Journal of Ethnic Foods

Pindang, the Indonesian Indigenous Traditional Fish-Based Food

--Manuscript Draft--

Manuscript Number:	JEFO-D-23-00277
Full Title:	Pindang, the Indonesian Indigenous Traditional Fish-Based Food
Article Type:	Review article
Funding Information:	
Abstract:	Indonesia has myriad recipes of aquatic products-based dishes which represent the wealth of diverse histories, ethnicities, cultures and natural resources. One of which is pindang, which is native to Indonesia, with diverse authentic recipes as discovered across the country. Thus, this manuscript aims to explore, identify and develop a culinary profile of 80 Indonesian pindang dishes as discovered in about 16 provinces across the country as viewed from geographical distribution, historical, cultural and culinary aspects. Pindang has been shaped over centuries by unique histories, local wisdoms, cooking techniques, traditions, natural resources and philosophy. Historically, pindang was initially created as a stew from various species of fishes and aquatic animals, involving various spices, herbs, souring agents and other ingredients. In the course of periods, the dish was subsequently evolutionized to be a preserved-product (salt-boiled fish), in which this preservation technique is only discovered in Indonesia. In the term of diversity, pindang is discovered as stew (45 dishes), salt-boiled fish (11 dishes) and processing version of salt-boiled fish (24 dishes), with mostly concentrated in South Sumatra (23 dishes). Specialties such as pindang belida (spicy and sour featherback knifefish [Chitala ornata] stew) from South Sumatra, ikan tuna pindang (salt-boiled tuna) from Bali and sambel pindang kemangi (salt-boiled fish, stir-fried in lemon basil and chili sauce) from East Java are instances of pindang stew, salt-boiled fish and processed version of salt-boiled fish, respectively. Although mostly developed from fish, pindang stew can also be developed from livestock products and vegetables as shown in Central Javanese pindang Kudus (buffalo meat stew) and pindang rebung santan (coconut milk-based bamboo shoot stew), respectively. Meanwhile, salt-boiled fish is mostly created by boiling fish in salt solution until dry as demonstrated in cue, Bawean and paso methods. The salt-boiled fish can be further cooked as numerous new dishes, most of which are sambal-based.
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Pindang, the Indonesian Indigenous Traditional Fish-Based Food

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Abstract

Indonesia has myriad recipes of aquatic products-based dishes which represent the wealth of diverse histories, ethnicities, cultures and natural resources. One of which is *pindang*, which is native to Indonesia, with diverse authentic recipes as discovered across the country. Thus, this manuscript aims to explore, identify and develop a culinary profile of 80 Indonesian *pindang* dishes as discovered in about 16 provinces across the country as viewed from geographical distribution, historical, cultural and culinary aspects.

Pindang has been shaped over centuries by unique histories, local wisdoms, cooking techniques, traditions, natural resources and philosophy. Historically, *pindang* was initially created as a stew from various species of fishes and aquatic animals, involving various spices, herbs, souring agents and other ingredients. In the course of periods, the dish was subsequently evolutionized to be a preserved-product (salt-boiled fish), in which this preservation technique is only discovered in Indonesia. In the term of diversity, *pindang* is discovered as stew (45 dishes), salt-boiled fish (11 dishes) and processing version of salt-boiled fish (24 dishes), with mostly concentrated in South Sumatra (23 dishes). Specialties such as *pindang belida* (spicy and sour featherback knifefish [*Chitala ornata*] stew) from South Sumatra, *ikan tuna pindang* (salt-boiled tuna) from Bali and *sambel pindang kemangi* (salt-boiled fish, stir-fried in lemon basil and chili sauce) from East Java are instances of *pindang* stew, salt-boiled fish and processed version of salt-boiled fish, respectively. Although mostly developed from fish, *pindang* stew can also be developed from livestock products and vegetables as shown in Central Javanese *pindang Kudus* (buffalo meat stew) and *pindang rebung santan* (coconut milk-based bamboo shoot stew), respectively. Meanwhile, salt-boiled fish is mostly created by boiling fish in salt solution until dry as demonstrated in *cue*, *Bawean* and *paso* methods. The salt-boiled fish can be further cooked as numerous new dishes, most of which are *sambal*-based.

Keywords: *pindang*, stew, salt-boiled fish, Indonesian traditional food, *sambal*-based dish, preservation, fermentation.

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Introduction

Indonesia, an archipelagic country strategically situated at the crossroads of Asia and Australia and surrounded by the Pacific and Indian Oceans, boasts over 17,000 official islands and spans more than 3 million square kilometers of water bodies (these encompass seas, straits, bays, rivers, lakes, marshlands, and floodplains). Located along the equator and characterized by intercontinental seasonal monsoon winds and a range of volcanic mountains, Indonesia is endowed with abundant natural resources, particularly aquatic animals [1]. The country hosts a remarkable variety of aquatic species, including freshwater and marine fishes as well as aquatic invertebrates [1, 2]. In economic terms, the total production of Indonesian aquatic animals surpassed 20 million metric tons by 2020, with a total commercial value exceeding 19 billion US dollars [2].

Indonesia also demonstrates a cultural megadiversity, with numerous languages, traditional ceremonies, arts, clothing, folk music, local wisdom, culinary traditions, dances, and so on, originating from nearly 1,300 distinct indigenous ethnic groups and impacted by various foreign influences [3]. The Indonesian culinary tradition has, over centuries, developed many vibrant and authentic recipes using the nation's abundant natural resources and diverse ethnic cultures, with hints of foreign gastronomical arts (Chinese, Indian, Arabian, European, and Polynesian culinary traditions) [3, 4]. Many Indonesian traditional dishes have been created from aquatic products as the main ingredients. One such dish is *pindang*.

Pindang is an intangible national heritage that represents the richness of Indonesian history, acculturation, natural resource, local wisdom, and culinary tradition [5]. Interestingly, the dish has become a specialty in some certain regions, often served on particular occasions, signifying a local identity [5, 6]. Every region has developed their own unique recipes of *pindang*,

formulated over centuries, for processing fish and aquatic animals into succulent *pindang* dishes [5, 6, 7, 8]. *Pindang* is popularly recognized as a spicy and sour fish stew in the culinary tradition of some regions in Indonesia [5]. However, the term is also ambiguously understood as a salt-boiling preservation method in other regions [6]. Interestingly, the dish can also be prepared from other ingredients such as meat, eggs, and vegetables rather than aquatic-based products [7, 9, 10, 11].

The current study presents a literature review of *pindang* as observed from historical, philosophical, cultural, gastronomical, and food science points of view. The manuscript explores all aspects related to *pindang* from regions across the country, including recipes, distribution, and related data, as elaborated from a wide range of sources such as cookbooks, recipe books, and academic journals. The objective is to develop a culinary profile and facilitate scientific discussions that can potentially enrich both national and international gastronomical databases. The article also reveals the origin of the ambiguity of two classical *pindang* terms and offers some logical hypotheses and chronologies based on history and culture. The manuscript also reviews the preparation methods of *pindang* either as a stew or a preserved salt-boiled fish, as well as the further culinary processing of salt-boiled fish (*pindang* preserved fish) across regions in Indonesia.

History of *Pindang*

According to the official Indonesian dictionary, the term *pindang* is literally described as a preservation method for fish and poultry products by boiling the ingredients in a brine or acidic solution with herbs containing a substance like tannin, followed by smoking or prolonged boiling until dry [12]. Furthermore, the definition is extended to include spicy and sour stews of fish (and

in some cases, meat and seafood are utilized as primary ingredients), as prepared using various herbs and spices [5].

There are two versions of *pindang*, with the latter being the older one historically. Many historians trace the origin of *pindang* back to southern Sumatra during the *Srivijaya* empire era (671–1025 AD) [13]. Examples of *pindang* stew include *pindang gabus* (spicy and sour snakehead fish [*Channa striata*] stew from South Sumatra), *pindang belida* (spicy and sour featherback knifefish [*Chitala ornata*] stew from South Sumatra), *pindang patin* (spicy and sour shark catfish [*Pangasius bocourti*] stew from South Sumatra and West Kalimantan) (Fig. 1A) and *pindang tongkol* (sour and spicy mackerel tuna [*Euthynnus affinis*] stew from Bangka-Belitung) (Fig. 1B) [5, 7, 14]. Interestingly, *pindang* shares similarities with other spicy and sour fish/meat stews found in mainland Southeast Asia, such as *samlar machu* (Cambodian-styled sour and spicy fish soup), *tom yum* (Thai-styled sour and spicy fish soup), and *canh chua* (Vietnamese-styled sour and spicy fish soup) [15, 16]. In the first century AD, the Funan kingdom was established and became a trading hub between China, India, and the Southeast Asian archipelago for about 500 years [17]. The historic connections (through religio-cultural and economic activities) between the Indonesian archipelago and the mainland Indo-China probably facilitated the spread of these spicy and sour fish stews from the mainland to maritime Southeast Asia [13, 18]. Some historians also hypothesized that the decline of the Funan kingdom in the mid-6th century probably led to migration, including people and nobles, to the southern island of Sumatra [18]. The intermarriage of Indo-Chinese immigrants with native Malay people might hypothetically establish a new entity, the *Srivijaya* kingdom (671 AD) [18, 19]. This cultural amalgamation potentially influenced culinary traditions, with the Indo-Chinese spicy and sour fish stews probably inspiring the creation of *pindang* in Sumatra [13, 20]. Today, *pindang* stews are still served at homes and restaurants in

South Sumatra, as well as at traditional ceremonies and feasts. Given its diverse ingredients, *pindang* stew symbolizes unity in South Sumatra society, bringing people together from various social and religious backgrounds [13, 21].

As the *Srivijaya* empire emerged as a thalassocratic empire (671–790 AD) and expanded its territory to include almost four-fifths of Sumatra island, the Malay peninsula, the western coast of Kalimantan, as well as western and central Java; the dish (*pindang*) spread throughout the entire imperial area [19]. The *Srivijaya* empire adopted a *mandala* political system whereby a state evolved from the network of many vassalized kingdoms under an influential central dominion. Political orders and policies diffused from the epicenter of the empire to vassal kingdoms and principalities [22]. This was a contrast to the common model of imperial political systems such as the Roman and Chinese empires, where the emperor strictly limited the sovereignty of vassal kingdoms and assigned governors as imperial representatives. The *mandala*-based ruling houses often orchestrated strategic diplomatic marriages with local ruling families as a means of exerting control and bolstering the *mandala* political system [18, 19, 22]. For example, the *Shailendra* dynasty (725–835 AD), a Malay *Srivijaya*-Javanese noble family, was designated as a co-ruler of *Srivijaya* empire to control several kingdoms in Java, including *Mataram*, *Sunda*, and *Kalingga* kingdoms [18, 19, 23]. The dynasty eventually assumed a sole ruler of the empire at the summit of their glory (812–833 AD) and shifted the capital from South Sumatra to central Java [18, 23]. It was probably the family who introduced and popularized *pindang* in Java. As it gained popularity among the Javanese people, *pindang* became a delicacy for a wider range of people and activities, from commoners to religious offerings and imperial banquets [24]. Even when the last monarch of *Shailendra* dynasty, *Balaputradewa*, was defeated by *Rakai Pikatan* from *Sanjaya* dynasty, the native dynasty of *Mataram* kingdom, which historically terminated the dominance of

Srivijaya realm in Java (835 AD), *pindang* was still served in the royal table banquets and religious ceremonies as documented in *Taji* inscription (901 AD) [19, 24].

Later, in Java, *pindang* evolved beyond its association solely with spicy and sour fish stews, and developed into a preservation method for seafood products. The method involves an extended period of stewing or boiling until almost all the water evaporates, resulting in a dry product. This process can extend the shelf life of a product [6]. It is suggested that the development of this preservation method was probably a local wisdom of the Javanese people to navigate challenging conditions, as there were instabilities in Java (circa 910–1100 A.D) due to numerous volcanic eruptions and inter-imperial wars that made it impossible to prepare food in the traditional ways [25]. Sometimes, additional processes were involved to prolong the shelf life of the products such as drying and smoking which can still discover until today. This method is referred to as "wet preservation" in order to distinguish it from the traditional salted-dried fish method [6]. *Ikan cakalang pindang* (salt-boiled skipjack tuna [*Katsuwonus pelamis*] found in Central Java, East Java, and Bali) (Fig. 1C), *ikan tongkol pindang* (salt-boiled mackerel tuna [*Euthynnus affinis*] found in Central Java, East Java, and Bali) (Fig. 1D) and *ikan tenggiri pindang* (salt-boiled wahoo [*Acanthocybium solandri*] found in Central Java, East Java, and Bali) are instances of the application of this preservation method [6]. The term *ikan tongkol pindang* differs from *pindang tongkol*, the latter being the stew version [5, 6]. This ancient preservation method is still being practiced in the northern coast of Java [6]. The collapse of the Hindu-Buddhist *Majapahit* empire and the rise of Islamic states in Java spurred demographic migrations from Java to Bali, introducing this preservation method in the latter region [26]. An instance of Balinese specialty using this preservation technique is *ikan tuna pindang* (salt-boiled tuna) (Fig. 1E) [6]. Interestingly, the by-product of this preservation process, the residual boiling water, is sometimes seasoned with spices

and herbs and utilized as a dressing in *rujak kuah pindang*, a Balinese-styled fruit salad (Fig. 1F) [27].

During the course of its history, *pindang*, in both stew and preserved forms, exhibited versatility beyond seafoods and fishery products. Its application to various meats (beef, pork, buffalo meat, mutton, and chicken) and other ingredients (vegetables and eggs) in the dish is widely observed in many regions in Indonesia [5, 7]. For example, a Javanese delicacy, *telur pindang* (Javanese-styled marbled egg from Central Java) (Fig. 1G), involves preserving eggs by boiling them in a mixture of brine and teak (*Tectona grandis*) leaves [5]. Sharing a similarity with Chinese marbled egg, the dish exhibits a hint of the past bilateral relationship with China dating back to the 11th century AD [27]. However, the Javanese employ teak leaves instead of tea (*Camelia sinensis*) leaves in the preservation process, as teak forests have long grown in Java for thousands of years [24, 28]. The tannin present in teak leaves aids in constricting egg proteins, thus reducing the pore size on the eggshell. This prevents the infiltration of foodborne bacteria through the pores [29]. Furthermore, *telur pindang* has been utilized in other Javanese delicacies such as *gudeg telur pindang* (a Javanese-styled marbled egg served with sweetened young jackfruit) discovered in Yogyakarta [30].

On the other hand, contemporary meat-based *pindang* stews such as *pindang Kudus* (Central Javanese buffalo meat stew) (Fig. 1H), *pindang tetelan* (Central Javanese cattle tendon stew) (Fig. 1I), and *pindang kambing* (Central Javanese mutton stew) probably originated in Java before the arrival of Islam (before the 15th century). They were probably prepared using non-*halal* meats (forbidden according to Islamic dietary law) such as pork, canine, and reptile meat [5, 9, 24]. Unfortunately, the remnants of these non-*halal pindang* stew are currently arduous to discover in Java. Enthrallingly, traces of the ancient non-*halal pindang* stew have been discovered in the

Kapampangan region of the Philippines, where it is locally known as *pindang babi* (pork *pindang* stew) [31]. Meanwhile, *burong baboy* is the dried-fermented version of *pindang babi* [32]. The term *pindang* being used for both dish names and their resemblance to Javanese *pindang* (both the meat-based stew and the preserved version) demonstrate a longstanding inter-insular relationship between Java and the Philippines, as evidenced by the *Laguna* copperplate inscription from the early 10th century AD [33]. Probably, it was the Javanese who introduced the dishes to the region [33].

The arrival of Europeans, especially the Portuguese and the Spaniards, in Southeast Asian archipelago (16–17th century AD) introduced new crops such as chili pepper (*Capsicum annum*), pineapple (*Ananas comosus*), and tomato (*Solanum lycopersicum*) from the American continent. These new ingredients enhanced the sourness and spiciness of *pindang* stew [21, 34]. Interestingly, several *pindang* stews also gained favor among the descendants of foreign immigrants, such as the Chinese and the Portuguese-based Creole-speaking *Mardjiker* people, inspiring them to create their own version of *pindang*. The abundance of milkfish (*Chanos chanos*) on the north coast of Batavia (modern-day Jakarta) enabled the *Mardjiker* people in Kampung Tugu to develop *pindang serani* (a Portuguese-Indonesian version of spicy milkfish stew) (Fig. 1J). The word *serani* derives from a corrupted version of the word *nasrani*, meaning Christian, the prevailing faith within the community [7, 35]. Meanwhile, the Chinese settlers created *pindang bandeng kecap* (milkfish stewed in soy sauce found in Indonesia's Chinatowns) (Fig. 1K) commonly served during Chinese holidays like *imlek* (Chinese new year) and *cap go meh* (the 15th day of the first month in the Chinese calendar), as bones of milkfish symbolize prosperity in Chinese belief [27].

Distribution of *Pindang*

Table 1 and appendix 1 recapitulate about 80 *pindang* dishes as collected from regions across Indonesia. These *pindang* dishes were discovered in 16 provinces situated mainly in the western part of the country (Fig. 2). The dishes are dominated by 45 *pindang* stews, with 23 originating primarily from South Sumatra (Fig. 2). Examples include *pindang telur gabus* (spicy and sour snakehead fish roe [*Channa striata*] stew) (Fig. 1L), *pindang kerang* (spicy and sour blood cockle [*Anadara granosa*] stew) (Fig. 1M) and *pindang patin* [5, 7]. Conversely, *pindang* dishes classified in terms of salt-boiled fish (11 dishes) and their further processed forms (24 dishes) are mostly discovered in Java and Bali (Fig. 2). Examples are *ikan kembung pindang* (salt-boiled Indian mackerel [*Rastrelliger kanagurta*] found in Central Java, East Java, and Bali), *tumis ikan pindang* (stir-fried salt-boiled fish found in Central Java and East Java), and *pindang tongkol suwir kemangi* (shredded salt-boiled mackerel tuna [*Euthynnus affinis*] stir-fried with lemon basil found in East Java) (Fig. 1N) [6, 36, 37]. Unfortunately, salt-boiled fish and the processing version of the preserved products are rarely discovered in Sumatra, especially South Sumatra (Fig. 2). On the other hand, the stew version (16 dishes) is still discovered in other parts of Indonesia (including in Java with 12 dishes) (Fig. 2). These facts reinforce the aforementioned hypothesis that *pindang* likely originated in South Sumatra during the *Srivijaya* empire's period (circa 671–1025 AD) in stew form [13, 17, 21]. The current distribution of dishes in the former regions of the ancient *Srivijaya* empire (mostly in the western part of Indonesia) indicates that *pindang* was historically introduced by the *Srivijaya* to the entire imperial region [17]. In Java, *pindang* was not only served as a stew, but it also evolutionized into a preservation method [6, 17]. From Java, this preservation method was introduced to other places in Indonesia, including Sumatra [6]. The Acehnese delicacy

of *keumamah* is a dried-version of salt-boiled fish while *pindang balado* (salt-boiled fish stir-fried in chili sauce of West Sumatra) is the contemporary creation of *pindang* (salt-boiled fish) (Table 1) [38, 39]. Both are possibly influenced by Javanese culinary traditions [6, 24].

Most South Sumatran *pindang* stews (9 dishes) (Table 1 and Fig. 2) utilize diverse species of freshwater fish as the main ingredient, including gourami fish (*Osphronemus gouramy*) (Fig. 3A), snakehead fish (*Channa striata*) (Fig. 3B), *baung* fish (*Hemibagrus nemurus*) (Fig. 3C), featherback knifefish (*Chitala ornata*) (Fig. 3D) and shark catfish (*Pangasius bocourti*) (Fig. 3E) [5, 7, 14, 40]. Meanwhile, about 6 dishes of South Sumatran *pindang* stews (Table 1 and Fig. 2) are made from seafood products such as red snapper (*Lutjanus argentimaculatus*) (Fig. 3F), blood cockle (*Anadara granosa*) (Fig. 3G), and shrimp (*Penaeus monodon*) (Fig. 3H) [5, 41]. The climatic and geographical conditions of South Sumatra, situated within a tropical region repleted with vast water bodies encompassing large rivers, marshlands, and seas, contribute significantly to the abundance of aquatic resources [1, 19, 21, 42]. This abundance probably encouraged the locals in the region to immediately process these ingredients [21]. The simplest technique recognized by the traditional people at that time was by stewing the aquatic products in a mixture of certain spices, herbs, brine and acidic solutions [5, 21]. On the other hand, the main ingredients employed in Javanese *pindang* stew are more vibrant than those in Sumatra (Table 1 and Fig. 2), as they are not limited to aquatic products, but also incorporates livestock products such as buffalo meat (Fig. 3I), offal (Fig. 3J), mutton (Fig. 3K), and poultry eggs (Fig. 3L) in the dish [5, 7]. It is suggested that the agriculture-based life in Java has significantly influenced the culinary processes, including the creation of Javanese *pindang* stews based on livestock products as an adaptation of traditional fish-based *pindang* stews [19, 24]. Fascinatingly, aquatic product-based *pindang* found in Java—whether in the form of stew, salt-boiled fish, or processed preserved fish—are

predominantly prepared from marine fishes (Table 1 and Fig. 2) such as mackerel tuna (*Euthynnus affinis*) (Fig. 3M), skipjack tuna (*Katsuwonus pelamis*) (Fig. 3N), and wahoo (*Acanthocybium solandri*) (Fig. 3O) rather than freshwater fishes [6]. Geographically, Java's limited availability of freshwater bodies such as marshlands and large rivers has historically compelled locals to rely primarily on marine sources of aquatic protein [1, 19].

Sumatran *pindang* stews tend to be sour, spicy and less sweet, while Javanese *pindang* stews elaborate more diverse tastes (sweet, sour, spicy, savory, and salty). The preference for particular tastes is determined by many factors such as culture, natural resources, and gastronomical traditions inherent to particular regions [4]. The various compositions of spices, herbs and other additional ingredients produce distinct tastes of *pindang* stew (Table 1). Turmeric (*Curcuma domestica*) (Fig. 4A), galangal (*Alpinia galanga*) (Fig. 4B), lemongrass (*Cymbopogon citratus*) (Fig. 4C), ginger (*Zingiber officinale*) (Fig. 4D) and chili pepper (*Capsicum annum*) (Fig. 4E) feature in almost all *pindang* stews across the country and infuse the dishes with eccentric, aromatic, and spicy tastes (Table 1 and Fig. 2) [5, 43, 44, 45]. The degree of sourness is determined by several additional ingredients incorporated into the stews such as *belimbing wuluh* (*Averrhoa bilimbi*) (Fig. 4F), *rambai* fruit (*Baccaurea motleyana*) (Fig. 4G), tamarind (*Tamarindus indica*) (Fig. 4H), yellow mangosteen (*Garcinia xanthochymus*) (Fig. 4I), pineapple (*Ananas comosus*) (Fig. 4J) and tomato (*Solanum lycopersicum*) (Fig. 4K), which are also found in almost all *pindang* stews in Sumatra, Java, Kalimantan and other regions (Table 1 and Fig. 2) [5, 7, 40, 46]. Meanwhile, the incorporation of ingredients such as soy sauce and palm sugar delivers a level of sweetness to *pindang* stews, as mostly found in some dishes in Java (Table 1 and Fig. 2) [9, 47]. Furthermore, some Indonesian indigenous herbs such as *kecombrang* (*Etlingera elatior*) (Fig. 4L), June plum leaf (*Spondias dulcis*) (Fig. 4M), *kencur* (*Kaempferia galanga*) (Fig. 4N) and *wadung*

(*Garcinia tetranda*) (Fig. 4O) are also employed in some stews across the country (Table 1 and Fig. 2) such as *pindang ikan bunga kecombrang* (South Sumatran fish stew spiced with *kecombrang* [*Etlingera elatior*]), *pindang gunung* (Sundanese-styled spicy and sour fish stew from West Java), *pindang rebung santan* (Central Javanese coconut milk-based bamboo shoot stew), and *pindang gendam* (East Javanese spicy Indian mackerel [*Rastrelliger kanagurta*] stew) (Fig. 1O), respectively [10, 48, 49, 50]. These ingredients produce distinctive aromatic flavors and introduce naturally preserving agents into the stews [43]. On the other hand, in the form of a preserved product, *ikan pindang* (salt-boiled fish) tends to be savory and salty due to the large amounts of salt used during its boiling process [6]. Furthermore, most salt-boiled fishes are subsequently cooked (stir-fried) with some spicy and aromatic ingredients such as chili pepper (*Capsicum annum*), lemon basil (*Ocimum sanctum*) (Fig. 4P), and kencur (*Kaempferia galanga*), as discovered in some dishes in Java and Bali (Table 1 and Fig. 2) such as *pindang lombok ijo* (Central Javanese salt-boiled fish, stir-fried in green chili sauce), *sambel pindang kemangi* (East Javanese salt-boiled fish, stir-fried in lemon basil and chili sauce), and *pindang kesuna cekuh* (salt-boiled fish, stir-fried with garlic and *kencur* [*Kaempferia galanga*] found in Bali) (Fig. 1P), respectively [51, 52]. The incorporation of spices, herbs, and even certain fruits in *pindang* dishes is associated with the Indonesian traditional culinary wisdom, in which the addition of aromatic and acidic-producing food materials can improve organoleptic properties and reduce undesired aroma in foods, including reducing fishiness level in foods based on aquatic products [28, 43]. In addition, the presence of some spices, herbs and other ingredients such as ginger, garlic, turmeric, galangal, chili pepper, soy sauce, pineapple, and tomato in the stew indicates a historical economic and cultural relationship between Indonesia, the Indian sub-continent, China, and Europe [17, 34, 42].

Preparations of *Pindang*

Ingredients

The main ingredients of *pindang* are tabulated in table 1. These, in general, consist of various species of freshwater fishes, marine fishes, aquatic invertebrates, livestock products, and vegetables. Meanwhile, the secondary ingredients include numerous aromatic spices and herbs, souring-agent fruits, salt, sugar, and fermented products, as also described in table 1.

Cooking Process

There are three versions of *pindang*: the stew, the preserved product (salt-boiled fish), and the processed version of salt-boiled fish. Each of these has a unique cooking method, as demonstrated in the flowcharts in figure 5.

Pindang Stew

In general, the preparation process for the 45 *pindang* stew dishes is technically similar, as depicted in figure 5A. Initially, spices and herbs such as garlic, shallot, chili pepper, turmeric, ginger, candlenut, shrimp paste, coriander, black pepper, salt, sugar, and cooking oil are pulverized, prior to stir-frying with the main ingredients (fish, meat, and vegetables). As an aromatic fragrance is generated, the stewing process is initiated by adding an appropriate quantity of water to the mixture. Tamarind is ground into a paste and herbs such as galangal and lemongrass are crushed

by hammering. Souring-agent fruits such as tomatoes and pineapples are chopped. The spices, herbs, and fruits are subsequently incorporated into the stew along with other herbs such as bay leaf and lemon basil. Sugar and salt are also added. After several minutes of stewing, the *pindang* stew is ready to be served [5].

Ikan Pindang (Salt-Boiled Fish)

In principle, the production of *ikan pindang* (salt-boiled fish) requires salt as an essential ingredient. Salt has for a long time in history been utilized as a preservative [6]. Boiling in a high concentration of salt solution prevents the growth of foodborne bacteria, as the scorching-saline liquid destroys bacterial cells by denaturizing the cell wall and draining out the cytoplasmic fluid [6, 73]. As the salt solution penetrates into the fish flesh, it expels the native fishy liquid from the flesh [6]. The application of a high temperature during boiling process also denaturizes the fish proteins and deliberates amino acids such as glutamic acid to produce savory and salty flavors [6, 74].

There are four basic methods in the production of *ikan pindang* (salt-boiled fish) (Fig. 5B, 5C, 5D and 5E). In general, this process involves the utilization of salt in both coarse crystal and solution (brine) forms. In the *paso* and *Bawean* methods, coarse salt is spread on every layer of fish and mixed thoroughly (Fig. 5C and 5E). In the *Muncar* method, the fish is soaked in the brine solution for several hours (Fig. 5B). Afterwards, the fish is boiled in clay pottery (*paso* in Sundanese or *kendil* in Javanese) in the *paso* and *Bawean* methods (Fig. 5C and 5E). Fish can also be boiled in brine along with their bamboo-based traditional containers (*naya* in Sundanese or *loko* in Javanese), as conducted in the *cue* method (Fig. 5D). On the other hand, fish is steamed rather

than boiled in the *Muncar* method, a production method of salt-boiled fish which is native to Muncar district, Banyuwangi regency, East Java (Fig. 5B). Lastly, fish is drained out and packed prior to being delivered to the market [6].

The proper post-production management is required to control the product quality during delivery to the market. As aforementioned, the *pindang* boiling process also produces moisture with an undesired fishy odor on the fish surface (containing amino acids, sugars, and fatty acids), which can promote the growth of foodborne bacteria [75]. In general, the shelf life of salt-boiled fish is about 3 - 14 days [6]. Thus, additional processes are required to prolong the shelf life of the product such as smoking, pickling, and drying. Salt-boiled fish can also be smoked after boiling to drain out the rest of its moisture, as in the *Bawean* method developed over centuries in the Bawean islands of East Java (Fig. 5C). This process can elongate the shelf life of the product by up to 3 months, after which fermentation and aging occur during storage [6]. On the one hand, the combination of salt and phenolic compounds reduces the growth of foodborne bacteria. On the other hand, the combination enables the growth of lactic acid bacteria (probiotics), as in smoked-fermented sausages [76]. Another example is the *Acehnese* specialty, *keumamah*, in which salt-boiled fish is desiccated under sunlight after the boiling process. Hence, the dried fish can be stored for several years. This preserved food was part of the vital military supplies for the soldiers of *Aceh* sultanate during the *Aceh* war (1873–1913) [38].

However, the additional processes still have their drawbacks. The texture of salt-boiled fish becomes increasingly harder as a result of a smoking or drying process, either of which significantly decreases moisture content [6]. The texture of *keumamah*, for instance, resembles a piece of wood, hence it is popularly known as the “wood fish” [38]. The woody texture resembles those of *jamon iberico* (Spanish dried-fermented pork) and *katsuobushi* (Japanese dried-fermented

fish), both of which require some effort to slice [77, 78]. A smoking process can also potentially increase the risk of cancer, as the method produces a high concentration of polycyclic aromatic hydrocarbons (PAHs) [78].

To overcome these problems, several recommendations are proposed in this article. For example, liquid smoke can be utilized in the preservation of salt-boiled fish [79]. Nevertheless, the concentration of the smoke should be carefully considered, since it still contains carcinogenic substances akin to the smoking method [78, 79]. Lactic acid-based fermentation (pickling) can potentially be an interesting alternative for the post-production of *ikan pindang*, since probiotic bacteria produces lactic acid that can inhibit the growth of food degrading bacteria [80, 81]. Lactic acid bacteria can also decrease undesired aroma, since the bacteria can metabolize amino acids, sugars, and fatty acids for the growth [82]. Although pickling exhibits several merits in terms of food preservation, the acidic condition during the fermentation process can affect the taste of the product. Hence, bacteria growth and lactic acid production should be controlled [81]. In order to maintain the moisture of *ikan pindang* during the pickling process, it is necessary to incorporate a particular chemical substance that can seal in the moisture (salt solution). The addition of tannin can chemically coagulate proteins on the fish surface, thereby locking moisture in the salt-boiled fish, much like in the traditional preparation of *telur pindang* [5, 29]. This preparation creates a chewy texture on chicken eggs. Furthermore, moisture locking can also prevent the absorption of lactic acid into salt-boiled fish during the pickling process [29].

Processing Version of *Ikan Pindang*

Table 1 elaborates various dishes made from salt-boiled fish across several Indonesian regions, ranging from curries to *sambal*-based (chili sauce) dishes. In this section, we describe the preparation of *sambel pindang kemangi*, a delicacy from East Java (Fig. 5F). Notably, the majority of processed salt-boiled fish are *sambal*-based dishes. The process commences with the main ingredient, either *ikan cakalang pindang* (salt-boiled skipjack tuna) or *ikan tongkol pindang* (salt-boiled mackerel tuna), being finely shredded into pieces. Meanwhile, portions of garlic, shallot, chili pepper, shrimp paste, salt, sugar, and cooking oil are finely ground into a spice blend prior to being stir-fried with shredded salt-boiled fish. Lemon basil is also incorporated into the mixture during cooking (stir-frying), following which the *sambel pindang kemangi* is ready to be served [51].

Conclusion

In summary, *pindang* is an Indonesian delicacy and a national heritage which has developed over centuries, influenced by history, culture, natural resource, philosophy, and cooking techniques. In general, *pindang* is widely recognized in two forms: as a spicy and sour fish stew and a preserved food. Historically, *pindang* was initially developed and introduced as the stew. Subsequently, the dish was expanded to be a preservation method. *Pindang* (80 dishes) is widely distributed across 16 provinces, categorized as stew (45 dishes), salt-boiled fish (11 dishes), and processing versions of salt-boiled fish (24 dishes) primarily concentrated in South Sumatra (23 dishes). The creation of *pindang* stew involves main ingredients such as fishes, aquatic animals,

livestock products, and vegetables as well as various spices, herbs, and souring agents. On the other hand, the preparation of *pindang* salt-boiled fish is based on different processing methods which involve the use of salt. Salt-boiled fish (*ikan pindang*) can be further cooked and served as numerous new dishes, most of which are *sambal*-based.

Acknowledgements

Author would like to thanks to Pempek Mang Piri (a South Sumatra restaurant) and some *pindang* salt-boiled fish small-scale home industries in Kendal, Central Java, Indonesia which become an inspiration for the manuscript writing.

Author contributions

IP designed the study, collected some literatures, tabulated and analyzed the data and were in charge of the manuscript writing and organizing the references. The author has read and approved the final manuscript before being sent.

Availability of data and materials

The data and material used in this work are available upon request.

Funding

The author received no specific funding for this work.

Declarations

Ethics approval and consent to participate

Not applicable.

Consent for publication

The author has given approval for the publication of this manuscript.

Competing interests

The author declares no competing interests.

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Table 1. The Indonesian *pindang* dishes based on their origin, type of dishes, and ingredients.

No	Name of Dishes	English Version of Dishes	Regions of Origin	Type of Dishes			Main Ingredients	Spices, Herbs and Other Ingredients	References
				Stew	Preserved-Fish	Processed Preserved-Fish			
1	Keumamah	Sun-Dried Salt-Boiled Fish	Aceh		√		Mackerel Tuna (*Euthynnus affinis*), Skipjack Tuna (*Katsuwonus pelamis*)	Salt	[38]
2	Pindang Balado	Salt-Boiled Fish Stir-Fried in Chili Sauce	West Sumatra			√	Mackerel Tuna (Euthynnus affinis)	Garlic, shallot, chili pepper, shrimp paste, salt, sugar, cooking oil.	[39]
3	Pindang Gurame Kuning	Spicy Gourami Fish (Osphronemus gouramy) Stew Spiced with turmeric	South Sumatra	√			Gourami Fish (*Osphronemus gouramy*)	Garlic, shallot, galangal, turmeric, ginger, green tomato, chili pepper, tamarind, salt, cooking oil.	[5]
4	Pindang Ikan Bunga Kecombrang	Fish Stew Spiced with *Kecombrang* (*Etlingera elatior*)	South Sumatra	√			Wahoo (*Acanthocybium solandri*)	Garlic, shallot, *belimbing wuluh* (*Averrhoa bilimbi*), *kecombrang* (*Etlingera elatior*), turmeric, ginger, galangal, chili pepper, soy sauce, salt, cooking oil.	[48]
5	Pindang Gabus	Spicy and Sour Snakehead Fish (*Channa striata)* Stew	South Sumatra	√			Snakehead Fish (*Channa striata*)	Garlic, shallot, galangal, citrus leaf, candlenut, chili pepper, ginger, turmeric, lemongrass, pineapple, tomato, salt, cooking oil.	[5]
6	Pindang Telur Gabus	Spicy and Sour Snakehead Fish Roe Stew	South Sumatra	√			Snakehead Fish (*Channa striata*) Roe	Garlic, shallot, galangal, citrus leaf, candlenut, chili pepper, ginger, turmeric, lemongrass, pineapple, tomato, salt, cooking oil.	[5]
7	Pindang Kakap	Spicy and Sour Red Snapper (*Lutjanus argentimaculatus)* Stew	South Sumatra	√			Red Snapper (*Lutjanus argentimaculatus*)	Garlic, shallot, galangal, turmeric, ginger, tamarind, tomato, citrus leaf, chili pepper, salt,cooking oil.	[41]
8	Pindang Kerang	Spicy and Sour Blood Cockle (*Anadara granosa)* Stew	South Sumatra	√			Blood Cockle (*Anadara granosa*)	Garlic, shallot, galangal, turmeric, ginger, tamarind, bay leaf, lime, tomato, citrus leaf, chili pepper, salt, cooking oil.	[5]
9	Pindang Kerupuk	Spicy and Sour Fish Cracker Stew	South Sumatra	√			Fish Cracker	Garlic, shallot, chili pepper, galangal, lime, tomato, bay leaf, turmeric, ginger, shrimp paste, lemongrass, pineapple, salt, cooking oil.	[44]
10	Pindang Meranjat	Spicy and Sour Smoked Fish Stew	South Sumatra	√			Glass Catfish [Kryptopterus bicirrhis], Shark Catfish [Pangasius bocourti]	Garlic, shallot, chili pepper, galangal, tamarind, turmeric, ginger, shrimp paste, bay leaf, lemongrass, pineapple, salt, cooking oil.	[45]

Table 1. The Indonesian *pindang* dishes based on their origin, type of dishes, and ingredients (continued).

No	Name of Dishes	English Version of Dishes	Regions of Origin	Type of Dishes			Main Ingredients	Spices, Herbs and Other Ingredients	References
				Stew	Preserved-Fish	Processed Preserved-Fish			
11	Pindang Musi Rawas	Musi Rawas-Styled Spicy and Sour Fish Stew	South Sumatra	√			Nile Talapia (*Oreochromis niloticus*)	Garlic, shallot, chili pepper, tamarind, turmeric, ginger, shrimp paste, bay leaf, lemongrass, tomato, salt, cooking oil.	[53]
12	Pindang Patin	Spicy and Sour Shark Catfish (*Pangasius bocourti)* Stew	South Sumatra, West Kalimantan	√			Shark Catfish (Pangasius bocourti)	Garlic, shallot, chili pepper, shrimp paste, lime, citrus leaf, turmeric, ginger, lemon basil, bay leaf, lemongrass, tomato, pineapple, salt, cooking oil.	[7]
13	Pindang Sekayu	Sekayu-Styled Sweet Fish Stew	South Sumatra	√			*Baung* Fish (*Hemibagrus nemurus*)	Garlic, shallot, chili pepper, tamarind, turmeric, ginger, sugar, bay leaf, lemongrass, pineapple, palm sugar, salt, cooking oil.	[54]
14	Pindang Udang	Spicy and Sour Shrimp Stew	South Sumatra	√			Shrimp (*Penaeus monodon*)	Garlic, shallot, chili pepper, tamarind, turmeric, ginger, sugar, bay leaf, lemongrass, tomato, salt, cooking oil.	[5]
15	Pindang Ceker	Spicy and Sour Chicken Feet Stew	South Sumatra	√			Chicken Feet	Garlic, shallot, chili pepper, turmeric, ginger, galangal, bay leaf, lemongrass, *rambai* fruit (*Baccaurea motleyana*), salt, cooking oil.	[55]
16	Pindang Hati Ayam	Spicy and Sour Chicken Liver Stew	South Sumatra	√			Chicken Liver	Garlic, shallot, chili pepper, turmeric, ginger, galangal, bay leaf, lemongrass, *tomato*, salt, cooking oil.	[56]
17	Pindang Asam Kambing	Spicy and Sour Mutton Stew	South Sumatra	√			Mutton	Garlic, shallot, chili pepper, tamarind, soy sauce, bay leaf, lemongrass, salt, cooking oil.	[5]
18	Pindang Tulang	Spicy Cattle Bone Stew	South Sumatra	√			Cattle Bone	Garlic, shallot, chili pepper, galangal, tamarind, turmeric, ginger, bay leaf, lemongrass, sugar, salt, cooking oil.	[8]
19	Pindang Kacang Panjang	Spicy and Sour Asparagus Bean (*Vigna unguiculata)* Stew	South Sumatra	√			Asparagus Bean (*Vigna unguiculata*)	Garlic, shallot, chili pepper, galangal, tamarind, turmeric, ginger, bay leaf, lemongrass, tomato, sugar, salt, cooking oil.	[57]
20	Pindang Pegagan	Pegagan-Styled Spicy and Sour *Fish* Stew	South Sumatra	√			*Baung* Fish (*Hemibagrus nemurus*), Snakehead Fish (*Channa striata*), Shark Catfish (*Pangasius bocourti*), Helicopter Catfish (*Wallagonia leerii*)	Garlic, shallot, chili pepper, tamarind, shrimp paste, bay leaf, lemongrass, tomato, salt, cooking oil.	[58]

Table 1. The Indonesian *pindang* dishes based on their origin, type of dishes, and ingredients (continued).

No	Name of Dishes	English Version of Dishes	Regions of Origin	Type of Dishes			Main Ingredients	Spices, Herbs and Other Ingredients	References
				Stew	Preserved-Fish	Processed Preserved-Fish			
21	Pindang Ikan Kembung	Spicy and Sour Indian Mackerel (*Rastrelliger kanagurta)* Stew	South Sumatra, Bangka-Belitung, West Kalimantan	√			Indian Mackerel (*Rastrelliger kanagurta*)	Garlic, shallot, chili pepper, tamarind, turmeric, ginger, bay leaf, lemongrass, tomato, lime, sugar, salt, cooking oil.	[59]
22	Pindang Tenggiri	Spicy and Sour Wahoo (*Acanthocybium solandri)* Stew	South Sumatra, Bangka-Belitung	√			Wahoo (*Acanthocybium solandri*)	Garlic, shallot, chili pepper, galangal, tamarind, turmeric, ginger, bay leaf, citrus leaf, lemongrass, belimbing wuluh (Averrhoa bilimbi), sugar, salt, cooking oil.	[5]
23	Pindang Belida	Spicy and Sour Featherback Knifefish (*Chitala ornata)* Stew	South Sumatra	√			Featherback Knifefish (*Chitala ornata*)	Garlic, shallot, chili pepper, galangal, tamarind, bay leaf, lemon basil, lemongrass, pineapple, sugar, salt, cooking oil.	[14]
24	Pindang Ayam	Spicy and Sour Chicken Stew	South Sumatra	√			Chicken	Garlic, shallot, chili pepper, turmeric, ginger, galangal, bay leaf, lemongrass, tomato, salt, cooking oil.	[5]
25	Pindang Buntut Sapi	Spicy and Sour Oxtail Stew	South Sumatra	√			Oxtail	Garlic, shallot, chili pepper, *belimbing wuluh* (*Averrhoa bilimbi*) , soy sauce, bay leaf, lemongrass, salt, cooking oil.	[7]
26	Pindang Kerapu	Spicy and Sour Brown-Marbled Grouper (*Epinephelus fuscoguttatus)* Stew	Bengkulu	√			Brown-Marbled Grouper (*Epinephelus fuscoguttatus*)	Garlic, shallot, chili pepper, galangal, yellow mangosteen (Garcinia xanthochymus), turmeric, ginger, bay leaf, citrus leaf, lemon basil, lemongrass, pineapple, sugar, salt, cooking oil.	[46]
27	Pindang Tongkol	Spicy and Sour Mackerel Tuna (*Euthynnus affinis)* Stew	Bangka-Belitung	√			Mackerel Tuna (*Euthynnus affinis*)	Garlic, shallot, chili pepper, galangal, tamarind, turmeric, ginger, bay leaf, lime, citrus leaf, lemon basil, lemongrass, sugar, salt, cooking oil.	[5]
28	Pindang Cumi-Cumi	Spicy and Sour Squid Stew	Bangka-Belitung	√			Squid	Garlic, shallot, chili pepper, galangal, tamarind, turmeric, ginger, bay leaf, lemongrass, pineapple, sugar, salt, cooking oil.	[5]
29	Pindang Bangka	Bangka Styled Spicy and Sour Fish Stew	Bangka-Belitung	√			Blue Butterfish (*Stromateus fiatola*)	Garlic, shallot, chili pepper, galangal, tamarind, turmeric, ginger, bay leaf, lemongrass, sugar, salt, cooking oil.	[60]
30	Pindang Baung	Spicy and Sour *Baung* Fish (*Hemibagrus nemurus)* Stew	Lampung	√			*Baung* Fish (*Hemibagrus nemurus*)	Garlic, shallot, chili pepper, galangal, *belimbing wuluh* (*Averrhoa bilimbi*), turmeric, ginger, bay leaf, lemon basil, lemongrass, *rambai* fruit (*Baccaurea motleyana*), sugar, salt, cooking oil.	[40]

Table 1. The Indonesian *pindang* dishes based on their origin, type of dishes, and ingredients (continued).

No	Name of Dishes	English Version of Dishes	Regions of Origin	Type of Dishes			Main Ingredients	Spices, Herbs and Other Ingredients	References
				Stew	Preserved-Fish	Processed Preserved-Fish			
31	Pindang Lampung	Lampung-Styled Spicy and Sour Fish Stew	Lampung	√			*Baung* Fish (*Hemibagrus nemurus*), Shark Catfish (*Pangasius bocourti*), Snakehead Fish (*Channa striata*)	Garlic, shallot, chili pepper, galangal, tamarind, turmeric, ginger, bay leaf, citrus leaf, lemon basil, lemongrass, tomato, sugar, salt, cooking oil.	[61]
32	Pindang Bandeng	Spicy and Sour Milkfish (*Chanos chanos)* Stew	Jakarta, Central Java	√			Milkfish (*Chanos chanos*)	Garlic, shallot, chili pepper, galangal, tamarind, turmeric, bay leaf, citrus leaf, tomato, palm sugar, soy sauce, stinky bean, salt, cooking oil.	[5]
33	Pindang Serani	Portuguese-Indonesian Version of Spicy Milkfish Stew	Jakarta	√			Milkfish (*Chanos chanos*)	Garlic, shallot, chili pepper, turmeric, bay leaf, citrus leaf, lemongrass, tomato, sugar, salt, cooking oil.	[7]
34	Pindang Gunung	Sundanese-Styled Spicy and Sour Fish Stew	West Java	√			Red Snapper (*Lutjanus argentimaculatus*), Blue Butterfish (*Stromateus fiatola*), Mackerel Tuna (*Euthynnus affinis*)	Garlic, shallot, shrimp paste, *kecombrang* (*Etlingera elatior*), turmeric, june plum leaf (*Spondias dulcis*), chili pepper, tamarind, salt, cooking oil.	[49]
35	Pindang Kepala Manyung	Spicy Marine Catfish Head (*Arius venosus)* Stew	West Java, Central Java	√			Marine Catfish (*Arius venosus*)	Garlic, shallot, chili pepper, galangal, turmeric, ginger, tamarind, bay leaf, citrus leaf, lemon basil, lemongrass, tomato, palm sugar, salt, cooking oil.	[62]
36	Pais Pindang	Spicy Salt-Boiled Fish Steamed in Banana Leaf Wrappings	West Java			√	Mackerel Tuna (*Euthynnus affinis*), Skipjack Tuna (*Katsuwonus pelamis*)	Garlic, shallot, chili pepper, shrimp paste, galangal, ginger, lemongrass, bay leaf, salt, sugar, lemon basil, cooking oil.	[63]
37	Kecap Cicue	Soy Sauce with Mashed Salt-Boiled Fish	West Java			√	Mackerel Tuna (*Euthynnus affinis*), Skipjack Tuna (*Katsuwonus pelamis*)	Soybean, palm sugar, salt, star anise.	[64]
38	Ikan Pindang Cue	Brine-Boiled Fish	West Java		√		Mackerel Tuna (*Euthynnus affinis*), Skipjack Tuna (*Katsuwonus pelamis*)	Salt	[6]
39	Pindang Mujaer	Spicy and Sour Redbelly Talapia (*Coptodon zillii)* Stew	West Java	√			Redbelly Talapia (*Coptodon zillii*)	Garlic, shallot, chili pepper, black pepper, coriander, tomato, ginger, tamarind, bay leaf, citrus leaf, lemongrass, candlenut, salt, cooking oil.	[5]
40	Telur Pindang	Javanese-Styled Marbled Egg	Central Java		√		Chicken Egg	Salt, teak leaf (*Tectona grandis*)	[5]

Table 1. The Indonesian *pindang* dishes based on their origin, type of dishes, and ingredients (continued).

No	Name of Dishes	English Version of Dishes	Regions of Origin	Type of Dishes			Main Ingredients	Spices, Herbs and Other Ingredients	References
				Stew	Preserved-Fish	Processed Preserved-Fish			
41	Telur Bebek Pindang	Javanese-Styled Marbled Duck Egg	Central Java		√		Duck Egg	Salt, teak leaf (*Tectona grandis*)	[7]
42	Pindang Kudus	Bufallo Meat Stew	Central Java	√			Bufallo Meat	Garlic, shallot, chili pepper, shrimp paste, *keluak* (*Pangium edule*), soy sauce, coriander, galangal, *Gnetum gnemon* leaf, bay leaf, tamarind, coconut milk, cooking oil, salt.	[9]
43	Pindang Kambing	Mutton Stew	Central Java	√			Mutton	Garlic, shallot, chili pepper, turmeric, ginger, soy sauce, galangal, *lemongrass*, bay leaf, soy sauce, cooking oil, salt.	[5]
44	Pindang Rebung Santan	Coconut Milk-Based Bamboo Shoot Stew	Central Java	√			Bamboo Shoot	Garlic, shallot, chili pepper, *kencur* (*Kaempferia galanga*), black pepper, galangal, bay leaf, coconut milk, cooking oil, salt, sugar.	[10]
45	Pindang Tetelan	Cattle Tendon Stew	Central Java	√			Cattle Tendon	Garlic, shallot, candlenut, black pepper, chili pepper, shrimp paste, *keluak* (*Pangium edule*), coriander, galangal, *lemongrass*, bay leaf, citrus leaf, palm sugar, cooking oil, salt.	[5]
46	Bothok Pindang	Spicy Grated Coconut Flesh and Salt-Boiled Fish Steamed in Banana Leaf Wrappings	Central Java			√	Mackerel Tuna (*Euthynnus affinis*), Skipjack Tuna (*Katsuwonus pelamis*)	Garlic, shallot, chili pepper, shrimp paste, galangal, ginger, lemongrass, bay leaf, salt, sugar, lemon basil, cooking oil, shredded coconut flesh.	[9]
47	Pindang Lombok Ijo	Salt-Boiled Fish Stir-Fried in Green Chili Sauce	Central Java			√	Mackerel Tuna (*Euthynnus affinis*), Skipjack Tuna (*Katsuwonus pelamis*)	Garlic, shallot, green chili pepper, salt, sugar, cooking oil.	[51]
48	Tumis Ikan Pindang	Stir-Fried Salt-Boiled Fish	Central Java, East Java			√	Mackerel Tuna (*Euthynnus affinis*), Skipjack Tuna (*Katsuwonus pelamis*)	Garlic, shallot, chili pepper, salt, sugar, tomato, cooking oil.	[36]
49	Mangut Pindang	Spicy Salt-Boiled Fish Curry	Central Java			√	Mackerel Tuna (*Euthynnus affinis*), Skipjack Tuna (*Katsuwonus pelamis*)	Garlic, shallot, chili pepper, turmeric, galangal, salt, lemongrass, ginger, coconut milk, cooking oil.	[65]
50	Lodeh Pindang	Salt-Boiled Fish Curry	Central Java			√	Mackerel Tuna (*Euthynnus affinis*), Skipjack Tuna (*Katsuwonus pelamis*)	Garlic, shallot, chili pepper, galangal, salt, ginger, coconut milk, cooking oil.	[66]

Table 1. The Indonesian *pindang* dishes based on their origin, type of dishes, and ingredients (continued).

No	Name of Dishes	English Version of Dishes	Regions of Origin	Type of Dishes			Main Ingredients	Spices, Herbs and Other Ingredients	References
				Stew	Preserved-Fish	Processed Preserved-Fish			
51	Ikan Tenggiri Pindang	Salt-Boiled Wahoo (*Acanthocybium solandri)*	Central Java, East Java, Bali		√		Wahoo (*Acanthocybium solandri*)	Salt	[6]
52	Ikan Kembung Pindang	Salt-Boiled Indian Mackerel (*Rastrelliger kanagurta*)	Central Java, East Java, Bali		√		Indian Mackerel (*Rastrelliger kanagurta*)	Salt	[6]
53	Ikan Cakalang Pindang	Salt-Boiled Skipjack Tuna (*Katsuwonus pelamis)*	Central Java, East Java, Bali		√		Skipjack Tuna (*Katsuwonus pelamis*)	Salt	[6]
54	Ikan Tongkol Pindang	Salt-Boiled Mackerel Tuna (*Euthynnus affinis)*	Central Java, East Java, Bali		√		Mackerel Tuna (*Euthynnus affinis*)	Salt	[6]
55	Gudeg Telur Pindang	Javanese-Styled Marbled Egg Served with Sweetened Young Jackfruit	Yogyakarta			√	Chicken Egg	Garlic, shallot, tamarind, soy sauce, palm sugar, salt, palm sugar, galangal, bay leaf, cooking oil.	[30]
56	Pindang Bumbu Rujak	Salt-Boiled Fish Cooked in Fruty and Spicy Dressing	East Java			√	Mackerel Tuna (*Euthynnus affinis*), Skipjack Tuna (*Katsuwonus pelamis*)	Garlic, shallot, chili pepper, salt, sugar, palm sugar, shrimp paste, tamarind, cooking oil.	[47]
57	Sambel Pindang Kemangi	Salt-Boiled Fish Stir-Fried in Lemon Basil and Chili Sauce	East Java			√	Mackerel Tuna (*Euthynnus affinis*), Skipjack Tuna (*Katsuwonus pelamis*)	Garlic, shallot, chili pepper, shrimp paste, salt, sugar, lemon basil, cooking oil.	[51]
58	Pindang Sambel Pencit	Salt-Boiled Fish Stir-Fried in Young Mango and Chili Sauce	East Java			√	Mackerel Tuna (*Euthynnus affinis*), Skipjack Tuna (*Katsuwonus pelamis*)	Garlic, shallot, chili pepper, shrimp paste, shredded young mango flesh, salt, sugar, cooking oil.	[51]
59	Sambal Pindang Suwir	Shredded Fried Salt-Boiled Fish Served with Chili Sauce	East Java			√	Mackerel Tuna (*Euthynnus affinis*), Skipjack Tuna (*Katsuwonus pelamis*)	Garlic, shallot, chili pepper, shrimp paste, salt, sugar, cooking oil.	[67]
60	Pindang Tongkol Suwir Kemangi	Shredded Salt-Boiled Mackerel Tuna Stir-Fried with Lemon Basil	East Java			√	Mackerel Tuna (*Euthynnus affinis*)	Garlic, shallot, chili pepper, lemon basil, cooking oil.	[37]

Table 1. The Indonesian *pindang* dishes based on their origin, type of dishes, and ingredients (continued).

No	Name of Dishes	English Version of Dishes	Regions of Origin	Type of Dishes			Main Ingredients	Spices, Herbs and Other Ingredients	References
				Stew	Preserved-Fish	Processed Preserved-Fish			
61	Pindang Masak Santan	Salt-Boiled Fish Cooked in Coconut Milk Broth	East Java			√	Mackerel Tuna (*Euthynnus affinis*), Skipjack Tuna (*Katsuwonus pelamis*)	Garlic, shallot, chili pepper, salt, turmeric, galangal, coconut milk, cooking oil.	[37]
62	Geseng Ikan Pindang	Salt-Boiled Fish Stir-Fried with Chopped Chili Pepper	East Java			√	Mackerel Tuna (*Euthynnus affinis*), Skipjack Tuna (*Katsuwonus pelamis*)	Garlic, shallot, chili pepper, shrimp paste, salt, sugar, cooking oil.	[57]
63	Kotokan Pindang	Salt-Boiled Fish Cooked in Spicy Coconut Milk Broth	East Java			√	Mackerel Tuna (*Euthynnus affinis*), Skipjack Tuna (*Katsuwonus pelamis*)	Garlic, shallot, chili pepper, turmeric, shrimp paste, galangal, salt, lemongrass, ginger, coconut milk, belimbing wuluh (*Averrhoa bilimbi*), cooking oil.	[57]
64	Pindang Gendam	Spicy Indian Mackerel (*Rastrelliger kanagurta*) Stew	East Java	√			Indian Mackerel (*Rastrelliger kanagurta*)	Garlic, shallot, chili pepper, *wadung* (*Garcinia tetranda)*, galangal, bay leaf, citrus leaf, lemongrass, salt, cooking oil.	[50]
65	Pindang Koyong	Javanese-styled Sour and Spicy Wahoo (*Acanthocybium solandri*) Stew	East Java	√			Wahoo (*Acanthocybium solandri*)	Garlic, shallot, *belimbing wuluh* (*Averrhoa bilimbi*), *coriander*, turmeric, ginger, galangal, lemongrass, citrus leaf, chili pepper, black pepper, salt, cooking oil.	[68]
66	Pindang Asem Probolinggo	Madurese-Styled Spicy and Sour Fish Stew	East Java	√			Mackerel Tuna (*Euthynnus affinis*), Skipjack Tuna (*Katsuwonus pelamis*)	Garlic, shallot, *belimbing wuluh* (*Averrhoa bilimbi*), *coriander*, turmeric, ginger, galangal, lemongrass, citrus leaf, chili pepper, black pepper, salt, cooking oil.	[69]
67	Ikan Pindang Asap Bawean	Smoked Salt-Boiled Mackerel Tuna (*Euthynnus affinis)*	East Java		√		Mackerel Tuna (*Euthynnus affinis*), Skipjack Tuna (*Katsuwonus pelamis*)	Salt	[6]
68	Ikan Pindang Kukus Muncar	Steamed Salt-Boiled Mackerel Tuna (*Euthynnus affinis)*	East Java		√		Mackerel Tuna (*Euthynnus affinis*), Skipjack Tuna (*Katsuwonus pelamis*)	Salt	[6]
69	Rujak Kuah Pindang	Balinese-Styled Fruit Salad	Bali			√	Fruits, fish broth.	Garlic, shallot, salt, sugar, shrimp paste, chili pepper, citrus leaf, lemongrass, cooking oil.	[27]
70	Pindang Kesuna Cekuh	Salt-Boiled Fish Stir-Fried with Garlic and *Kencur* (*Kaempferia galanga)*	Bali			√	Mackerel Tuna (*Euthynnus affinis*), Skipjack Tuna (*Katsuwonus pelamis*)	Garlic, shallot, chili pepper, shrimp paste, salt, sugar, *kencu*r (*Kaempferia galanga*), cooking oil.	[52]

Table 1. The Indonesian *pindang* dishes based on their origin, type of dishes, and ingredients (continued).

No	Name of Dishes	English Version of Dishes	Regions of Origin	Type of Dishes			Main Ingredients	Spices, Herbs and Other Ingredients	References
				Stew	Preserved-Fish	Processed Preserved-Fish			
71	Pindang Sambal Embe	Salt-Boiled Fish Served with Chopped Chili Pepper and Cooking Oil	Bali			√	Mackerel Tuna (*Euthynnus affinis*), Skipjack Tuna (*Katsuwonus pelamis*)	Garlic, shallot, chili pepper, lime, salt, sugar, cooking oil.	[51]
72	Ikan Tuna Pindang	Salt-Boiled Tuna *(Thunnus albacares)*	Bali		√		Tuna (*Thunnus albacares*)	Salt	[6]
73	Pindang Nangka	Spicy and Sour Young Jackfruit	West Nusa Tenggara	√			Jackfruit	Garlic, shallot, chili pepper, black pepper, candlenut, turmeric, coriander, galangal, citrus leaf, bay leaf, lemongrass, coconut milk, cooking oil, sugar, salt.	[70]
74	Pindang Ikan Tuna Kunyit Mai	Tuna (Thunnus albacares) Stewed in turmeric-Based Broth	East Nusa Tenggara	√			Tuna (*Thunnus albacares*)	Garlic, shallot, chili pepper, candlenut, turmeric, coriander, bay leaf, lemongrass, cooking oil, sugar, salt.	[71]
75	Pampis Pindang	Spicy Shredded and Chopped Salt-Boiled Skipjack Tuna	North Sulawesi			√	Mackerel Tuna (*Euthynnus affinis*), Skipjack Tuna (*Katsuwonus pelamis*)	Garlic, shallot, chili pepper, shrimp paste, galangal, lemongrass, salt, sugar, lemon basil, cooking oil.	[67]
76	Pindang Lele	Spicy and Sour Catfish (*Clarias anguillaris*) Stew	Ubiquitous	√			Catfish (*Clarias anguillaris*)	Garlic, shallot, chili pepper, candlenut, *belimbing wuluh* (*Averrhoa bilimbi*), turmeric, coriander, galangal, ginger, citrus leaf, bay leaf, lemongrass, coconut milk, cooking oil, sugar, salt.	[36]
77	Pindang Bumbu Tomat	Salt-Boiled Fish Stir-Fried in Tomato Sauce	Ubiquitous			√	Mackerel Tuna (*Euthynnus affinis*), Skipjack Tuna (*Katsuwonus pelamis*)	Garlic, shallot, chili pepper, tomato, salt, sugar, cooking oil.	[57]
78	Ikan Pindang Goreng	Fried Salt-Boiled Fish	Ubiquitous			√	Mackerel Tuna (*Euthynnus affinis*), Skipjack Tuna (*Katsuwonus pelamis*)	Cooking oil.	[6]
79	Ikan Pindang Bakar	Grilled Salt-Boiled Fish	Ubiquitous			√	Mackerel Tuna (*Euthynnus affinis*), Skipjack Tuna (*Katsuwonus pelamis*)	Garlic, shallot, soy sauce, sugar, salt.	[72]
80	Pindang Bandeng Kecap	Milkfish Stewed in Soy Sauce	Indonesian Chinatowns	√			Milkfish (*Chanos chanos*)	Garlic, shallot, chili pepper, sesame oil, turmeric, bay leaf, citrus leaf, tomato, palm sugar, oyster sauce, fish sauce, soy sauce, stinky bean, salt, cooking oil.	[7]

Fig. 1. *pindang patin* (spicy and sour shark catfish [*Pangasius bocourti*] stew) from South Sumatra and West Kalimantan (A); *pindang tongkol* (sour and spicy mackerel tuna [*Euthynnus affinis*] stew) from Bangka-Belitung (B); *ikan cakalang pindang* (salt-boiled skipjack tuna [*Katsuwonus pelamis*]) from Central Java, East Java, and Bali (C); *ikan tongkol pindang* (salt-boiled mackerel tuna [*Euthynnus affinis*]) from Central Java, East Java, and Bali (D); *ikan tuna pindang* (salt-boiled tuna) from Bali (E); *rujak kuah pindang* (Balinese-styled fruit salad) from Bali (F); *telur pindang* (Javanese-styled marbled egg) from Central Java (G); *pindang kudus* (buffalo meat stew) from Central Java (H); *pindang tetelan* (cattle tendon stew) from Central Java (I); *pindang serani* (Portuguese-Indonesian version of spicy milkfish stew) from Kampung Tugu Jakarta (J); *pindang bandeng kecap* (milkfish stewed in soy sauce) from Indonesia's Chinatowns (K); *pindang telur gabus* (spicy and sour snakehead fish roe [*Channa striata*] stew) from South Sumatra (L); *pindang kerang* (spicy and sour blood cockle [*Anadara granosa*] stew) from South Sumatra (M); *pindang tongkol suwir kemangi* (shredded salt-boiled mackerel tuna [*Euthynnus affinis*] stir-fried with lemon basil) from East Java (N); *pindang gendam* (spicy Indian mackerel [*Rastrelliger kanagurta*] stew) from East Java (O); and *pindang kesuna cekuh* (salt-boiled fish, stir-fried with garlic and *kencur* [*Kaempferia galanga*]) from Bali (P).

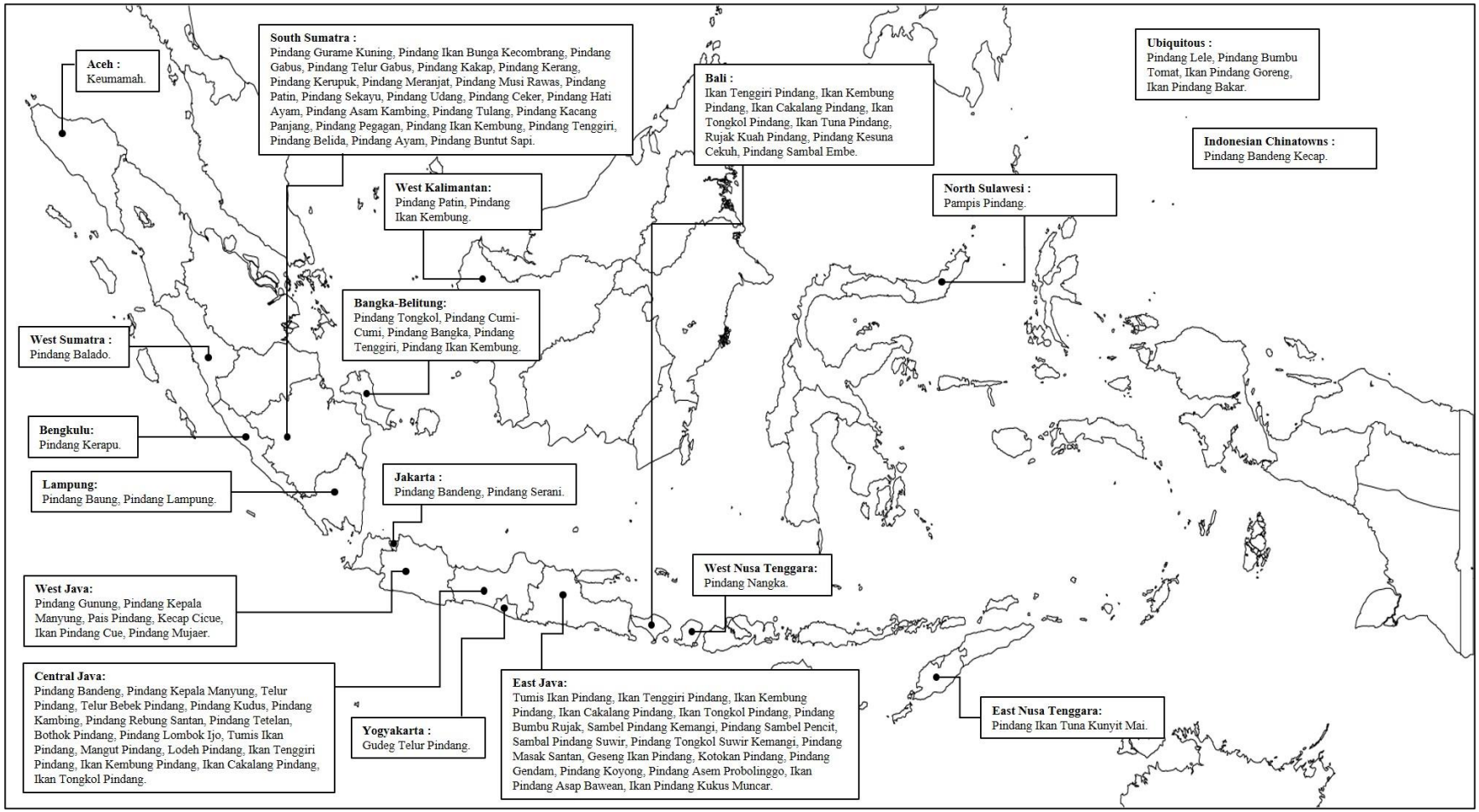

Fig. 2. The geographical distribution of Indonesian *pindang* dishes.

Fig. 3. gourami fish (*Osphronemus gouramy*) (A); snakehead fish (*Channa striata*) (B); *baung* fish (*Hemibagrus nemurus*) (C); featherback knifefish (*Chitala ornata*) (D); shark catfish (*Pangasius bocourti*) (E); red snapper (*Lutjanus argentimaculatus*) (F); blood cockle (*Anadara granosa*) (G); shrimp (*Penaeus monodon*) (H); buffalo meat (I); offal (J); mutton (K); poultry eggs (L); mackerel tuna (*Euthynnus affinis*) (M); skipjack tuna (*Katsuwonus pelamis*) (N); and wahoo (*Acanthocybium solandri*) (O).

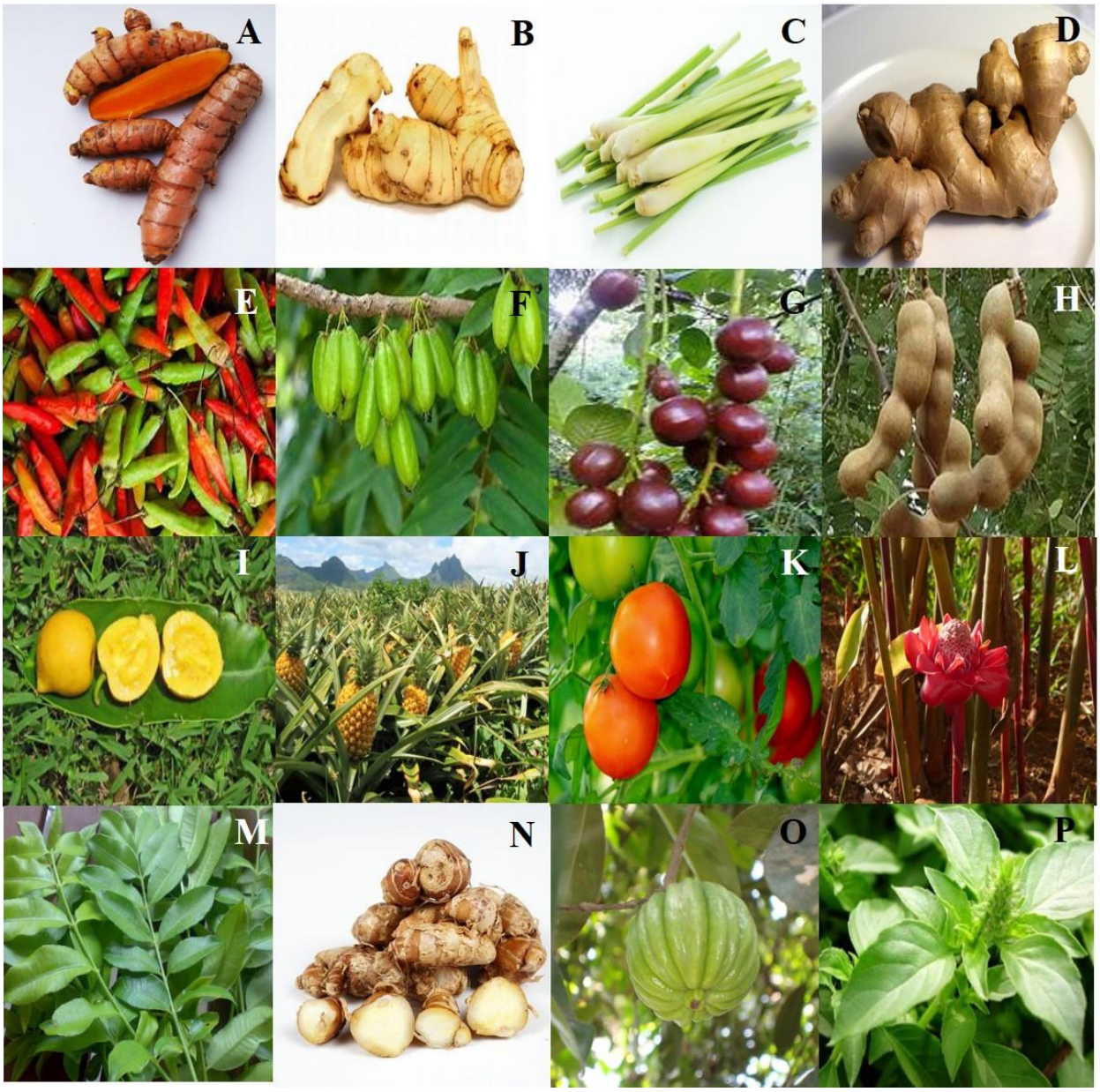

Fig. 4. turmeric (*Curcuma domestica*) (A); galangal (*Alpinia galanga*) (B); lemongrass (*Cymbopogon citratus*) (C); ginger (*Zingiber officinale*) (D); chili pepper (*Capsicum annum*) (E); *belimbing wuluh* (*Averrhoa bilimbi*) (F); *rambai* fruit (*Baccaurea motleyana*) (G); tamarind (*Tamarindus indica*) (H); yellow mangosteen (*Garcinia xanthochymus*) (I); pineapple (*Ananas comosus*) (J); tomato (*Solanum lycopersicum*) (K); *kecombrang* (*Etlingera elatior*) (L); June plum leaf (*Spondias dulcis*) (M); *kencur* (*Kaempferia galanga*) (N); *wadung* (*Garcinia tetranda*) (O) and lemon basil (*Ocimum sanctum*) (P).

Figure 5 Click here to access/download;Figure;Fig. 5.docx

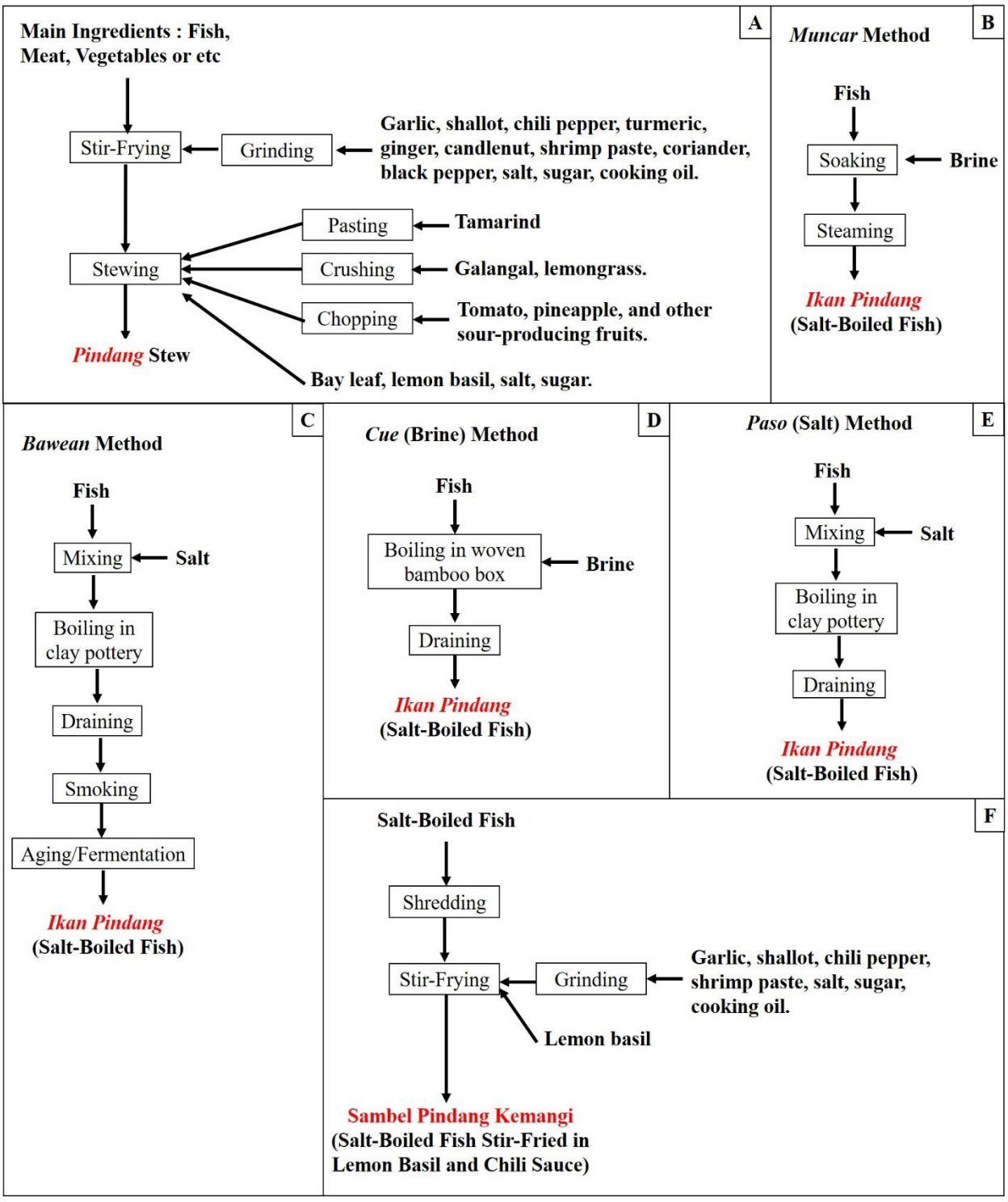

Fig. 5 preparations of *pindang* stew (A); *ikan pindang* (salt-boiled fish) using *Muncar* method (B); using *Bawean* method (C); using *Cue* (brine) method (D); using *Paso* (salt) method (E) and *sambel pindang kemangi* (East Javanese salt-boiled fish, stir-fried in lemon basil and chili sauce) as an instance of salt-boiled fish processing (F).

Cover Letter

The Result of Plagiarism Checking