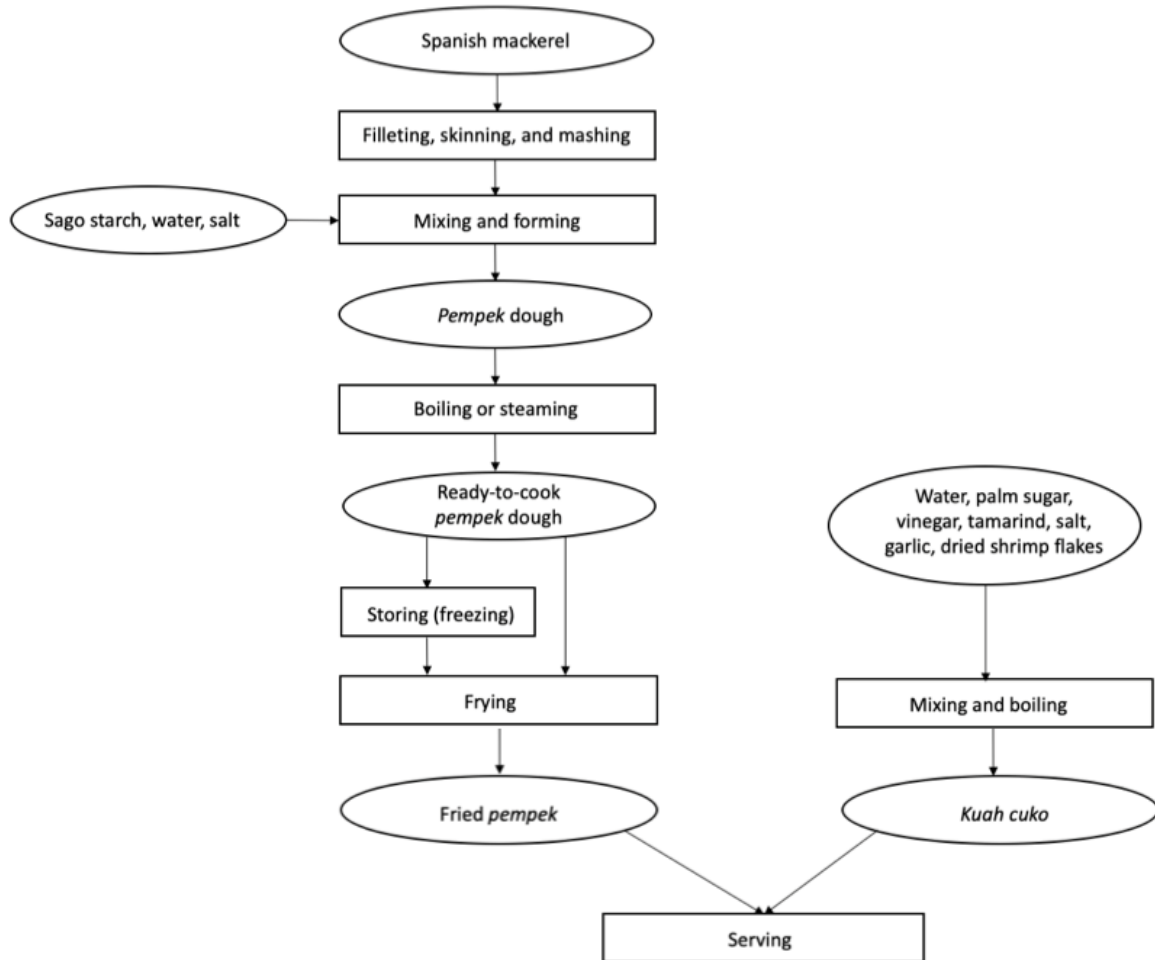


Figure 4. Flowchart of common processing method applied in *Pempek* production.

An example of *Pempek* recipe is presented in Appendix (45). Generally, *Pempeks* made by different producers differ in the recipes used. The proportion of fish and sago used is primordial to determine the texture of *Pempek* (43). The type of fish used, either only narrow-barred Spanish mackerels or combined with other fish, determines mainly the flavor of *Pempek* (41). The proportion of each ingredient present in *kuah cuko* would influence its final flavor profile. Some varieties are dominantly sweet due to the high concentration of palm sugar while others tend to be sour due to the high concentration of vinegar used in its formulation. Sometimes, *tongcai* (Tianjin-styled pickled Chinese cabbage) and *ebi* (ground dried shrimp) are also added to *kuah cuko* to enrich its flavor (7,32). In general, *kuah cuko* is cooked to form a concentrated solution that has a longer shelf-life and is diluted with hot water prior to consumption.



Figure 5. The production of *Pempek* that consists in (A) mixing ingredients to form *Pempek* dough, (B) shaping *Pempek* dough into desired shapes, (C) boiling or steaming *Pempek* dough, (D) frying *Pempek*, (E) preparing *kuah cuko*, and (F) serving *Pempek* with *kuah cuko* for consumption.

## 6. Varieties of *Pempek*

There are different existing varieties of *Pempek* with different additional ingredients, shapes, filling, cooking methods, and serving styles (Figure 6). *Pempek adaan* (Figure 6A) and *Pempek lenjer* (Figure 6B) are the most commonly sold *Pempek* varieties with round and cylindrical shape respectively (46). Usually, *Pempek adaan* has a stronger taste and aroma compared to *Pempek lenjer* due to the addition of coconut milk in the dough. While most *Pempeks* are made from fish flesh, *Pempek kulit* or skin *Pempek* (Figure 6C) is made with scaled fish skin. It has more pungent/fishy flavor and different texture compared to other *Pempeks* due to the higher amount of subcutaneous fat within the mixture (46). *Pempek kulit* is always flattened before frying, thus giving it a thin appearance and a good balance of crunchiness and chewiness. *Pempek keriting* or curly *Pempek* is another type of *Pempek* with unique shape (Figure 6D) due to its preparation process that involves extrusion of dough mixture, overlapping with each other, to form a wrinkly-tangled form before being steamed to give soft chewy texture (46). Its shape resembles a ball of rounded noodles. It is also noteworthy that there is also a cheaper variant of *Pempek* which exclusively uses sago starch (without any fish added) called *Pempek dos* (47).

*Pempek* can also have multiple types of fillings. *Pempek kapal selam* or submarine *Pempek* (Figure 6E) is one of the most well-known types of *Pempek*. It is given such a name due to the presence of a whole egg in the middle of the dough, its oval shape of the outer layer resembling submarine, and its serving method by drenching in *kuah cuko* - as if the *Pempek* was floating in one (46). Compared to the other types, *Pempek kapal selam* is generally the biggest in term of size. It is commonly served with noodles, diced cucumbers, and topped with dried shrimp flakes (*ebi*) to give a contrasting texture and highlight the fishy flavor. A smaller version of *Pempek kapal selam* is called *Pempek telur*, which contains egg yolk instead of a whole egg (46). There is another type called *Pempek pastel* (Figure 6F) whose name comes from the shape resemblance to a common Indonesian pastry called *pastel*. It is generally filled with shredded young papaya (46). Unique *Pempek* preparations in banana



leaves are known as *Pempek sate* (Figure 6G) and *Pempek otak-otak* (Figure 6H). *Pempek sate* is made from *Pempek* dough filled into banana leaves that are subsequently folded into triangles prior to steaming, thus lending its signature look and fragrant smell during serving (48). *Pempek otak-otak* is also made from *Pempek* dough wrapped in banana leaves, but has a flattened cylindrical shape and is grilled on charcoal (49).

In terms of cooking method, while some varieties (such as *Pempek adaan* and *Pempek kulit*) are commonly deep fried directly after forming the dough into the intended shape, some others (such as *Pempek lenjer*) undergo an additional step of boiling/steaming in between to lend a firmer rigid shape before deep frying (46). Some varieties are prepared without involving deep frying at all, which means they are either steamed or boiled prior to serving, such as *Pempek keriting*, *Pempek sate*, and *Pempek pastel* (46,48). Another popular method of *Pempek* cooking involves grilling on charcoal, thus providing a crispy outer layer with a smoky flavor. *Pempek otak-otak* is prepared using such a method (49). *Pempek panggang* or *Pempek tunu* (Figure 6I) is a popular *Pempek* prepared by grilling previously-steamed or -boiled *Pempek* dough (46). It has a dry and crunchy texture and is often filled with dried shrimp flakes (*ebi*), which sometimes are mixed with palm sugar and chili paste. The shape of *Pempek panggang* can be either cylindrical with a middle cut for the aforementioned filling, or flat oval with a horizontal slit to place the filling. *Pempek lenggang* (Figure 6J) is made from chopped pre-boiled or pre-steamed *Pempek* dough that is put in a small container made of woven banana leaves, mixed with spiced beaten eggs, and then grilled (46). It has an omelette-like appearance. In recent days, *Pempek lenggang* is also made by pan frying.



Figure 6. Different variants of *Pempek*, including (A) *Pempek adaan*, (B) *Pempek lenjer*, (C) *Pempek kulit* or skin *Pempek*, (D) *Pempek keriting* or curly *Pempek*, (E) *Pempek kapal selam* or submarine *Pempek*, (F) *Pempek pastel*, (G) *Pempek sate*, (H) *Pempek otak-otak*, (I) *Pempek panggang* or *Pempek tunu*, and (J) *Pempek lenggang*.

There are various ways to serve *Pempek* and the most common one is dipping it in *kuah cuko*. *Pempek* can also be served in different types of broth to lend different mouthfeel, thus resulting in other signature dishes derived from *Pempek* such as *tekwan*, *model*, *laksan*, *celimpungan*, and *rujak mi* (Figure 7). *Tekwan* (Figure 7A) is created by boiling fish dough along with jicama (*Pachyrizus erosus*) tu ber and wood ear mushroom (*Auricularia auricular-judae*) in shrimp or fish broth (50). *Model* is pretty similar to *tekwan* in the sense that the broth used is either clear shrimp or fish broth, with the difference being the *Pempek* in *model* is a combination of fish dough and tofu (beancurd) stucked together (51). *Laksan* (Figure 7B)

and *celimpungan* (Figure 7C) are the creamier variants due to the addition of coconut milk to the broth (50). *Celimpungan* generally has a yellowish opaque colored broth due to the addition of turmeric, while *laksan* has a reddish broth due to the addition of red chili pepper (50). *Rujak mi* (Figure 7D) is a famous salad dish in South Sumatra made of chunks of *Pempek* (mostly *Pempek lenjer*), tofu, yellow egg noodles, cellophane noodles, cucumber, and beansprouts immersed in *kuah cuko* (52).

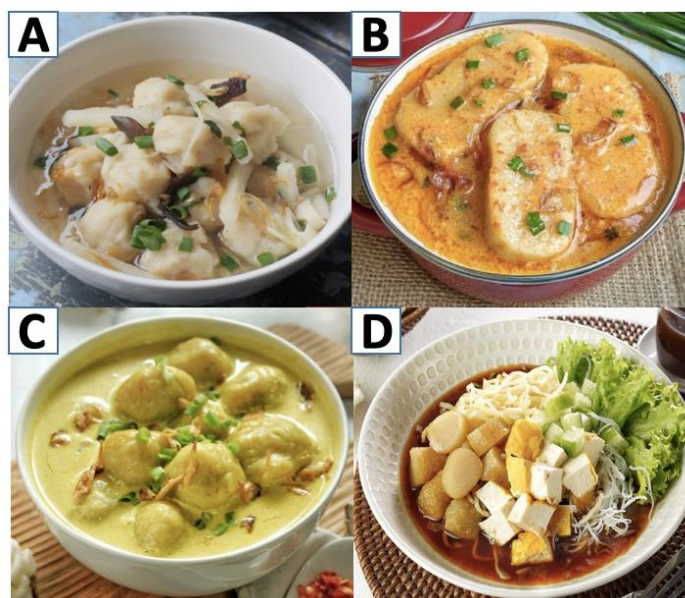


Figure 7. Traditional dishes derived from *Pempek*, including (A) *tekwan*, (B) *laksan*, (C) *celimpungan*, and (D) *rujak mi*.

## 7. Philosophy of *Pempek*

Food is regarded as a symbol of civilization since eating is a part of human daily activities. Traditional Indonesian foods harbor noble philosophical values that have been passed down through generations as the source and guide for Indonesian people's lives. Some of these values include solidarity, mutual cooperation, respect for fellow humans and diversity, and gratitude towards nature and the gods (53).

Philosophically, *Pempek* contains four humanistic values that reflect the way of life of South Sumatrans (54). Firstly, the chewy texture of *Pempek* reminds that life should be dynamic and flexible, particularly when we face changes and adapt with them. Secondly, the complex flavor of *Pempek* symbolizes life balance. *Pempek* is indeed rich in flavor, from the salty and umami taste of the fish to the sweet, spicy, and sour taste of *kuah cuko*. All these flavors exist in harmony and do not overpower one another. Thus, this aspect reflects a life balance that would lead to a harmonious way of living. Thirdly, the quality of *Pempek* represents credibility. It appears primordial to opt for fish of high quality to be used as the main ingredient for *Pempek*. *Pempek* sellers should be consistent in producing *Pempeks* of good quality to gain consumers' trust and maintain their credibility. This aspect contains the philosophy of always doing one's best and respecting integrity in life. Lastly, the local story of *Pempek* being invented by a Chinese old man noticing wasted unsold fish teaches us to be creative and courageous. Such a story also inspires to always look out for opportunities in life.

A local saying in South Sumatran traditional language describes *Pempek* as follows : *Pempek* ; when it is served in a clear soup, it becomes *tekwan* ; when it is served in a yellow coconut milk soup, it becomes *celimpungan* ; when it is served in a red coconut milk soup, it becomes *laksan* ; when it is wrapped in beaten eggs and grilled, it becomes *lenggang* ; when it is served in *kuah cuko* with noodles and fried tofu, it becomes *rujak mi* ; therefore, the value that we can learn from *Pempek* is that wherever we live, we need to adapt with the environment and be useful to other people (55). Moreover, a local expression “*ngirup cuko Pempek*” (literally translated to sipping the *cuko* of *Pempek*) reflects the love and pride of South Sumatrans towards *Pempek* (56). Such an expression is popular among South Sumatrans working and living in other cities or islands who often say “*kangen ngirup cuko Pempek*” or longing to sip the *cuko* of *Pempek* to describe their genuine feelings of missing their home town and eat delicious and authentic *Pempek* amidst their families and friends. Therefore, for South Sumatrans, *Pempek* is also a symbol of togetherness and kinship (56).

## 8. Nutritional Aspects of *Pempek*

The nutritional profile of narrow-barred Spanish mackerel filet and *Pempek* is presented in Table 1 (57,58). Both narrow-barred Spanish mackerel and *Pempek* can be considered as good sources of protein due to their high protein content (19.3% and 12.6% respectively). Protein is essential to a plethora of body functions, including building tissues and muscles, producing hormones and enzymes, providing energy, and supporting immunity (59). Among the essential amino acids, lysine and leucine are found in a relatively high amount in narrow-barred Spanish mackerel (60). Therefore, it is suggested to be a complementary ingredient to cereals (including rice, the staple food in Indonesia) that are usually poor in lysine (59). Narrow-barred Spanish mackerel and *Pempek* are also sources of unsaturated fatty acids, mostly oleic acid (C18:1, n-9) and docosahexaenoic acid (C22:6, n-3; DHA) [60]. High consumption of unsaturated fatty acids is linked to lower incidence of cardiovascular diseases and improvement of cognitive functions in children (61). Selenium (Se) is a micromineral found in a relatively high amount in narrow-barred Spanish mackerel (36.5 mcg Se/100 g filet fulfilling 52% of daily requirement for Se) (57). Indeed, Se is an essential component of various proteins called selenoproteins that help protect the cells against cell damage and infections (62). The caveat related to consuming narrow-barred Spanish mackerel and *Pempek* would be their relatively high concentration of cholesterol. High consumption of foods rich in cholesterol has been demonstrated to promote cardiovascular diseases (63).

Since *Pempek* is produced through deep frying and is often served with *kuah cuko* made from palm sugar, it can be considered to be high in fat, sugar, and calorie. A chunk of fried *Pempek* weighs approximately 30-50 g, depending of its type and size (58). Compared to *Pempek adaan*, *Pempek kapal selam* would provide a higher amount of energy due to its larger size and the presence of a whole chicken egg as its stuffing. A portion of *Pempek adaan* dish would generally consist of 4-5 chunks of *Pempek*. These *Pempeks* are also served with approximately 150-200 mL of *kuah cuko* containing 10-20% palm sugar (45). Therefore, a portion of *Pempek adaan* in *kuah cuko* may contain 300-500 kcal (58). Moreover, if the dish is consumed with noodles, the energy it provides would increase. Thus, it is advised not to eat *Pempek* in an excessive manner. Since *Pempek* is poor in dietary fiber and vitamins, consuming vegetables and fruits in addition to *Pempek* would help reach a more balanced diet. Furthermore, consumption of soluble dietary fiber would help the body eliminate cholesterol that is found in a relatively high concentration in *Pempek* (64).

Table 1. Nutritional contents of narrow-barred Spanish mackerel fillet and *Pempek* (57,58).

	Spanish mackerel fillet		<i>Pempek</i> (fried)	
	Amount per 100 g	% DV*	Amount per 100 g	% DV*
Energy (kcal)	139	7	195	10
Carbohydrates (g)	0	0	23.6	8
Dietary fiber (g)	0	0	0.7	3
Sugars (g)	0	0	9.3	19
Protein (g)	19.3	39	12.6	25
Fats (g)	6.3	10	5.2	8
Saturated fat (g)	1.8	9	1.5	8
Monounsaturated fat (g)	1.5	-	1.7	-
Polyunsaturated fat (g)	1.7	-	1.2	-
Cholesterol (mg)	76	25	81	27
Vitamins				
Vitamin A (IU)	100	2	-	-
Vitamin C (mg)	1.6	3	-	-
Vitamin E (mg)	0.7	3	-	-
Vitamin B12 (mcg)	2.4	40	-	-
Minerals				
Sodium (mg)	59	2	57	2
Potassium (mg)	446	13	231	7
Phosphorus (mg)	205	20	116	11
Calcium (mg)	11	1	26	2
Selenium (mcg)	36.5	52	-	-

\*) DV: daily value

## 9. Current Development of *Pempek*

Since being invented, Indonesian communities have adopted *Pempek* in numerous ways and this has led to the development of different types of *Pempek* served widely across the archipelago. While *Pempek* has become a popular dish in the neighboring provinces such as Jambi, Bengkulu, and Lampung, the popularity of *Pempek* has also expanded to big cities across Indonesia and some other neighboring countries including Malaysia, Singapore, and Australia (65). However, the taste of *Pempek* in other regions usually differs from the original South Sumatran variant since the main ingredients such as fish and flour may be difficult to find in other regions outside South Sumatra. Today, *Pempek* has become the identity of South Sumatra and is known as one of the most popular Indonesian dishes (8,9).

Currently, *Pempek* can be easily found in many Indonesian cities (Figure 8A-E), from food courts in shopping centers, traditional markets, to ambulant *Pempek* vendors on motorcycles or carts. There are also small traditional restaurants and eateries specialized in serving *Pempek*, most of which are usually run by South Sumatran owners. Some *Pempek* establishments are very popular nationally and have opened franchised branches in many cities (65). In South Sumatra, *Pempek* is sold mainly as foodstuff gifts or souvenirs for visitors from other Indonesian cities (66). In this case, *Pempek* is commonly sold as frozen ready-to-cook dumplings in vacuum packagings along with concentrated *kuah cuko* that needs further diluting upon consumption (Figure 8F). Palembang *Pempek* is also delivered to neighboring provinces and islands (mostly Java) on daily basis for restaurant supplies or individual consumption. During the first 10 days of the Ramadan in 2016, the Indonesian Postal Service (PT Pos Indonesia) handled the deliveries of 11 tons of *Pempek* from Palembang to other big cities in Indonesia, mainly Jakarta, Bandung, Semarang, and Surabaya in Java (67). In addition,

since there are many domestic tourist visiting South Sumatra to eat authentic *Pempek* dishes, *Pempek* can also be considered as a potential gastronomic tourist attraction (65,68).



Figure 8. Various types of *Pempek* vendors, including ambulant vendors on (A) motorcycle or (B) cart, (C) vendors in traditional markets, (D) specialized *Pempek* shops, and (E) stalls or restaurants in commercial centers. (F) As souvenirs, *Pempek* and *kuah cuko* are usually sold frozen in vacuum packaging to facilitate delivery and prepared just a moment prior to consumption.

The preservation technique for *Pempek* has also developed across the years as it grew in popularity as souvenirs. Freezing is the most common preservation method for *Pempek* to allow longer shelf life and further transportation range (69). In addition to this, food preservatives (antimicrobial agents) are also added by some *Pempek* producers to inhibit the growth of microorganisms in *Pempek* and thus, prolonging its shelf life (70). Modern innovations on *Pempek* (Figure 9) are also sprouting, especially in big cities in Java such as Jakarta, Bandung (West Java), and Surabaya (East Java) where interest in fusion food tends to be higher, particularly among young people. This includes the addition of melted mozzarella cheese as topping on *Pempek lenggang* and stuffing different varieties of filling inside *Pempek*, such as sausage, cheese, salmon, beef salami, or spicy chili peppers (71,72). Other innovations include making a large-sized *Pempek* stuffed with eggs and smaller *Pempek*s (*Pempek beranak* or *Pempek* giving birth), filling *Pempek* with condensed *kuah cuko* (*Pempek klepon*), creating *Pempek* in the form of a donut (*Pempek donat*), and adding fruit and vegetable extracts as dyes in *Pempek* dough to make colorful *Pempek* (*Pempek pelangi* or rainbow *Pempek*) (72). Up to this point, most of the *Pempek* production is dominated by home industries and there is no industrialization that allows mass production with consistent quality (73). Further development for *Pempek* production is still required, particularly in terms of production hygiene and innovative preservation method to ensure the safety of *Pempek* when consumed, since *Pempek* is categorized as a perishable food prone to putrefactive and pathogenic microorganisms.

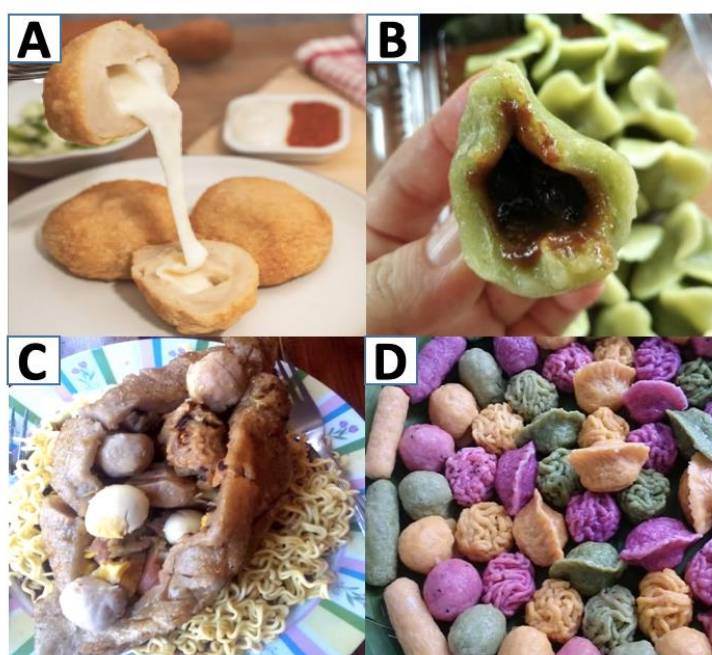


Figure 9. Emerging new innovations of *Pempek*, including (A) *Pempek mozzarella* using melting mozzarella cheese as filling, (B) *Pempek klepon* whose appearance resembles the popular Javanese green klepon cake with condensed *kuah cuko* as filling, (C) *Pempek beranak* or *Pempek* giving birth stuffed with eggs and smaller *Pempek*s, and (D) colorful *Pempek pelangi* or rainbow *Pempek* made using extracts of different fruits and vegetables.

## 10. Conclusions

*Pempek* is a traditional fishcake dish from Palembang, South Sumatra that has gained popularity across Indonesia and some neighboring countries, such as Malaysia, Singapore, and Australia. There is a plethora of *Pempek* varieties as the result of years of acculturation between the Chinese and South Sumatran culture. Composition, shape, filling, cooking method, and serving style are the determinants of *Pempek* varieties. From the nutritional point of view, *Pempek* is a good source of protein and unsaturated fatty acids, despite containing a relatively high amount of cholesterol. More than just a traditional food, *Pempek* is also a symbol of identity and pride which embodies a wide range of philosophical values upheld by the people of South Sumatra. The authors hope that this review would provide a thorough understanding with regard to *Pempek* and open the possibility for further studies on *Pempek*.

## Appendix

Recipe of *Pempek* and *kuah cuko* (45)

Ingredients (for 5 portions):

For *Pempek*: 250 g narrow-barred Spanish mackerel fillet (ground), 100 g of sago starch, 75 mL of coconut milk, 1 beaten chicken egg, 2 shallots (thinly sliced), 1 leek (chopped), 4 cloves of garlic (ground), 1 tsp of salt, ½ tsp of granulated sugar, ½ tsp of pepper, water (for boiling), and cooking oil (for frying).

For *kuah cuko*: 1 L of water, 500 g of palm sugar, 50 g of red chili pepper (ground), 5 cloves of garlic (ground), 3 tbsp of vinegar, 1 tbsp of tamarind paste, and 1 tsp of salt.

For condiments: 100 g of yellow egg noodles, 1 tbsp of dried shrimp flakes (*ebi*), and 1 cucumber (diced).

Instructions:

For *Pempek*: In a container, the ground fish fillet is mixed with the beaten egg, shallots, leek, garlic, salt, sugar, pepper, coconut milk, and sago starch until they are mixed thoroughly and form a homogenous *Pempek* dough. Afterwards, a portion of the dough is taken and then rolled to form a certain shape (ball, cylinder, etc) using one's hands. The steps are repeated until all the dough has been used and transformed into *Pempeks*. The *Pempeks* are then cooked in boiling water until they are thoroughly cooked and float. During this step, the noodles can also be cooked together with the *Pempeks* in the boiling water. The cooked *Pempeks* are then drained and can be stored in the freezer or deep fried directly in cooking oil. Once the *Pempeks* turn slightly brownish, they are ready to serve.

For *kuah cuko*: In boiling water, all the ingredients are put and stirred constantly. Some unwanted particles can be removed by using a fine mesh strainer or other types of filter. The *kuah cuko* is cooked until it reaches the desired level of thickness.

Serving: The *Pempeks* are placed on a plate with the pre-cooked noodles and diced cucumber as condiments. Some types of *Pempek* might need cutting into smaller pieces of bite size to facilitate eating. The *kuah cuko* is then poured into the plate. Some dried shrimp flakes (*ebi*) can be sprinkled on the top of the *Pempek* dish to improve its flavor.

### Acknowledgements

The publication cost of this manuscript is covered by the Research and Technology Transfer Office (RTTO), Bina Nusantara University.

### Author Contributions

Study conceptualization and design: R.S. and W.D.; data collection and manuscript writing: R.S., D.N., and S.; manuscript review: R.S.

### Funding

This study received no any external funding.

### Institutional Review Board Statement

Not applicable.

### Data Availability Statement

Invalid.

### Conflicts of Interest

The authors declare no conflicts of interest.

### References

1. The Editors of Encyclopaedia Britannica. South Sumatra [Internet]. 2022 [cited 2022 Jul 14]. Available from: <https://www.britannica.com/place/South-Sumatra>
2. Badan Pusat Statistik Provinsi Sumatera Selatan. Hasil sensus penduduk 2020 Provinsi Sumatera Selatan 2020 [Internet]. 2021 [cited 2022 Jul 14]. Available from:

- <https://sumsel.bps.go.id/pressrelease/2021/01/21/549/hasil-sensus-penduduk-provinsi-sumatera-selatan-2020.html>
3. Ananta A, Arifin EN, Hasbullah MS, Handayani NB, Pramono A. A new classification of Indonesia's ethnic groups (based on the 2020 population census) [Internet]. 2014 [cited 2022 Jul 14]. Available from: [https://www.iseas.edu.sg/images/pdf/iseas\\_working\\_papers\\_2014\\_1.pdf](https://www.iseas.edu.sg/images/pdf/iseas_working_papers_2014_1.pdf)
  4. Munoz PM. Early Kingdoms of the Indonesian Archipelago and the Malay Peninsula. Singapore: Editions Didier Millet; 2006.
  5. Kementerian Agama Republik Indonesia. Data umat berdasarkan agama [Internet]. 2022 [cited 2022 Jul 14]. Available from: <https://data.kemenag.go.id/statistik/agama/umat/agama>
  6. Kusnandar VB. Sebanyak 97% Penduduk Sumatera Selatan Beragama Islam pada Juni 2021 [Internet]. Katadata. 2021 [cited 2022 Jul 14]. Available from: <https://databoks.katadata.co.id/datapublish/2021/09/25/sebanyak-97-penduduk-sumatera-selatan-beragama-islam-pada-juni-2021#:~:text=Berdasarkan%20data%20Direktorat%20Jenderal%20Dinas>
  7. Anita SB. *Pempek* Palembang : mendeskripsikan identitas Wong Kito melalui kuliner lokal kebanggaan mereka. Yogyakarta: Leutikaprio; 2014.
  8. Wargadalem FR. *Pempek* sebagai identitas Palembang. Palembang: Bening Media Publishing; 2021.
  9. Syarifuddin S, Asmi AR, Safitri S, Abidin NF. Cuisine as Cultural Identity of Palembang Residents. Adv Soc Sci Educ Humanit Res. 2021;513(1):474–81.
  10. Ramadhan B. Pemprov Sumsel perjuangkan *Pempek* jadi warisan budaya UNESCO [Internet]. 2021 [cited 2022 Jul 14]. Available from: <https://www.republika.co.id/berita/qq3nym330/pemprov-sumsel-perjuangkan-Pempek-jadi-warisan-budaya-unesco>
  11. Wijaya S. Indonesian food culture mapping: a starter contribution to promote Indonesian culinary tourism. J Ethn Foods [Internet]. 2019;6(1):1–10.
  12. Oh Y, Razak NFAHA, Wee DHT, Ching EL, Rahman Z. The development of Nyonya cuisine in the Malay Archipelago : Penang and Malacca Nyonya cuisine. J Ethn Foods. 2019;6(17):1–10.
  13. Regenstein JM, Chaudry MM, Regenstein CE. The Kosher and Halal Food Laws. Compr Rev Food Sci Food Saf. 2003;2(3):111–27.
  14. Chee-Beng T. Nyonya cuisine : Chinese, non-Chinese and the making of a famous cuisine in Southeast Asia. In: Cheung SCH, Chee-Beng T, editors. Food and Foodways in Asia Resource. Oxfordshire: Routledge; 2007.
  15. Ratnawati L, Mairu T, Hanif ZA, Marbe UZ. Makanan: wujud, variasi dan fungsinya serta cara penyajiannya pada orang Palembang daerah Sumatra Selatan. Jakarta: Departemen Pendidikan dan Kebudayaan; 1993.
  16. Samitra D, Harmoko H, Sepriyaningsih S, Rozi ZF, Setiawan A, Yustian I. Freshwater fishes of Gegas Dam, South Sumatra Indonesia: composition and diversity. Ecol Environ Conserv. 2021;27(1):216–21.
  17. Ng HH. Chitala lopus. The IUCN red list of threatened species 2020 [Internet]. 2020 [cited 2022 Jul 14]. Available from: <https://www.iucnredlist.org/species/157719927/89815479>



18. Adriyana RA. Mie celor Palembang, perpaduan budaya Melayu dan Tionghoa [Internet]. 2021 [cited 2022 Jul 14]. Available from: <https://www.ketiknews.id/kuliner/pr-3012061869/Mie-Celor-Palembang--Perpaduan-Budaya-Melayu-dan-Tionghoa>
19. Rahma F. Sejarah martabak HAR Palembang, asal usul & lokasi membeli martabak HAR, kuah karinya bikin rindu [Internet]. 2018 [cited 2022 Jul 14]. Available from: <https://palembang.tribunnews.com/2018/11/30/sejarah-martabak-har-palembang-asal-usul-lokasi-membeli-martabak-har-kuah-karinya-bikin-rindu>
20. Rianti A. Food culture acculturation of martabak cuisine originally from India to Indonesia. *Studi Budaya Nusantara*. 2018;2(1):57–65.
21. Glenn A. Resep pindang patin khas Palembang, kuahnya segar bikin nagih [Internet]. 2021 [cited 2022 Jul 14]. Available from: <https://www.idntimes.com/food/recipe/arthur-glrrn-tambahani/resep-pindang-patin-khas-palembang-c1c2>
22. Ervani E. Brengkes tempoyak menu khusus warga Palembang [Internet]. 2015 [cited 2022 Jul 14]. Available from: <https://sumsel.antaranews.com/berita/298823/brengkes-tempoyak-menu-khusus-warga-palembang>
23. Rajagukguk YV, Arnold M. Tempoyak: fermented durian paste of Malay ethnic and its functional properties. *Int J Gastron Food Sci*. 2021;23:100297.
24. Zaakiyah R. Resep burgo kenyal khas Palembang dengan kuah santan yang gurih [Internet]. 2022 [cited 2022 Jul 14]. Available from: <https://www.idntimes.com/food/recipe/oksi-pangestuti/resep-burgo-kenyal-khas-palembang-c1c2>
25. Agmasari S, editor. Resep Malbi Khas Palembang, Olahan Daging Sapi yang Mirip Semur [Internet]. 2021 [cited 2022 Jul 14]. Available from: <https://www.kompas.com/food/read/2021/07/18/080800775/resep-malbi-khas-palembang-olahan-daging-sapi-yang-mirip-semur>
26. Surya R, Tedjakusuma F. Diversity of sambals, traditional Indonesian chili pastes. *J Ethn Foods* [Internet]. 2022;9(1):1–19. Available from: <https://doi.org/10.1186/s42779-022-00142-7>
27. Guttifera G, Rahmawati L, Sari SR, Pratama F, Widowati TW. Traditional puffed fish cracker (“kemplang Palembang”) by microwave-oven method: physical properties and microstructure evaluation. *Czech J Food Sci*. 2022;40(3):202–9.
28. Romulo A, Surya R. Tempe: a traditional fermented food of Indonesia and its health benefits. *Int J Gastron Food Sci*. 2021;26:100413.
29. Sidharta M. Soyfoods in Indonesia. In: Du Bois CM, Tan CB, Mintz SW, editors. *The World of Soy*. Singapore: NUS Press; 2008.
30. Agustini S, Priyanto G, Hamzah B, Santoso B, Pambayun R. Unravel browning mechanism in making kue delapan jam. *Int Food Res J*. 2017;24(1):310–7.
31. Noviani L. Resep membuat kue 8 jam khas Palembang, bahan dan cara buat adonannya mudah [Internet]. 2019 [cited 2022 Jul 14]. Available from: <https://sumsel.tribunnews.com/2019/02/14/resep-membuat-kue-8-jam-khas-palembang-bahan-dan-cara-buat-adonannya-mudah>
32. Efrianto E, Zubir Z, Maryetti M. Inventarisasi perlindungan karya budaya: *Pempek Palembang*. Padang: Balai Pelestarian Nilai Budaya Padang; 2014.

33. Basoni S. Mengintip 5 kembaran *Pempek* di China hingga Denmark [Internet]. 2021 [cited 2022 Jul 14]. Available from: <https://food.detik.com/info-kuliner/d-5595762/mengintip-5-kembaran-Pempek-di-china-hingga-denmark>
34. Bi X, Soong YY, Lim SW, Henry CJ. Evaluation of antioxidant capacity of Chinese five-spice ingredients. *Int J Food Sci Nutr*. 2015;66(3):289–92.
35. Coppel CA. The Indonesian Chinese. In: Hooker MB, editor. *Law and the Chinese in Southeast Asia*. Singapore: Institute Of Southeast Asian Studies; 2002.
36. Wijaya T. Tepung sagu dan ikan: makanan orang Nusantara 1500 tahun yang lalu [Internet]. 2018 [cited 2022 Jul 14]. Available from: <https://www.mongabay.co.id/2018/11/14/tepung-sagu-dan-ikan-makanan-orang-nusantara-1500-tahun-yang-lalu/>
37. Food and Agriculture Organization of the United Nations. *FAO species catalogue vol. 2: Scombrids of the world*. Rome: FAO; 1983.
38. Widayanti R, Nugroho HA, Megarani DV, Widiasih DA, Pakpahan S. Revealing Spanish mackerel's diversity in Indonesian through local commodities in the fish market. *Biodiversitas J*. 2022;23(2):624–30.
39. Sanaji M. *Wisata kuliner makanan daerah khas Bandung*. Jakarta: Gramedia Pustaka Utama; 2010.
40. Adzkiyak A. *Etnografi kuliner: makanan dan identitas nasional*. Yogyakarta: Zahir Publishing; 2021.
41. Tiofani K. 9 jenis ikan untuk membuat *Pempek*, mudah ditemukan di pasar [Internet]. 2021 [cited 2022 Jul 14]. Available from: <https://www.kompas.com/food/read/2021/09/09/140300175/9-jenis-ikan-untuk-membuat-Pempek-mudah-ditemukan-di-pasar?page=all>
42. Trisia MA, Tachikawa M, Ehara H. The role of the sago supply chain for rural development in Indonesia: a review and perspective. *Rev Agric Sci*. 2021;9(0):143–56.
43. Tiofani K. 3 tips membuat *Pempek* kenyal dan kencang, perhatikan rasio ikan dan tepung [Internet]. 2021 [cited 2022 Jul 14]. Available from: <https://www.kompas.com/food/read/2021/06/06/093300975/3-tips-membuat-Pempek-kenyal-dan-kencang-perhatikan-rasio-ikan-dan-tepung?page=all>
44. Hall GM. *Surimi and Fish Mince Products*. In: Hall GM, editor. *Fish processing: sustainability and new opportunities*. West Sussex: Blackwell Publishing; 2011.
45. Rudy G. *Resep autentik Pempek Palembang & masakan khas Wong Kito*. Jakarta: Gramedia Pustaka Utama; 2018.
46. Aisyah Y. Mengenal 9 jenis *Pempek* Palembang, bukan cuma kapal selam [Internet]. 2021 [cited 2022 Jul 14]. Available from: <https://www.kompas.com/food/read/2021/03/01/110400575/mengenal-9-jenis-Pempek-palembang-bukan-cuma-kapal-selam?page=all>
47. Fridayani N. Resep *Pempek* tanpa ikan, *Pempek* dos yang murah meriah [Internet]. 2020 [cited 2022 Jul 14]. Available from: <https://www.kompas.com/food/read/2020/09/05/110100475/resep-Pempek-tanpa-ikan-Pempek-dos-yang-murah-meriah?page=all>
48. Noviani L. Resep cara mudah membuat sate ikan kukus masakan khas Palembang, dijamin lezat [Internet]. 2019 [cited 2022 Jul 14]. Available from: <https://sumsel.tribunnews.com/2019/01/11/resep-cara-mudah-membuat-sate-ikan-kukus-masakan-khas-palembang-dijamin-lezat>

49. Fridayani N. Resep otak-otak ikan panggang, masak bersama keluarga di akhir pekan [Internet]. 2020 [cited 2022 Jul 14]. Available from: <https://www.kompas.com/food/read/2020/09/06/111600375/resep-otak-otak-ikan-panggang-masak-bersama-keluarga-di-akhir-pekan?page=all>
50. Santoso AB. Kuliner Palembang: celimpungan, laksan, tekwan, hehancang tehung, gurame asam manis [Internet]. 2015 [cited 2022 Jul 14]. Available from: <https://www.tribunnews.com/travel/2015/06/26/kuliner-palembang-celimpungan-laksan-tekwan-hehancang-tehung-gurame-asam-manis>
51. Santoso AB. Entah mengapa santapan mirip *Pempek* Palembang ini namanya model, terbuat dari sagu dan ikan [Internet]. 2015 [cited 2022 Jul 14]. Available from: <https://www.tribunnews.com/travel/2015/06/12/entah-mengapa-santapan-mirip-Pempek-palembang-ini-namanya-model-terbuat-dari-sagu-dan-ikan>
52. Rahman NA. Resep masak rujak mie, sajian sedap khas Palembang yang nikmat [Internet]. 2020 [cited 2022 Jul 14]. Available from: <https://www.idntimes.com/food/recipe/naufal-al-rahman-1/resep-rujak-mie-sajian-sedap-khas-palembang>
53. Setiawan R. Memaknai kuliner tradisional di Nusantara: sebuah tinjauan etis. Respons: Jurnal Etika Sosial. 2019;21(1):113–40.
54. Rossa V. 4 filosofi *Pempek* ini bias jadi pelajaran dalam menjalani hidup [Internet]. 2022 [cited 2022 Jul 14]. Available from: <https://www.suara.com/lifestyle/2022/01/28/094434/4-filosofi-Pempek-ini-bisa-jadi-pelajaran-dalam-menjalani-hidup>
55. Azzam A. Filosofi *Pempek* [Internet]. 2021 [cited 2022 Jul 14]. Available from: <https://terbitkanbukugratis.id/ardi-azzam/08/2021/filosofi-Pempek/>
56. Isnawijayani I, Rozalena A, Caropeboka RM. The Meaning of Longing for the Tradition of “Ngirup Cuko *Pempek*” Palembang as Friendship Communication in the Covid-19 Pandemic Era. Int J Commun Service Engagem. 2021;2(4):99–111.
57. Fat Secret Singapore. Spanish mackerel [Internet]. 2022 [cited 2022 Jul 14]. Available from: <https://www.fatsecret.com.sg/calories-nutrition/generic/spanish-mackerel?portionid=60746&portionamount=100.000>
58. Fat Secret Singapore. *Pempek* [Internet]. 2022 [cited 2022 Jul 14]. Available from: <https://www.fatsecret.com.sg/calories-nutrition/generic/Pempek?portionid=4969140&portionamount=100.000>
59. Jackson AA, Truswell AS. Protein. In: Mann J, Truswell AS, editors. Essentials of Human Nutrition. Oxford: Oxford University Press; 2017.
60. Yilmaz HA. Proximate composition, fatty acid, and amino acid profiles of narrow-barred Spanish mackerel (*Scomberomorus commerson*) fillets from Iskenderun Bay in the North-Eastern Mediterranean Sea. J Agric Sci. 2021;27(4):441–8.
61. Lee H, Park WJ. Unsaturated fatty acids, desaturases, and human health. J Med Food. 2014;17(2):189–97.
62. Rayman MP. Selenium and human health. The Lancet. 2012;379(9822):1256–68.
63. Tabas I. Cholesterol in health and disease. J Clin Investig. 2002;110(5):583–90.
64. Brown L, Rosner B, Willett WW, Sacks FM. Cholesterol-lowering effects of dietary fiber: a meta-analysis. Am J Clin Nutr. 1999;69(1):30–42.
65. Kartika T, Harahap Z. The culinary development of *Pempek* as a gastronomic tourist attraction in Palembang, Sumatera Selatan. Tourism Scientific J. 2019;4(2):211–33.

66. Karneta R, Gultom NF. The development strategy of packaged *Pempek* industry. *Int J Bus Manag*. 2017;12(8):227–33.
67. Rosana D. Pengiriman *Pempek* melalui Pos tembus 11 ton [Internet]. 2016 [cited 2022 Jul 14]. Available from: <https://www.antaranews.com/berita/567447/pengiriman-Pempek-melalui-pos-tembus-11-ton>
68. Ningrum DP, Arrianie L. Potensi kuliner *Pempek* dalam membangun Kota Palembang. *Mediakom : Jurnal Ilmu Komunikasi* [Internet]. 2019;3(2):186–95. Available from: <https://doi.org/10.35760/mkm.2019.v3i2.2245>
69. Aisyah Y. Cara membuat *Pempek* beku buat stok lauk siap pakai [Internet]. 2021 [cited 2022 Jul 14]. Available from: <https://www.kompas.com/food/read/2021/04/06/170300275/cara-membuat-Pempek-beku-buat-stok-lauk-siap-pakai>
70. Triarko K. Perajin *Pempek* Palembang diimbau tak pakai pengawet [Internet]. 2017 [cited 2022 Jul 14]. Available from: <https://www.cendananews.com/2017/09/perajin-Pempek-palembang-diimbau-tak-pakai-pengawet.html>
71. Manihuruk V. Inovasi *Pempek* yang bikin ketagihan [Internet]. 2017 [cited 2022 Jul 14]. Available from: <https://www.pikiran-rakyat.com/gaya-hidup/pr-01272122/inovasi-Pempek-yang-bikin-ketagihan-390651>
72. Batubara R. Ini 10 kreasi kekinian *Pempek* Palembang, mulai *Pempek* pelangi, hingga Titanic seberat 10 kg [Internet]. 2019 [cited 2022 Jul 14]. Available from: <https://batam.tribunnews.com/2019/03/12/ini-10-kreasi-kekinian-Pempek-palembang-mulai-Pempek-pelangi-hingga-titanic-seberat-10-kg?page=all>
73. Supriadi A, Saputra D, Priyanto G, Pambayun R, Oswari LD. Mapping and development strategy of *Pempek* – a specialty traditional food of South Sumatra, Indonesia. *Potravinarstvo Slovak J Food Sci*. 2018;12(1):707–15.