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Review article

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DIVERSITY OF SAMBAL TYPES IN INDONESIA

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KEY WORDS:

Sambal, food diversity, Indonesia

ABSTRACT

Sambal is a processed chili paste with a spicy taste. The history of sambal begins with the arrival of chili seeds brought by the Portuguese in the 16th century, which was like a cultural renaissance of spicy foods. The methodology used for this research included analysis of food ethnographic literature, origin, function and types of sambal found in relevant articles and book chapters. The results show that the population with the highest consumption of sambal lives on the Sumatra Islands. There are two types of sambal preparation methods, namely slicing and mashing. Some chili sauces can be cooked or eaten raw. Sambal diversity is influenced by several factors, namely resources, geographical factors, history, and culture. Thus, sambal is considered to be an important contributor to food diversity in Indonesia because every local cuisine includes sambal and it is never left behind.

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РАЗНООБРАЗИЕ ТИПОВ САМБАЛА В ИНДОНЕЗИИ

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КЛЮЧЕВЫЕ СЛОВА: АННОТАЦИЯ

самбал, разнообразие пищевых продуктов, Индонезия

Самбал — это переработанная паста из чили с острым вкусом. История самбала начинается с появлением семян чили, ввезенных португальцами в XVI веке, что было подобно культурному ренессансу острой пищи. Исползованной для данного исследования методологией был анализ этнографической литературы по пищевым продуктам, происхождения, функций и типов самбала из релевантных статей и глав книг. Результаты показали, что наиболее высокое потребление самбала было у жителей о. Суматра. Существует два типа методов приготовления самбала, а именно нарезка и растирание. Некоторые соусы чили могут быть термообработаны или потребляться сырыми. На разнообразие самбала влияют несколько факторов, а именно, ресурсы, географические факторы, история и культура. Таким образом, самбал рассматривается как важный фактор, вносящий вклад в разнообразие блюд в Индонезии, т. к. каждая кухня включает самбал и от него никогда не отказываются.

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1. Introduction

Sambal is a popular Indonesian dish. The main ingredient that makes it spicy is chili. Since the introduction of chili into Indonesia from the American continent by the Portuguese and the Spanish during the first colonial period, it has been widely used in Indonesian cuisine [1]. During the Dutch colonial period in Indonesia, a popular book with the title *Kokki Bitja* was first published in 1857. It was compiled by Nonna Cornelia and describes sambal, which is called sambalan in this book [2]. There are other publications about sambal, including poetry. For example, popular verses found in 1669, which are known to be from the poem by Van Overbeeke in Batavia, characterize the spicy taste of sambal [3].

Sambal became popular due to the publication of cookbooks from the 19th century to the beginning of the 20th century. The cookbook conforming to "Pancasila" was finally published in 1967 with the title "Mustika Rasa Resep Masakan Indonesia" for Indonesian sambal [4]. The preparation of *Mustika Rasa* was based on the idea that the main thing was the creation of the national Indonesian cuisine [5]. Some of the chili recipes written with Indonesian old spelling are sambal *bantji*, *belimbing*, *lado hidjau*, *ontjom*, *petjel*, *tempojak* and many more [6].

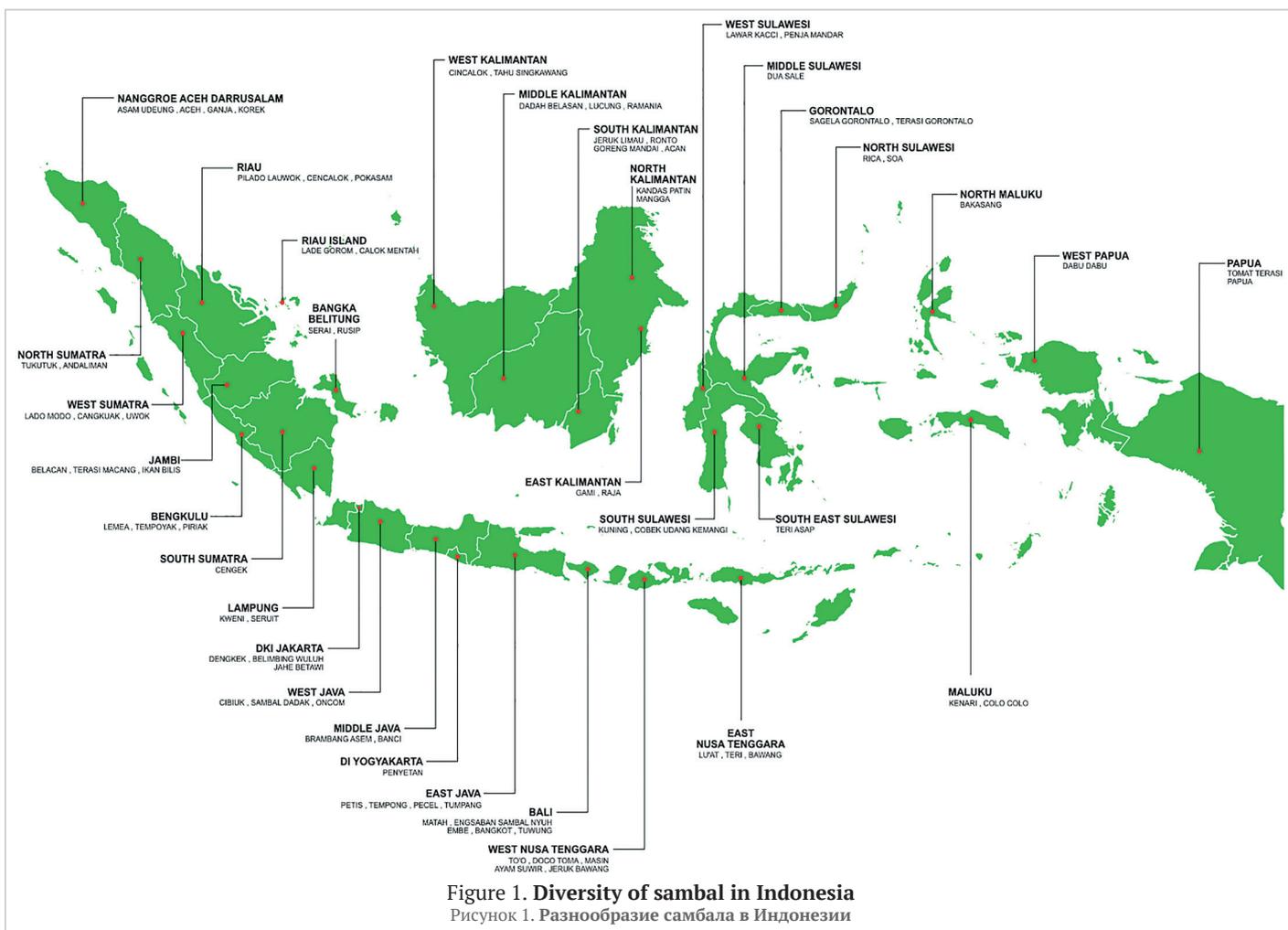
Chili is an important commodity in Indonesia because most households use it to complement everyday dishes. With its increased consumption, the demand for chili has become relatively high as the average Indonesian likes spicy [7,8]. The high consumption of sambal is due to tolerance of people living in hot climates to chili [9]. In every local restaurant in Indonesia, customers are offered bowls with sambal. One teaspoon of sambal is more than enough for a full plate of rice or soup [5].

As an archipelago, Indonesia has numerous races and cultures. Aside from its ancestral heritage, the country's culture is also influenced by the diversity of traditions and foods [10]. Indonesia is well known for its cultural and ethnic diversity, including diversity of food, customs, and ceremonies [11]. A great nation is expected to uphold the national identity. Indonesia is a country with remarkable works of art, culinary heritage, and traditional culture [9]. Sambal is one of the favorite spicy dishes in Indonesia with high diversity [12]. Figure 2 is a roadmap to explore sambal types in Indonesia.

Previous findings show that food differences are associated with the geography and demography of the Indonesian archipelago because food

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diversity emerged from the traditional ways of adding spices [13,14]. The traditional raw materials have been used for generations up to date and are adapted to complement the main ingredients based on region and [15].

Food diversity is related to various types of culture as well as the ecological and human environment. It focuses on the varieties of food systems in different regions, cultures, and ecosystems. Several studies have also examined the nutritional status of humans in relation to food systems [16]. There is a close correlation between the potential benefits and “functional roles” of food and regional diversity. Nutrition science must support sustainable ecosystems, ecological resources, and a healthy environment. Nutrition and the environment are closely linked throughout the food system [17].

Food diversity represents the dietary habits of people in a country [8]. One of the culinary heritages of the average Indonesian is the consumption of spicy food, such as sambal. It is preferred by various groups and is consumed quite frequently. Sambal is pureed chili (*Capsicum sp.*) with or without additives such as salt, shallots, and garlic. The Creative Economy Agency of the Republic of Indonesia has a goal to make sambal well known globally to increase its value and bring pride to Indonesians [18]. Therefore, it can be concluded that Indonesia has diversified food culture, and various food ingredients in addition to chili and various manufacturing techniques are used to produce sambal.

2. Objects and methods

This study aims to explore the diversity of sambal in Indonesia as part of cultural identity with a long historical trail and complex interweaving aspects of environment, history, society, and culture [12]. The methodology used for this research included analysis of food ethnographic literature, origin, function and types of sambal from relevant articles and book chapters containing reviews, summaries, and authors’ thoughts. Ethnographic literature represents a large repository of information on culture [19,20]. Food ethnographic literature consisted of descriptions of food provisioning, production, consumption, sharing food and beverages and the use of food and drinks in ritual and symbolism.

3. Results and discussion

According to the Indonesian National Standard (SNI), sambal is a spicy thick sauce made primarily from chilies and additional seasonings with or without complementary ingredients. The processes involved in its production include preparing raw materials, cooking, and serving [17]. Sambal is also defined as a processed chili product that resembles porridge and usually contains other ingredients such as salt, shallots, and garlic [21]. In general, there is a sequential process used to prepare this meal in Indonesia. The first step is the preparation of raw materials, which consists of washing and sauteing chilies and other ingredients. This is followed by grinding ingredients along with chilies using the Indonesian traditional tools *cobek* (mortar) and *ulek* (pestle) in separate processes. The last stage that is optional is the cooking process, which requires continuous stirring to avoid charring a product [13].

3.1. Origin of sambal in Indonesia

As a part of the human cultural identity, food has a long historical trail and complex interweaving of various aspects [22]. The history of chili sauce which we now know as sambal begins with the arrival of chili or capsicum in Indonesia. Thus, chili that is consumed by local Indonesian people is not a local plant that existed in the archipelago, but is a native American commodity introduced by the Portuguese. The entry of chili seeds brought by the Portuguese in the 16th century was like a cultural renaissance of spicy foods such as sambal [23]. Today, the import of chili sauce has colored the lives of Indonesian people and has an impact on various aspects of life, from culinary to the Indonesian economy [24].

During the Dutch colonial period in Indonesia, the book “Kokki Bitja atau Tab Masak-Masakan India” was published for the first time in 1857. It was compiled by Nonna Cornelia who was a citizen of the Netherlands. In this cookbook, she introduced various foods and ingredients that were available and could be processed in the Indies (ancient Indonesian name). The impression is that Cornelia compiled a wide collection of recipes for various kinds of food and chili sauces called *sambalan* that represented the tastes of various regions of the Indies and had unique and distinctive names, such as: sambal *goreng*, sambal *godog*, sambal *pete* and many others [3]. In addition, there are popular verses found in 1669, which are

known to be from the poem by Van Overbeeke in Batavia: “Soya, Gengber, Look en Ritsjes. Maect de maegh wel scharp en spitsjes”, which means “Soybean, ginger, garlic and chili make the stomach twist because they are spicy and stirred” [2].

Sambal became popular and was prepared widely due to the publication of cookbooks from the 19th century to the beginning of the 20th century. During this period, a regional culinary concept was developed which was referred to as the *Indische keuken* (Indian cuisine) by the gastronomists of that time. The inception of the *Indische keuken* led to the categorization of recipes based on social groups in the colony by several cookbooks. For example, the author of *Oost-Indisch Kookboek* (1870) classified recipes into “Dutch Food” (*Hollandsch eten*) and “Bumiputera Food” (*Inlandscheten*). Figures of bumiputera, such as Kartini and her sisters Kardinah and Roekmini, are suitable examples to show the influence of Indian cuisine on local culinary tastes, including sambal. In the previous years when there were the unstable political conditions in Indonesia plus the power of President Sukarno, who was on the brink, the cookbook conforming to “Pancasila” was finally published in 1967 with the title “Mustika Rasa Resep Masakan Indonesia”. This book contains recipes for various types of sambal [4]. The recipes written with Indonesian old spelling are sambal *bantji*, *lado hidjau*, *ontjom*, *petjel*, *tempojak* and many more [6]. Sambal diversity is growing very widely in Indonesia because of mouth and stomach adaptations. Newcomers to Java usually try hometown dishes, but because the signature ingredients are not widely used in Java, these individuals have begun to adapt their recipes according to circumstances and functional food in the area [25]. The average chili sauce in Indonesia is categorized as halal food because the majority of Indonesians are Muslims. Food culture is closely related to religion, hence, food in Indonesia is adapted to Islam [26].

The tools used to make sambal are known as a *cobek* (mortar) and *ulek* (pestle). From the traces of history, the traditional Indonesian *cobek* and *ulek* are among the greatest kitchen tools of all time. The shape of the *cobek* is flatter and more open on the top (like a plate with rounded edges) than an enclosed bowl-like mortar. The *ulek* is also shaped differently from a pestle and has a distinctive curvature for easy handgrip, thereby allowing for Indonesia’s unique technique of grinding. The *cobek* and *ulek* are made of basalt stone, and allow herbs and spices to have optimum surface contact area with them, thereby producing delicious and spicy sambals with their smooth texture [27].

3.2. Function of sambal in Indonesia

Indonesians are very familiar with several varieties of sambal because ingredients, such as chili, tomatoes and other spices, are easy to find [28]. In Indonesia, sambal is also served as one-dish food and is called *makanan sepinggan* (one-dish meal). An example of a *sepinggan* menu from Yogyakarta city in Indonesia is *gudeg*, which contains *tewel* (young jackfruit stewed with palm sugar, coriander, and coconut milk), fried chicken initially boiled in seasoned coconut milk, fermented soybean meal (*tempe*) fried with shrimps and sweetened with palm sugar, fried crispy shrimp wafers (*krupuk*), and red sambal [29].

There is unique creative tourism organized by some Balinese local tourism activists, who offer visitors cooking experience with the local community. Tourists can discover Balinese cuisine taking part in preparation of dishes, for example cooking rice, *be tutu*, *lawar*, *jukut meurap* and the side dishes sambal *bongkot*, sambal *embe* [30]. At the other end of the Indonesian spectrum is food from the West Sumatran region of Padang. This food called *Masakan Padang* consists of rice, the main side dish full of wet spices and served with the addition of green sambal and red sambal [29].

Sambal is usually consumed as a side dish along with *lalapan*, which is a typical salad of West Java, Indonesia. *Lalapan* is a side dish that consists of several raw plant parts such as fruit, flowers, seeds, roots, stems, and leaves without the addition of spices and is dipped in sambal. Fresh *lalapan* sambal is used as a flavor enhancer to rice complement [31].

Traditionally fresh sambal is prepared together with chilies and other ingredients using traditional tools usually close to serving time [32]. In the concept of a simple Indonesian food plate, apart from rice and side dishes, there is fresh sambal that provides a spicy contrast and is eaten with something that provides crispiness such as fried small anchovies (*teri goreng*), tapioca crackers (*krupuk*), fried shallots, or fried *tempe* [29]. Furthermore, sambal and sambal *goreng* are two terms that are often misinterpreted by people unfamiliar with Indonesian cuisine. Generally, it is widely known that sambal is spicy while *goreng* means “fried”; therefore, sambal *goreng* is often interpreted as fried dish. While sambal is used as a side dish, fried sambal is the main dish with additional protein such as shrimps [33]. Sambal *goreng ebi* potatoes are usually consumed with seasoned *uduk* rice [34].

3.3. Types of sambal in Indonesian

A typical Indonesian full meal is accompanied by dressings or sauce called sambal, a mixture of herbs and spice. The main spice used in making sambal is chili with varieties found throughout islands in Indonesia [14]. Several chili varieties are presented in supplementary data (Table S2).

Capsaicin in chilies has the high anti-atherosclerotic potential. Furthermore, some varieties of chili also cause inhibition of tumor cells [16]. There are 26 species of chili pepper (*cabai* in Indonesian) or *Capsicum* genus. Furthermore, locally and internationally cultivated chili consists of five species, namely 1) *Capsicum annum*; 2) [35]. Chili is an important spice widely distributed throughout all regions in Indonesia. It is processed and also consumed fresh to increase appetite. There are various names for chili pepper in Indonesia in addition to *cabai*, for example *lombok* and *cegek* [36]. Four types of chili are used for sambal, namely red (*Capsicum annum*), curly (*Capsicum annum*), red bird’s eye (*Capsicum frutescens*) and green bird’s eye (*Capsicum frutescens*).

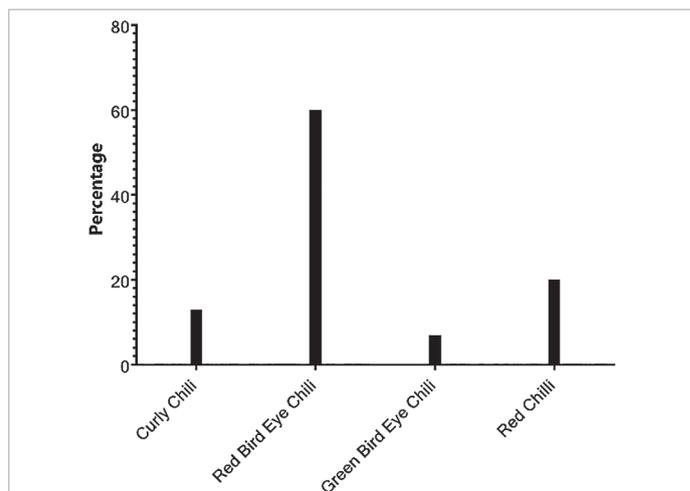


Figure 2. Use of chili for sambal in Indonesia
Рисунок 2. Использование перца чили для самбала в Индонезии

Figure 2 and supplementary data (Table S2) show that the most utilized chili for sambal is red bird’s eye chili. It is predominantly used due to its spiciness [37]. Indonesians usually prefer foods with spicy taste. A little amount of red bird’s eye chili makes sambal taste spicy [38]. The average Indonesian uses red chili pepper. However, there is a green sambal called *lado mudo* that comes from Padang City, Indonesia [4].

Culinary culture in Indonesia is influenced by several factors such as natural resources, history, and culture. Food is a strategic tool to boost country’s tourism industry. Indonesian cuisine has a complex and wide range of tastes due to its geographic diversity and great cultural wealth. Various types of sambal are used all over the country [39]. The diversity of these sambals can be seen in Table 1.

Table 1. Sambal types in Indonesia based on region

Таблица 1. Типы самбала в Индонезии по регионам

No	Island	Province	Sambal
1	Sumatra	Nanggroe Aceh	Asam Udeung
2		Darrussalam	Aceh
3			Ganja
4			Korek
5		North Sumatra	Tukutuk
6			Andaliman
7		West Sumatra	Lado Modo
8			Cangkuak
9			Uwok
10		South Sumatra	Cengek
11		Riau	Pilado Lauwok
12			Cencalok
13			Pokasam
14		Riau Island	Lade Gorom
15			Calok Mentah
16		Jambi	Belacan
17			Terasi Macang
18			Ikan Bilis

End of Table 1 / Окончание Таблицы 1

No	Island	Province	Sambal
19		Bangka Belitung Island	Serai
20			Rusip
21		Bengkulu	Lemea
22			Tempoyak
23			Piriak
24		Lampung	Kweni
25			Seruit
26	Jawa	DKI Jakarta	Dengkek
27			Belimbing Wuluh
28			Jahe Betawi
29		Banten	Borog
30			Goang
31		West Java	Cibiuk
32			Dadak
33			Oncom
34		Middle Java	Brambang Asem
35			Banci
36		DI Yogyakarta	Penyetan
37		East Java	Petis
38			Tempong
39			Pecel
40			Tumpang
41	Nusa Tenggara	Bali	Matah
42			Engsaban Sambal Nyuh
43			Embe
44			Bangkot
45			Tuwung
46		West Nusa Tenggara	To'o
47			Doco Toma
48			Masin
49			Ayam Suwir
50			Jeruk Bawang
51		East Nusa Tenggara	Lu'at
52			Teri
53			Bawang
54	Kalimantan	West Kalimantan	Cincalok
55			Tahu Singkawang
56		Middle Kalimantan	Dadah Belasan
57			Lucung
58			Ramania
59		South Kalimantan	Jeruk Limau
60			Ronto
61			Goreng Mandai
62			Acan
63		East Kalimantan	Gami
64			Raja
65		North Kalimantan	Kandas Patin
66			Mangga
67	Sulawesi	North Sulawesi	Rica
68			Roa
69		Gorontalo	Sagela Gorontalo
70			Terasi Gorontalo
71		Middle Sulawesi	Dua Sale
72		West Sulawesi	Lawar Kacci
73			Penja Mandar
74		South Sulawesi	Kuning
75			Cobek Udang Kemangi
76		Southeast Sulawesi	Teri Asap
77	Papua	Maluku	Kenari
78			Colo-colo
79		West Papua	Dabu-dabu
80		Papua	Tomat Terasi
81			Papua
82		North Maluku	Bakasang

These unique names are based on the strategies used to process chili to create various types of sambal with different spicy sensations. There are many types of sambal that reflect the harmony of chili combined with other various signature ingredients in each region, for example, *sambal lado*, *dabu-dabu*, *oncom*, *pecel* and *matah* from Sumatra, Papua, West Java, East Java, and Bali, respectively [1]. It can be seen from Table 1 and supplementary data (Table S2) that a type of sambal in Indonesia is specifically named in accordance with the regions and the main ingredients used.

In Indonesia, the majority of sambal types (30%) are found in Sumatra Island, while the smallest number of its types (8%) is found in Papua Island (Figure 3 and supplementary data Table S1). Most people describe Sumatran food as the spiciest. At the same time, thousands of Indonesians like spicy foods; therefore, Padang restaurants are found in most cities throughout Indonesia [29].

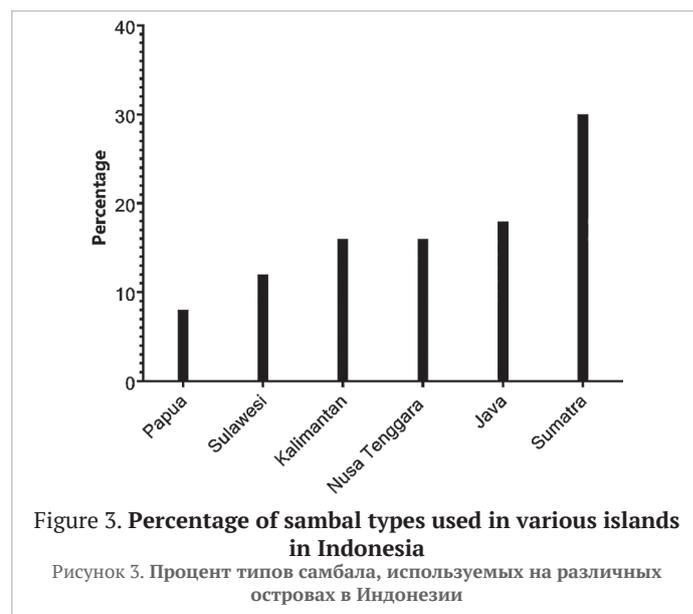


Figure 3. Percentage of sambal types used in various islands in Indonesia

Рисунок 3. Процент типов самбала, используемых на различных островах в Индонезии

Sumatra Island is famous for a wide variety of sambals, namely *tuk-tuk*, *tempoyak*, *lemea*, *kweni*, and *serit* sambal. *Tuk-tuk* sambal is a sambal served as a complement to food. This typical Batak sambal is suitable to be served with all meals. The name “*tuk-tuk*” came from the sound of traditional mashing tools. The ingredients of *tuk-tuk* sambal are shallots, chilies, candlenuts, and other additional ingredients mixed with anchovies (preferably) or dried salted fish to improve the taste of sambal. Dry fish is common food. The small dried anchovy adds crunchiness, spicy flavor and protein to sambal [29].

Some of the names of sambal were derived from the main ingredients [35]. *Andaliman* sambal is a chili sauce from North Sumatra. It is processed from chilies or tomatoes and spices such as andaliman and kecombrang (both flowers, stems, and fruits) [36]. Ingredients for *andaliman* sambal are mixed and the grinding process is carried out with an ulek (pestle) to obtain a delicious and fresh taste of sambal [40].

Tempoyak sambal is easily found on Sumatra Island. *Tempoyak* or fermented durian is used for cooking ingredients in several areas such as Lampung, Jambi, South and West Sumatra, Aceh, West Kalimantan, and Bengkulu. Furthermore, *tempoyak* is also processed into sambal in Bengkulu City. Generally, *tempoyak* sambal is made using red chili [41]. It is a popular traditional food from Jambi Province [42]. *Tempoyak* durian is made by adding 1–1.5% salt to the fruit flesh, which is then fermented for three to seven days at room temperature. It is a traditional food widely consumed in Southeast Asia, especially in Indonesia and Malaysia. A certain type of *tempoyak* sambal is produced with a mixture of chili, shrimps, anchovies, and petai or bitter beans in Pontianak, Kalimantan Island [43].

The other Sumatran chili sauces are sambal *mango kweni* and *seruit*. *Mango kweni*, also known as *Mangifera odorata* Griff, is a type of mango widely cultivated in Indonesia. It is broadly used in making sambal *kweni* in Sumatra Island, Lampung, and Palembang. The ingredients used in making *kweni* sambal include mango kweni, red bird’s eye chilies, garlic, shallots, water, sugar, salt, and cooking oil [44]. Meanwhile, *seruit* sambal is typical of Lampung. It is made from chilies, rampai, shrimp paste, and is usually stirred with tofu, tempeh, fish, and eggplant [45].

Sambal used as a food complement is made by adding other additives such as garlic [42]. When preservatives are not added, sambal is only

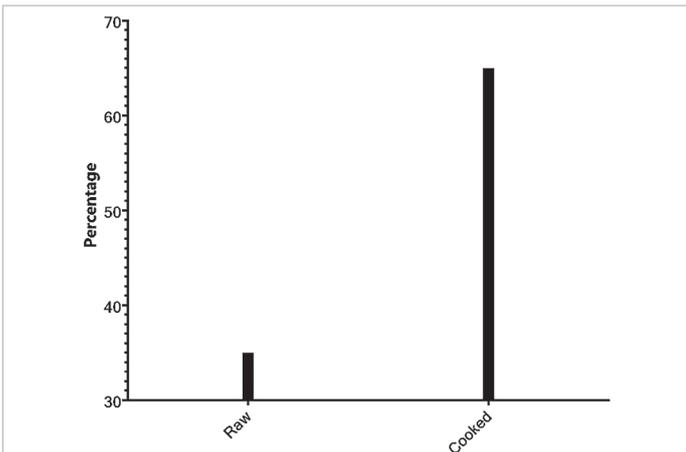


Figure 4. Percentage of sambal types in Indonesia in terms of the processing methods

Рисунок 4. Процент типов самбала в Индонезии по методам обработки

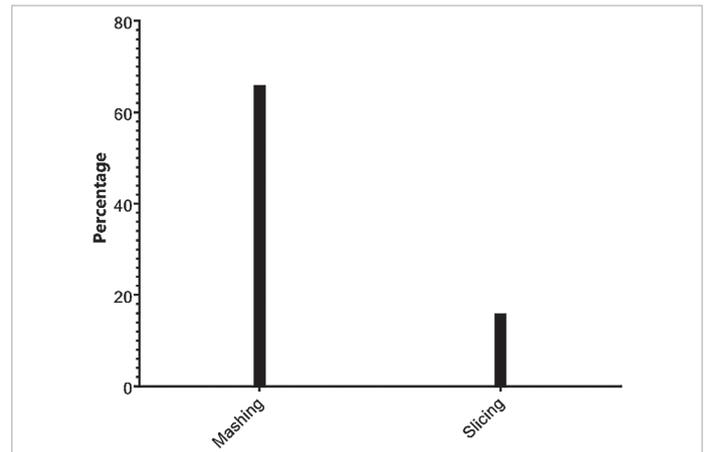


Figure 5. Percentage of sambal types in Indonesia in terms of the preparation method

Рисунок 5. Процент типов самбала в Индонезии по методам подготовки

stored for up to two months under room temperature [36]. There are two types of sambal preparation methods, namely slicing and mashing. The cooking stage can be included in or excluded from the process of sambal processing. Thus, sambal can be divided into two types in terms of the processing method: raw and cooked [6].

It can be seen from Figure 4 and Figure 5 as well as the supplementary data (Table S3) that mashing and cooking are most frequently used in the process of sambal preparation. Meanwhile, the process of making sambal sauce is quite simple. The general procedure of making tomato sambal is as follows: (1) garlic, shallots, and chili peppers are mashed using a pestle until a smooth paste forms, (2) oil is heated in a small pan over medium high heat and the paste is sautéed for about 1 minute until very fragrant and lightly charred, (3) tomatoes, salt, and sugar are added and sautéed until the tomato breaks down slightly. It is served warm [27].

Some examples of mashed sambal include *terasi*, *belacan*, and *pecel*. *Terasi* sambal is commonly found in Gorontalo City. The Gorontalo residents have been reported to prefer food with a spicy taste [38]. *Terasi* sambal is also called sambal *belacan*, which is a type of sambal that uses chili as the main ingredient. Moreover *terasi* (fermented shrimp or fish) is used as a delicious taste enhancer. This shrimp paste has a spicy taste due to its capsaicin content [46].

In Jambi Province, the *belacan* sambal (Figure 6) is another name for sambal paste. The main ingredients of *belacan* sambal include fresh red chili, *belacan* (shrimp paste), and salt. It is made by mixing and then pounding the ingredients in a mortar with a pestle until a smooth texture is formed. *Belacan* sambal increases appetite for food [47].

Another well-known type of sambal is *pecel*, also known as peanut sauce. It is made from peanuts together with various ingredients such as sugar, garlic, red chilies, salt, shrimp paste, lime leaves, kencur, and tamarind water. These ingredients are fried together at 120 °C until fragrant, then the grinding process is carried out using a grinding machine. After that, the *pecel* spice dough is formed [48].

Sambal *matah* (Figure 7) is a special chili sauce from Bali Island prepared without mashing ingredients. It is made using the following proce-

dure: (1) lime leaves, red bird’s eye chilies, shallots, and lemongrass stalks are thinly sliced; (2) sliced shallots are placed in a bowl and some salt is added; then, shallots are stirred and squeezed; (3) sliced lime leaves, red bird’s eye chilies, lemongrass stalks and grilled shrimp paste are put into a bowl; (4) coconut oil is heated and poured into a bowl and mixed thoroughly [49]. Sambal *matah* is an alternative complementary food in Kerta Village, Bali, Indonesia and is consumed with rice, *sate lilit*, *babi guling*, *lawar paku*, and *lawar embung* [50]. Furthermore, it is used as the main dish at lunch or dinner. For example, the main dish consists of chicken *betutu* with *matah* sambal, *urap*, *moran* corn, and *tum* rice [51]. Another typical Indonesian chili sauce similar to sambal *matah* is sambal *colo-colo*, which comes from Maluku. Its basic ingredients are chopped tomatoes, red chillies, shallots, basil, lemon juice and light soy sauce [52].

Indonesia is surrounded by many waters, so it is not surprising that the country’s most popular side dishes are fish and shrimps [21]. Examples of sambal with distinctive sea taste also include roa, lemea, masin, and ronto. Sambal roa is one of the most widely-known sambals. Roa fish (*Hemirhampus* sp.) is one of the typical small fish in North Sulawesi with a distinctive taste [48]. It is usually processed to achieve its savory and distinctive taste. In addition, the volume of roa fish production in North Sulawesi is very large, hence, the addition of roa for making sambal is a way to optimize the province’s main products [42]. Another fish sambal is Lemea produced by fermentation of semi-finished food made from diced bamboo shoots and mixed with fish. The fermentation is usually carried out for 3, 5, and 7 days. The resulting product, lemea sambal, is a traditional food typical of Bengkulu Province [53]. Shrimp is another seafood utilized for making sambal. The specific type often used is rebon shrimp. One of the processed products from rebon shrimp is salted. Meanwhile, masin is a type of sambal made from fermented rebon shrimps with the addition of salt and tamarind. It is a typical product mostly produced by the people of Sumbawa, West Nusa Tenggara, especially in the Empang and Pelampang Districts [54]. Another processed sambal from rebon seafood is ronto, which is typical of the coastal community, especially South Kalimantan. It is made from ronto mixed with spices and sautéed with

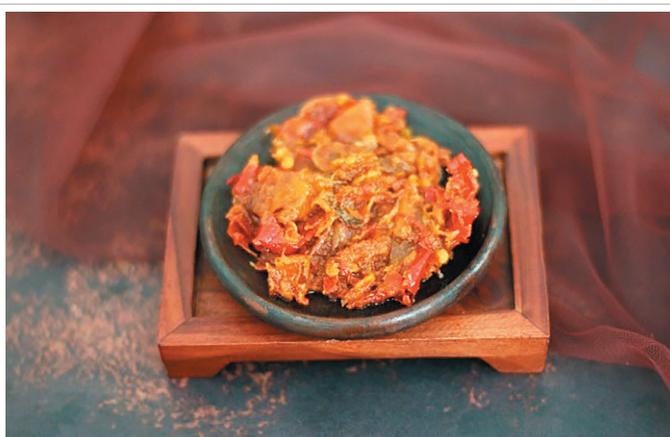


Figure 6. *Belacan* sambal
Рисунок 6. Самбал белакан



Figure 7. *Sambal Matah*
Рисунок 7. Самбал матах

cooking oil. The spices used include chilies, shallots, garlic, lemongrass, laos, bay leaves, and palm sugar. Ronto is a fermented rebon product in the form of a pink to brownish red paste that has a distinctive aroma of fermented shrimps with a sour to pungent aroma, and a mixture of salty and sour tastes [55].

4. Conclusion

Indonesian food diversity is influenced by several factors, namely resources, history, and culture. Furthermore, due to the enormous geographical resources, history, and cultural diversity throughout the archipelago, there is variety in shapes, textures, and tastes with the adaptation of mouth and stomach as well as adjustments of ingredients according to the natural resources. Sambal is used as a side dish that is always on the table along with staple foods. It is processed by mashing and slicing, and has a spicy taste. The addition of sambal with the spicy taste is intended to provide a prominent contrast to staple food, and has been applied since time immemorial. There are various kinds of ingredients and methods for making sambal resulting in various names and tastes. The variety of chili as well as the diversified culture and geographical factors led to the inception of many types of sambal.

Supplementary Data

Table S1. Percentage of sambal types used in various islands in Indonesia

Таблица S1. Процент типов самбала, используемых на различных островах в Индонезии

No	Island	Province	Sambal	Total	Percentage
1	Sumatra	Nanggroe Aceh Darussalam	Asam Udeung	25	30%
2		Aceh			
3		Ganja			
4		Korek			
5		North Sumatra	Tukutuk		
6		Andaliman			
7		West Sumatra	Lado Modo		
8		Cangkuak			
9		Uwok			
10		South Sumatra	Cengek		
11		Riau	Pilado Lauwok		
12		Cencalok			
13		Pokasam			
14		Riau Island	Lade Gorom		
15		Calok Mentah			
16		Jambi	Belacan		
17	Terasi Macang				
18	Ikan Bilis				
19	Bangka Belitung Island	Serai			
20		Rusip			
21	Bengkulu	Lemea			
22		Tempoyak			
23	Piriak				
24	Lampung	Kweni			
25		Seruit			
26	Java	DKI Jakarta	Dengkek	15	18%
27		Belimbing Wuluh			
28		Jahe Betawi			
29		Banten	Borog		
30		Goang			
31		West Java	Cibiuk		
32	Sambal Dadak				

End of Table S1 / Окончание Таблицы S1

No	Island	Province	Sambal	Total	Percentage
33			Oncom		
34		Middle Java	Brambang Asem		
35			Banci		
36		DI Yogyakarta	Penyetan		
37		East Java	Petis		
38			Tempong		
39			Pecel		
40			Tumpang		
41	Nusa Tenggara	Bali	Matah	13	16%
42			Engsaban Sambal Nyuh		
43		Embe			
44		Bangkot			
45		Tuwung			
46		West Nusa Tenggara	To'o		
47		Doco Toma			
48		Masin			
49		Ayam Suwir			
50		Jeruk Bawang			
51	East Nusa Tenggara		Lu'at		
52			Teri		
53			Bawang		
54	Kalimantan	West Kalimantan	Cincalok	15	16%
55			Tahu Singkawang		
56		Middle Kalimantan	Dadah Belasan		
57		Lucung			
58		Ramania			
59		South Kalimantan	Jeruk Limau		
60		Ronto			
61		Goreng Mandai			
62		Acan			
63		East Kalimantan	Gami		
64	Raja				
65	North Kalimantan	Kandas patin			
66		Mangga			
67	Sulawesi	North Sulawesi	Rica	10	12%
68			Roa		
69		Gorontalo	Sagela Gorontalo		
70		Terasi Gorontalo			
71		Middle Sulawesi	Dua Sale		
72		West Sulawesi	Lawar Kacci		
73		Penja Mandar			
74		South Sulawesi	Kuning		
75		Cobek Udang Kemangi			
76		Southeast Sulawesi	Teri Asap		
77	Papua	Maluku	Kenari	7	8%
78			Colo-Colo		
79		West Papua	Dabu-Dabu		
80		Papua	Tomat Terasi		
81		Papua	Papua		
82		North Maluku	Bakasang		
				83	100%

Table S2. Use of chili for sambal in Indonesia

Таблица S2. Использование перца чили для самбала в Индонезии

No	Island	Province	Sambal	Red chili	Green Bird Eye Chili	Red Bird Eye Chili	Curly Chili	
1	Sumatra	Nanggroe Aceh Darrussalam	Asam Udeung		1			
2			Aceh			1		
3			Ganja			1		
4			Korek			1		
5			North Sumatra	Tukutuk		1	1	
6				Andaliman		1		
7			West Sumatra	Lado Modo		1		
8				Cangkuak	1			
9				Uwok	1	1		
10			South Sumatra	Cengek		1	1	
11		Riau	Pilado Lauwok			1		
12			Cencalok	1	1			
13			Pokasam		1	1		
14		Riau Island	Lade Gorom				1	
15			Calok Mentah	1	1			
16		Jambi	Belacan	1	1			
17			Terasi Macang	1	1			
18			Ikan Bilis		1	1		
19		Bangka Belitung Island	Serai		1			
20			Rusip					
21		Bengkulu	Lemea		1			
22			Tempoyak				1	
23			Piriak		1			
24		Lampung	Kweni	1	1			
25			Seruit		1			
26	Java	DKI Jakarta	Dengkek		1	1		
27				Belimbing Wuluh			1	
28				Jahe Betawi		1		
29			Banten	Borog	1	1		
30				Goang		1		
31			West Java	Cibiuk		1	1	
32				Sambal Dadak	1	1		
33				Oncom	1	1		
34			Middle Java	Brambang Asem		1		
35				Banci				
36		DI Yogyakarta	Penyetan		1	1		
37		East Java	petis		1			
38			Tempong		1			
39			Pecel				1	
40			Tumpang	1	1			
41	Nusa Tenggara	Bali	Matah		1	1		
42				Engsaban Sambal Nyuh	1	1		
43				Embe		1		

End of Table S2 / Окончание Таблицы S2

No	Island	Province	Sambal	Red chili	Green Bird Eye Chili	Red Bird Eye Chili	Curly Chili
44			Bangkot			1	
45			Tuwung			1	
46		West Nusa Tenggara	To'o			1	
47			Doco Toma			1	
48			Masin			1	
49			Ayam Suwir	1	1		
50			Jeruk Bawang			1	
51		East Nusa Tenggara	Lu'at			1	
52			Teri			1	
53			Bawang			1	
54	Kalimantan	West Kalimantan	Cincalok (Tomat Hijau)			1	
55				Tahu Singkawang		1	1
56			Middle Kalimantan	Dadah Belasan		1	1
57				Lucung		1	
58				Ramania		1	
59			South Kalimantan	Jeruk Limau	1	1	
60				Ronto		1	
61				Goreng Mandai		1	1
62				Acan	1	1	
63			East Kalimantan	Gami		1	
64			Raja	1	1		
65		North Kalimantan	Kandas Patin		1		
66			Mangga		1		
67	Sulawesi	North Sulawesi	Rica	1	1		
68				Roa		1	
69			Gorontalo	Sagela Gorontalo		1	1
70				Terasi Gorontalo		1	
71			Middle Sulawesi	Dua Sale		1	
72			West Sulawesi	Lawar Kacci	1	1	
73				Penja Mandar		1	
74			South Sulawesi	Kuning		1	
75				Cobek Udang Kemangi	1	1	1
76			Southeast Sulawesi	Teri Asap	1	1	1
77	Papua	Maluku	Kenari	1			
78				Colo-Colo		1	
79			West Papua	Dabu-Dabu		1	
80			Papua	Tomat Terasi		1	
81				Papua		1	
82		North Maluku	Bakasang	1			
Total				22	8	68	15
Percentage			113	19.47%	7.08%	60.18%	13.27%

Table S3. Percentage of sambal types in Indonesia in terms of the preparation method

Таблица S3. Процент типов самбала в Индонезии по методам подготовки

No	Island	Province	Sambal	Mashing	Slicing	
1	Sumatra	Nanggroe Aceh Darrussalam	Asam Udeung	1		
2			Aceh	1		
3			Ganja	1		
4			Korek	1		
5			North Sumatra	Tukutuk	1	
6				Andaliman	1	
7			West Sumatra	Lado Modo	1	
8				Cangkuak	1	
9				Uwok	1	
10			South Sumatra	Cengek	1	
11			Riau	Pilado Lauwok		1
12				Cencalok	1	
13				Pokasam	1	
14			Riau Island	Lade Gorom	1	
15			Calok Mentah		1	
16		Jambi	Belacan	1		
17			Terasi Macang	1		
18			Ikan Bilis	1		
19		Bangka Belitung Island	Serai	1		
20			Rusip	1		
21		Bengkulu	Lemea	1		
22			Tempoyak	1		
23			Piriak	1		
24		Lampung	Kweni	1		
25			Seruit	1		
26	Java	DKI Jakarta	Dengkek	1		
27				Belimbing Wuluh	1	
28			Jahe Betawi	1		
29			Banten	Borog	1	
30				Goang	1	
31			West Java	Cibiuk	1	
32				Sambal Dadak	1	
33				Oncom	1	
34			Middle Java	Brambang Asem	1	
35				Banci	1	
36			DI Yogyakarta	Penyetan	1	
37			East Java	Petis	1	
38				Tempong	1	
39				Pecel	1	
40			Tumpang	1		
41	Nusa Tenggara	Bali	Matah		1	
42				Engsaban Sambal Nyuh	1	
43				Embe	1	
44				Bangkot	1	
45				Tuwung	1	
46			West Nusa Tenggara	To'o	1	
47				Doco Toma	1	
48				Masin	1	
49				Ayam Suwir	1	
50				Jeruk Bawang	1	

End of Table S3 / Окончание Таблицы S3

No	Island	Province	Sambal	Mashing	Slicing	
51		East Nusa Tenggara	Lu'at	1		
52			Teri		1	
53			Bawang	1		
54	Kalimantan	West Kalimantan	Cincalok		1	
55				Tahu Singkawang	1	
56			Middle Kalimantan	Dadah Belasan	1	
57				Lucung	1	
58				Ramania	1	
59			South Kalimantan	Jeruk Limau	1	
60				Ronto	1	
61				Goreng Mandai	1	
62				Acan	1	
63			East Kalimantan	Gami	1	
64			Raja		1	
65		North Kalimantan	Kandas Patin	1		
66			Mangga	1		
67	Sulawesi	North Sulawesi	Rica		1	
68				Roa	1	
69			Gorontalo	Sagela Gorontalo	1	
70				Terasi Gorontalo	1	
71			Middle Sulawesi	Dua Sale	1	
72			West Sulawesi	Lawar Kacci	1	
73				Penja Mandar		1
74			South Sulawesi	Kuning	1	
75				Cobek Udang Kemangi	1	
76			Southeast Sulawesi	Teri Asap		1
77	Papua	Maluku	Kenari	1		
78				Colo-Colo	1	
79			West Papua	Dabu-Dabu	1	
80			Papua	Tomat Terasi	1	
81				Papua	1	
82			North Maluku	Bakasang	1	
Total				66	16	
Percentage			82	80%	20%	

Table S4. Percentage of sambal types in Indonesia in terms of the processing method

Таблица S4. Процент типов самбала в Индонезии по методам обработки

No	Island	Province	Sambal	Raw	Cooked	
1	Sumatra	Nanggroe Aceh Darrussalam	Asam Udeung	1		
2				Aceh		1
3				Ganja	1	
4				Korek	1	
5			North Sumatra	Tukutuk		1
6				Andaliman		1
7			West Sumatra	Lado Modo		1
8				Cangkuak		1
9				Uwok		1
10			South Sumatra	Cengek		1
11			Riau	Pilado Lauwok	1	
12				Cencalok	1	

Continuation of Table S4 / Окончание Таблицы S4

No	Island	Province	Sambal	Raw	Cooked
13			Pokasam		1
14		Riau Island	Lade Gorom		1
15			Calok Mentah	1	
16		Jambi	Belacan	1	
17			Terasi Macang		1
18			Ikan Bilis		1
19		Bangka Belitung Island	Serai		1
20			Rusip		1
21		Bengkulu	Lemea		1
22			Tempoyak		1
23			Piriak		1
24		Lampung	Kweni		1
25			Seruit	1	
26	Java	DKI Jakarta	Dengkek		1
27			Belimbing Wuluh		1
28			Jahe Betawi		1
29		Banten	Borog		1
30			Goang		1
31		West Java	Cibiuk	1	
32			Sambal Dadak		1
33			Oncom		1
34		Middle Java	Brambang Asem	1	
35			Banci		1
36		DI Yogyakarta	Penyetan		1
37		East Java	petis	1	
38			Tempong		1
39			Pecel		1
40			Tumpang		1
41	Nusa Tenggara	Bali	Matah	1	
42			Engsaban Sambal Nyuh	1	
43			Embe		1
44			Bangkot		1
45			Tuwung	1	
46		West Nusa Tenggara	To'o	1	
47			Doco Toma	1	
48			Masin		1

End of Table S4 / Окончание Таблицы S4

No	Island	Province	Sambal	Raw	Cooked
49			Ayam Suwir		1
50			Jeruk Bawang	1	
51		East Nusa Tenggara	Lu'at		1
52			Teri	1	
53			Bawang		1
54	Kalimantan	West Kalimantan	Cincalok		1
55			Tahu Singkawang		1
56		Middle Kalimantan	Dadah Belasan		1
57			Lucung		1
58			Ramania	1	
59		South Kalimantan	Jeruk Limau		1
60			Ronto		1
61			Goreng Mandai		1
62			Acan		1
63		East Kalimantan	Gami		1
64			Raja		1
65		North Kalimantan	Kandas Patin		1
66			Mangga		1
67	Sulawesi	North Sulawesi	Rica		1
68			Roa		1
69		Gorontalo	Sagela Gorontalo		1
70			Terasi Gorontalo		1
71		Middle Sulawesi	Dua Sale		1
72		West Sulawesi	Lawar Kacci		1
73			Penja Mandar		1
74		South Sulawesi	Kuning		1
75			Cobek Udang Kemangi		1
76		Southeast Sulawesi	Teri Asap		1
77	Papua	Maluku	Kenari	1	
78			Colo-Colo		1
79		West Papua	Dabu-Dabu		1
80		Papua	Tomat Terasi		1
81			Papua		1
82		North Maluku	Bakasang		1
		Total		29	53
		Percentage	82	35%	65%

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