



Characteristics of *Soto*, an ethnic food that reflects Indonesian diversity: Based on ingredients

Laras Cempaka^{1*}, Afifah Amalia Rizki¹, Nurul Asiah¹, Wahyudi David¹, Kurnia Ramadhan¹, Arnia Sari Mukaromah², Hegar Pramastya³, Fadly Husain⁴, and Nurul Huda⁵

¹Department of Food Science and Technology, Universitas Bakrie, Jl. H.R. Rasuna Said, Kav. C-22, Kuningan South Jakarta, Indonesia

²Study Program of Biology, Faculty of Science and Technology, UIN Walisongo Semarang, Semarang, Central Java, Indonesia

³Pharmaceutical Biology Department, School of Pharmacy, Bandung Institute of Technology, Bandung, West Java, Indonesia

⁴Study Program of Sociology and Antropology Education, Universitas Negeri Semarang, Semarang, Central Java, Indonesia

⁵Faculty of Food Science and Nutrition, Universiti Malaysia Sabah, Kota Kinabalu, Malaysia

Abstract

Indonesia is highly diverse in culture, ethnicity, religion, and natural resources. The diversity is also obvious in its cuisine. *Soto* is an example of an iconic Indonesian dish found in many parts of the country. Despite sharing a similar name, the recipes vary according to their place of origin. Until now, how many variants of *Soto* are in Indonesia is not exactly known. This review aimed to discuss the characteristics of *Soto* based on ingredients. *Soto* is a soup composed of spices-flavored broth and various solid ingredients, such as vegetables and protein- and carbohydrate-rich foods. Every region in Indonesia has a different recipe of *Soto*; some use non-turmeric soup or coconut milk soup. The carbohydrate ingredients are mainly soun (cellophane noodle) and potato. The protein ingredients are mainly composed of chicken, egg, and beef. Vegetables consist of bean sprouts, tomatoes, and cabbage. Fried garlic, shallot, spring onion, and crackers are added as a garnish. The diversity of the ingredient makes the distinction among *Soto*: diversity of locality and diversity of ingredients. Approximately 46 types of *Soto* are reviewed in this article. Most of the *Soto* recipes use chicken, bean sprouts, soun, boiled egg, garlic, white pepper, red onion, ginger, and bay leaf as the main ingredients. *Soto* becomes an identity of its geographical origins and has distinction based on the main recipes.

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1. Introduction

Indonesia is an archipelago with thousands of ethnicities manifested in diverse cultures, languages, customs, and other foods (1,2). It has a tropical climate that stretches from Sabang (end of the east) to Merauke (end of the west). As the second-largest biodiverse country worldwide, Indonesia is blessed with an abundance of biodiverse resources comprising food plants, herbs, and thousands of plant and animal species (3-5).

Indonesia is also known for its culinary diversity. Each region has various recipes and dishes. The cuisine also has specific taste characteristics. In Java Island, especially Yogyakarta,

* Correspondence : Laras Cempaka

 laras.cempaka@bakrie.ac.id

dishes have sweet tastes, for example, a typical warm dish made from the main ingredients of young jackfruit (*Gudeg*) added with palm sugar (6). Some ethnic groups in the central region of Indonesia, especially those on the coast, such as Makassar and Bugis, have unique dishes made from sea fish, which are added with tamarind. The public believes that the sour taste of food neutralizes the fishy aroma. Meanwhile, the people of Lombok prefer spicier food (7). The spicy taste will add to the enjoyment of cooking and increase appetite. This proves that Indonesian cuisine is rich in variety and taste (8).

In cultural studies, food or cuisine is understood as part of a cultural system. The ingredients used and the taste enjoyed will be determined socially and culturally. This allows for variations in cuisine that depend on a specific culture as the background. Cuisine with its various recipes is a marker of the identity of an ethnicity (9). Every Indonesian region has a culinary wealth that is characteristic or an identity of that region. Local specialties have been around for a long time and still survive, so they are highly valued as cultural heritage (10). The recipe has also been passed down from generation to generation; even the old ways of cooking are still preserved. Despite modifications or variations, the main ingredients and cooking procedures have not changed. For being part of an area, traditional foods are very easy to find (11).

Five types of cuisine represent Indonesia, namely, *Soto*, *rendang*, *satay*, fried rice, and *gado-gado* (12). Among these five types, *Soto* most represents the diversity of Indonesia because almost every region has different variants of *Soto* (13). The choice of using certain protein sources, condiments, and spices might also reflect the preference of local people for cooking materials. Not to mention the highly diverse cooking process each *Soto* variant requires, the relatively simple cooking process also makes this cuisine available throughout the country. *Soto* is not distinguishable from other soup food. *Soto* is defined as broth added with spices, supplements, and filling.

Soto, also known as *sroto* or *tauto*, is a broth-based dish filled with ingredients rich in carbohydrates and proteins, vegetables, garnish, and other additives. Going back to the history of how *Soto* was developed and became a popular dish in Indonesia, *Soto* has been known since the nineteenth century. During the Dutch colonization (1816–1942), Indonesian people experienced an economic downturn. Immigrants such as the Chinese also became marginalized (14). The term *Soto* also originated from caudo of China. “Cau” means grass, which refers to spices as seasonings, and “do” means innards (14,15). Preparing the food was very difficult because people did not have much income, or raw materials are difficult to obtain. People who eat low-nutritious foods are only able to eat beef and poultry innards. At that time, *Soto* was popular. *Soto* is prepared from leftover protein sources such as beef innards mixed with spices-containing soup (16). In one large pot, *Soto* can be eaten together by many people. *Soto*, prepared with cheap ingredients, can meet the food needs of the family.

Almost every Indonesian region has its version of *Soto* with different and quite often unique ingredients. The rich collection of spices also contributes to the highly diverse *Soto* repertoire of the country (13). This review has studied 46 soup varieties from many regions in Indonesia. The study aimed to characterize each type of *Soto* based on its ingredients.

2. General Characteristics

Soto is a soup that mainly consists of solid and liquid ingredients. *Soto* is usually served warm with a distinctive broth flavor (17). Currently, *Soto* has various variations, names, and recipes. Diversity has also been influenced by the food culture where *Soto* comes from. In Indonesia, 75 types of *Soto* are available, spreading in Java-Madura, Sumatera, Kalimantan, Sulawesi, Bali, and Nusa Tenggara (13). However, only 46 types of *Soto* are evaluated in this paper. This is related to the information obtained and the easiness of getting this type of soup in Indonesia. Every region has its characteristic *Soto* because of the differences in the availability of raw materials and eating habits. Indonesia has varied ways of cooking and eating habits. The spices used are also very diverse; each region has a special spice that marks the identity of that region (18).



Figure 1. Various *Soto* ingredients. The solid ingredients consist of (a) potato patties (carbohydrate), (b) lime (additional), (c) cabbage and tomato (vegetable), (d) boiled chicken and egg (protein), and (e) shallot and celery (garnish). The liquid ingredients consist of (f) broth and (g) herbs and spices.

Differences include variations in the solid and liquid ingredients (Figure 1). The solid ingredients consist of carbohydrates, protein, vegetables, and garnish. The liquid ingredients consist of broth, herbs, and spices. Thus, each type of *Soto* must contain these ingredients. Every *Soto* is unique based on its recipe, and its ingredients include chicken meat, bean sprouts, noodles, tomatoes, soy soup, chicken eggs, cayenne, chili soup, beef, cabbage, potato fritters, red chili, and crackers.

In Indonesia, the abundance of spices offers various choices of typical Indonesian food and drinks (19). Taste is the greatest strength of Indonesian cuisine because Indonesian people like cuisine with a complex taste (19-21). A plate of food can have various flavors (sweet, salty, sour, spicy, and others) and textures (soft, hard, creamy, crunchy, and others). This cuisine is relatively healthier for using materials with fewer artificial preservatives or long processes. Traditional cooking techniques can allow the absorption of herbs perfectly into ingredients (22).

3. General Traditional Methods of Cooking *Soto*

Each variant of *Soto* has general and common techniques, i.e., making the broth, sautéing the seasoning (liquid ingredients) into the broth, and then filling in the solid ingredients (23).

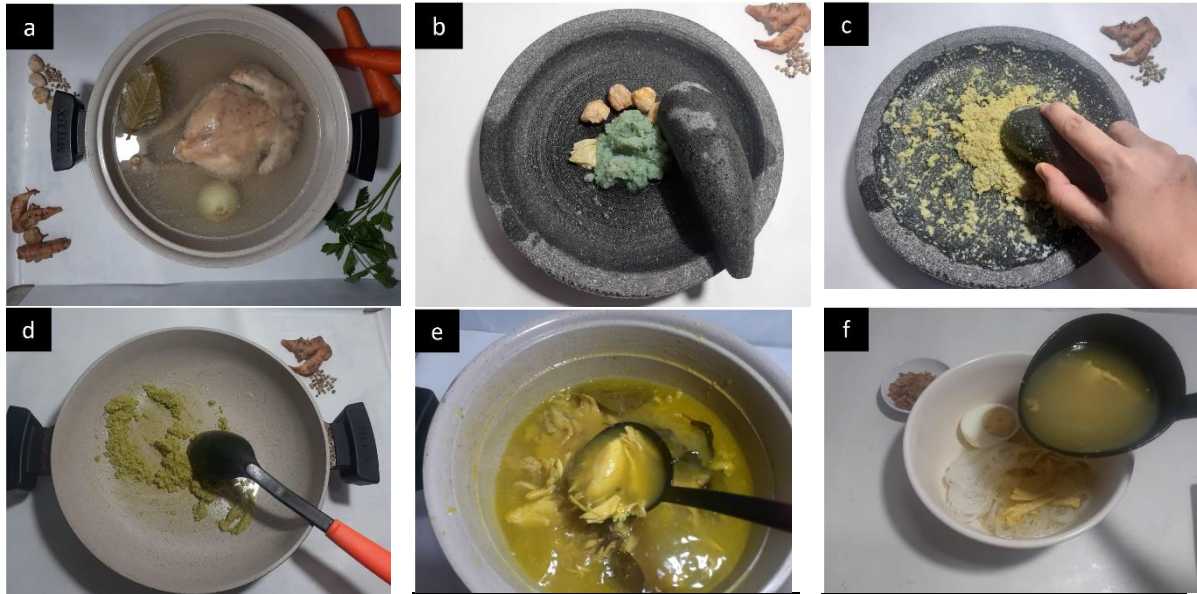


Figure 2. General steps in cooking *Soto*: (a) broth extraction, (b,c) spice refinement, (d) spice sautéing, (e) addition of ingredients, and (f) serving.

3.1. Broth Extraction

In making the delicious chicken stock, free-range chickens, or “*ayam kampung*,” are generally used, especially the back and claw parts. The chicken is cooked over low heat for a long time to extract optimal broth. Apart from chicken, broth can also be extracted from beef. Beef broth is obtained from boiling beef or bone. To get the maximum taste, beef bones can be added to the broth stew (Figure 2a).

3.2. Spice Refinement

Soto seasoning must be mashed first so that the meat can be soaked easily into it and blended optimally with the broth. However, not all spices must be smoothed, for example, aromatic spices such as bay leaves, orange leaves, and lemongrass and dried herbs such as cloves and nutmeg. Spices are usually left whole and cooked with broth (Figures 2b and 2c).

3.3. Spice Sautéing

The seasoning is usually sautéed to reduce the unpleasant scent of raw seasoning. Blended seasonings can be sautéed together with aromatic herbs such as bay leaves (Figure 2d).

3.4. Addition of Ingredients

Carbohydrates and proteins are the main ingredients of *Soto*. The combination of these ingredients makes *Soto* a one-dish meal, i.e., a meal served in one dish, already containing carbohydrates, proteins, fats, vitamins, and minerals. These foods can be served for breakfast, lunch, and dinner (Figure 2e).

3.5. Serving

Soto is generally served in a bowl, added with a garnish on top, and served hot (22). Generally, *Soto* is served when it will be eaten (Figure 2f). Most *Soto* is served with rice or rice cake, which are served separately or mixed directly into the soup such as in *Soto* Kudus. In

addition to rice, *Soto* can be mixed with noodles, like *Soto Mie Bogor*. Makassar *Coto* is served with rice cake (24).

4. Variations of *Soto*

In addition to naming the majority of *Soto* types using the name of the region of origin, differences can be observed in the types of sauce, contents, seasonings, and complements. *Soto* sauce is divided into clear, yellow (turmeric), and coconut milk soup.

Soto variants are spread throughout Indonesia. This paper focused on 46 types of *Soto*, namely, 8 *Soto* in Sumatra, 33 in Java, 2 in Kalimantan, 1 in Sulawesi, and 2 in Bali (Figure 3; the numbering is intended for the ease of writing, which has nothing to do with any ranking).

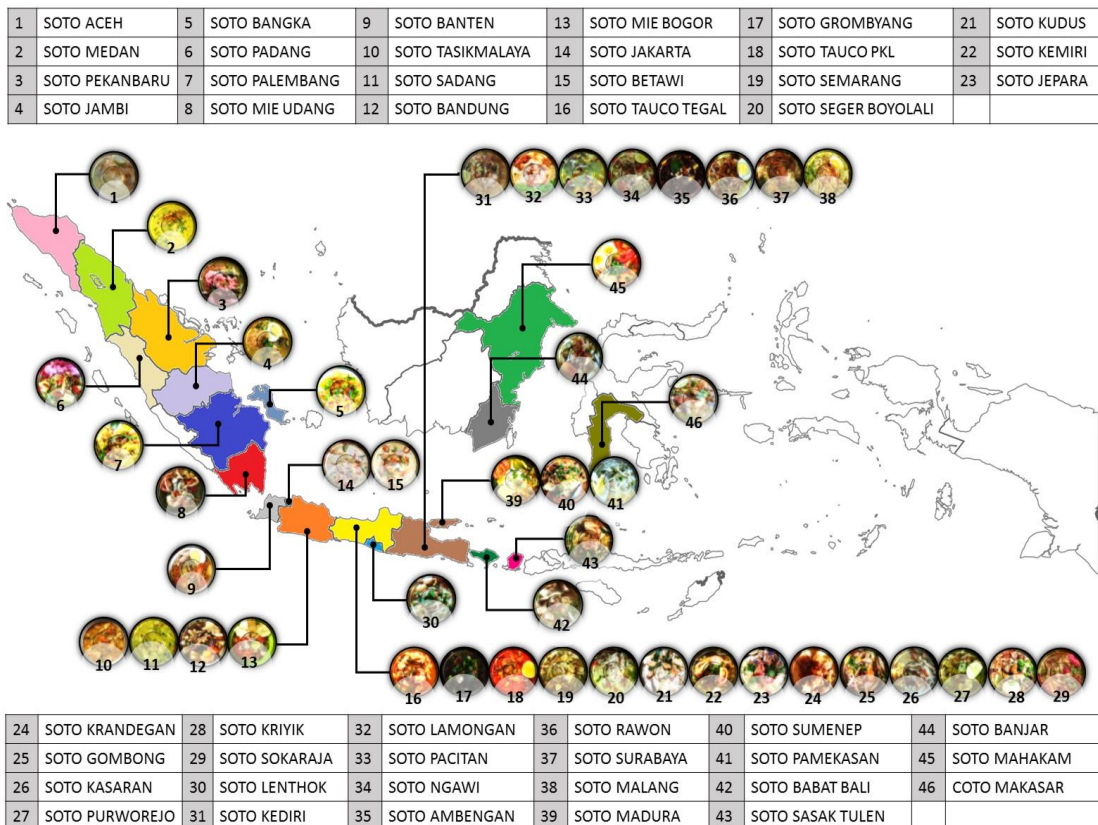


Figure 3. Indonesian *Soto* map based on the type of *Soto* from various regions

4.1. Solid Ingredients

4.1.1. Carbohydrates

Carbohydrate sources often found in *Soto* include tubers such as potatoes and cassava. Potatoes are fried, steamed, or mashed. The Indonesian fried mashed potatoes, or perkedel, are flavored mashed potatoes formed into flat rounds and fried. Perkedel (in Indonesian) or potato patties are a source of carbohydrates and very complementary to *Soto* dish besides rice and noodles. Processed cereals such as glass noodles, vermicelli, noodles, and macaroni are also used as sources of carbohydrates. Noodles, which are generally a source of carbohydrates, are also found in *Soto Mie Bogor*. As shown in Table 1, the most dominant sources of carbohydrates are glass noodles/vermicelli (44.9%), potatoes (18.4%), and mashed potatoes (16.3%), whereas noodles, cassava, and macaroni are found only in certain types of *Soto*.

4.1.2. Proteins

Protein sources of *Soto* are influenced by the culture and farming commodity of the regions. For example, Palembang is well known for its *Pempek* (fish cake). Fish, as the main protein source, is reflected in their food culture. *Soto* protein sources consist of chicken, beef, egg, offal, fish, and seafood. As shown in Table 1, chicken is a popular source of protein widely used in *Soto* (55.1%) and every dish. The average consumptions of chicken eggs and chicken meat in Indonesia are 2.119 and 0.124 kg per capita/week, respectively. This amount is greater than that of beef consumption, with 0.009 kg per capita/week (25). Therefore, chicken is more widely used than beef (26). Most types of *Soto* with chicken as the main ingredient are found in Java; approximately 60% of *Soto* in Java uses chicken meat as the main ingredient, whereas only approximately 14% in Sumatra used chicken meat. *Soto* types using chicken meat as the main ingredient are *Soto* Lamongan, *Soto* Tasikmalaya, *Soto* Tauto Tegal, *Soto* Kediri, *Soto* Semarang, like *Soto* Boyolali, *Soto* Kudus, *Soto* Kemiri, *Soto* Jepara, *Soto* Krandegan, *Soto* Gombang, *Soto* Purworejo, *Soto* Kriyik, *Soto* Lenthok, *Soto* Pacitan, *Soto* Ngawi, *Soto* Ambengan, *Soto* Surabaya, *Soto* Malang, *Soto* Pamekasan, *Soto* Sokaraja, *Soto* Medan, *Soto* Banjar, *Soto* Mahakam, *Soto* Makassar, and *Soto* Sasak Bali.

Apart from chicken, eggs (32.7%) and beef (30.6%) are often added as protein sources (Table 1). Generally, chicken eggs or quail eggs are used. Eggs are usually served as sliced boiled chicken eggs or quail satay eggs.

Fish meatballs are the main protein source in *Soto* Palembang, besides mushrooms and *sedap malam* flowers (*Polianthes tuberosa*). Palembang is very well known for its distinctive fish-processing characteristics such as *Pempek* Palembang (a savory fishcake delicacy) and Palembang crackers, which used fish as raw materials. Thus, its *Soto* possibly uses fish as an ingredient. Fish is rarely used as a protein source; however, the natural potential that supports it and consumer preferences resulted in the addition of fish in *Soto*. Likewise, the typical *Soto* Tenggiri Jambi adds mackerel as a protein ingredient.

Table 1. Solid ingredients of Soto (23).

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46						
	Soto Banten	Soto Jakarta	Soto Betawi	Soto Mie Bogor	Soto Bandung	Soto Sadang	Soto Tasikmalaya	Soto Tauco Tegal	Soto Grombyang	Soto Tauco Pekalongan	Soto Kediri	Soto Semarang	Soto Seger Boyolali	Soto Kudus	Soto Kemiri	Soto Jepara	Soto Lamongan	Soto Krandegan	Soto Tenggiri Jambi	Soto Gombong	Soto Kasaran	Soto Purworejo	Soto Kriyik	Soto Lenthok	Soto Pacitan	Soto Ngawi	Soto Ambengan	Soto Rawon	Soto Surabaya	Soto Malang	Soto Madura	Soto Sumenep	Soto Pamekasan	Soto Sokaraja	Soto Aceh	Soto Medan	Soto Padang	Soto Pekanbaru	Soto Palembang	Soto Mie Udang Lampung	Soto Bangka	Soto Banjar	Soto Mahakam	Soto Makassar	Soto Babat Bali	Soto Sasak Tulen	Percentage (%)					
CARBOHYDRATE																																																				
1	✓		✓									✓												✓																								18.4				
2		✓												✓																																				16.3		
3																																																			6.1	
4				✓																																														6.1		
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1																																																			55.1	
2		✓																																																	30.6	
3																																																				14.3
4																																																			10.2	
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VEGETABLE																																																				
1																																																				51.0
2																																																				34.7
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5																																																		4.1		
6																																																			2.0	
7			✓																																																2.0	
GARNISH																																																				
1																																																			63.3	
2																																																			59.2	
3																																																				87.8
4																																																				91.8
5																																																			2.0	

Soto Kasaran (Kebumen, an area in Central Java) uses duck meat, which is rarely found in another *Soto*. At Kebumen, many people are engaged in duck farming. Generally, consumers prefer chicken meat to duck meat because of the higher fat content, fishy smell and odor, reddish flesh color, and rough and tough texture; however, they are more expensive, so *Soto* with duck-based ingredients is rarely found (26).

4.1.3. Vegetable

Vegetables used most commonly are bean sprouts, tomatoes, and cabbage (51%, 34.7%, and 22.4%, respectively, Table 1). Bean sprouts or sprouts are one of the popular vegetables consumed by the Indonesian people, both middle and upper classes because bean sprouts are easy to grow anywhere. Bean sprouts grow from germinated green bean seeds. Bean sprouts are widely used for consumption as vegetables, eaten raw, or mixed with *gado-gado*, meatballs, fried tofu, *bakwan*, *Soto*, or other foods. Bean sprouts made from green beans and soybeans, Mung bean (*Vigna radiata* L.), are one of the plant commodities. Indonesian people also consumed legumes (27). Tomatoes contain lycopene as an antioxidant, and tomatoes are often added to every dish because they give a savory taste in the presence of glutamic acid (28), improving the taste. Fruits and vegetables are excellent sources of antioxidants, which contain vitamins E and C and various carotenoids such as beta-carotene and lycopene (29).

Some *Soto* types have specific ingredients. These types are based on the natural resources in each region, such as radish (13). Radish is used as a flavor remedy for other foods, especially animal foods with high fat (30); thus, beef and offal can be neutralized. *Soto Bandung* uses radish as an additional ingredient because radish is abundant in Bandung (31). This clear *Soto* becomes even more delicious when sprinkled with fried soybeans as a topping. Apart from *Soto Bandung*, radishes are also used in *Soto Babat Bali*.

4.1.4. Garnish

The term garnish comes from the French word “*garnir*,” which means to decorate or furnish. In the culinary world, garnishes make food an attractive decoration. In *Soto*, common garnishes include fried garlic (91.8 %), shallot (87.8%), spring onion (63.3%), and celery (59.2%) (Table 1). Indonesian dishes often add shallot to each meal, whether it is soupy or not, but in soupy foods, spring onion and celery are often used as garnishes. Shallot and fried garlic are very often used in Indonesia; red onion gives a distinctive savory taste to every dish. Garlic also provides a strong taste (32).

Soto types are distinguished based on the additional ingredient. *Kerupuk* is an Indonesian deep-fried cracker made from starch and other ingredients, which serves as flavoring (33,34). Crackers give a crisp texture to each dish. Other additional ingredients are roll, tofu, and fried tempe, which only exist in certain soups. *Soto Mie Bogor* is generally added with *risol*, a pastry containing meat/vegetables, whereas *Soto Mie Bogor* *risoles* contains soun or vermicelli, which makes this *Soto* unique (35).

4.2. Liquid Ingredients

The characteristics of *Soto* soup are influenced by the broth and spice components used. Regarding color, *Soto* is divided into clear, yellow, white, and red. A clear soup generally does not use turmeric, like that in yellow gravy. A white sauce is generally added with concentrated coconut milk. A red sauce is usually added with chili sauce.

4.2.1. Broth

Bone broth, which is considered one of the most ancient and extraordinary nutrients, is made from boiled animal bones. Bone broth greatly contains amino acids, collagen, gelatin, and essential minerals, many of which are not obtained easily from other common foods (36). As shown in Table 2, chicken broth is the most widely used in various types of *Soto* (32.6%). Beef broth (17.4%) is also commonly used in *Soto*. Other components are salt (97.8%), sugar (91.3%), and vegetable oil (63.0%).

Soto with yellow soup is *Soto* Lamongan. This *Soto* has a savory taste and is often added with chicken feet as a protein source. Interestingly, this *Soto* is usually served with a sprinkle of shrimp cracker powder, often called *koya* powder. Turmeric is widely used in various *Soto* in Indonesia (37).

Unlike the yellow soup, the coconut milk soup is used in *Soto* Jakarta and *Soto* Betawi, which have similarities owing to the use of milk or coconut milk soup, beef or offal, and chips (melinjo chips). The use of rambak crackers, crackers, bay leaves, *koya*, coconut milk, fried tempeh, turmeric, and shallots are influenced by Javanese tradition. The use of turmeric in soup is influenced by Indian cuisine. Indians use turmeric in their curry dishes. Curry is used in *Soto* Sulung, *Soto* Betawi, and *Soto* Madura. Meanwhile, ingredients and spices such as tomatoes, celery, cabbage, and processed cakes are Western influences.

4.2.2. Herbs and Spices

Spices are the key to the richness of *Soto's* taste. Some *Soto* types are recognized by their specific aroma and flavor of the spices. Spices are natural food additives that contribute to the taste of foods. Spices possess medicinal and nutritional properties (38). *Coto* Makassar is known for its 40 ingredients called "Patang Pulo," which means that this soup contains huge amounts of seasoning. *Coto* Makassar is one of the oldest Makassar culinary foods in Indonesia. *Coto* Makassar is a traditional heritage that has become a favorite of the community and can be found in most regions in South Sulawesi (39).

As shown in Table 2, the main herbs and spices found in *Soto* include white pepper, lemongrass, ginger-lime leaves, bay leaf, turmeric, candlenut, galangal, coriander, clove, cumin, cinnamon, nutmeg, cardamom, kencur (*Kaempferia shipyard*), mace flower, curry leaves, and kluwek. Three types of spices, namely, white pepper, lemongrass, and ginger, are always used in every soup dish. As for the specific types of soup ingredients, cardamom is used in *Soto* Kalimantan and Sumatra. Nutmeg is only used in *Soto* Sumatra.

Meanwhile, lime is used in *Soto* Betawi and West Java. Soybean soup, coconut, peanut soup, and taoco sauce are used in Central Java and Yogyakarta. Each culinary area has its unique flavoring ingredients (8).

White pepper provides flavor and aroma to the dish. Consumption of this spice induces a warm feeling. Apart from providing nutrition, this spice can be also used in medicine. Indonesia is the world's second-largest producer of white pepper after Vietnam (40). dish.

Lemongrass gives a fresh taste to the cuisine, and this is often used in Indonesian, Malay, or Thai cuisine (41). The stem leaf section is used. In addition, ginger can be added to the *Soto*. Ginger is very popularly used as a spice and medicine. It has a slightly spicy taste because it contains zingerone ketone (42). This ginger gives a warm taste to every dish. Usually, it is used by rubbing or pounding it with spices.

Three other types of herbs that are often used are spring onion, candlenut, and turmeric. Celery, lime leaves, galangal, bay leaf, sugar, and coriander are also used in some *Soto* types. Palm sugar, cumin, coconut milk, and taoco are very rarely used.

A *Soto* variant in East Java is the most diverse. This *Soto* uses 5–16 types of spices. While *Soto* variants in Aceh, Banjarmasin, Lampung, Minahasa, and Jambi used the least number of spices, with only 6–7 spices.

Bay leaf, ginger, and lemongrass are popular herbs and spices used in *Soto*. However, several *Soto* variants are prepared without bay leaf (39%), ginger (21.7%), and lemongrass (21.7%). The similarity of Indonesian *Soto* types was clustered using the unweighted pair group method with arithmetic mean based on 51 characters (Tables 1 and 2).

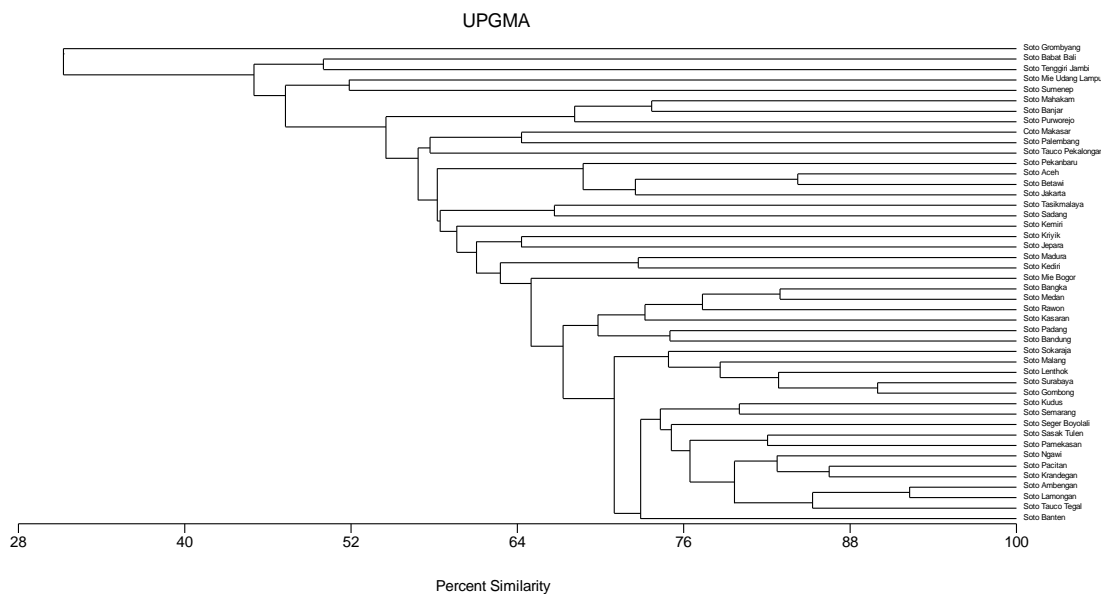


Figure 4. Percent similarity of 46 *Soto* types in Indonesia based on solid and liquid ingredients.

With 50% similarity, Indonesian *Soto* can be classified into four groups (Figure 4). Group 1 includes *Soto* Banten, *Soto* Tauco Tegal, *Soto* Lamongan, *Soto* Ambengan, *Soto* Krandengan, *Soto* Pacitan, *Soto* Ngawi, *Soto* Pamekasan, *Soto* Sasak Tulen, *Soto* Seger Boyolali, *Soto* Semarang, *Soto* Kudus, *Soto* Gombang, *Soto* Surabaya, *Soto* Lenthok, *Soto* Malang, *Soto* Sokaraja, *Soto* Bandung, *Soto* Padang, *Soto* Kasaran, *Soto* Rawon, *Soto* Medan, *Soto* Bangka, *Soto* Mie Bogor, *Soto* Kediri, *Soto* Madura, *Soto* Jepara, *Soto* Kriyik, *Soto* Kemiri, *Soto* Sadang, *Soto* Tasikmalaya, *Soto* Jakarta, *Soto* Betawi, *Soto* Aceh, *Soto* Pekanbaru, *Soto* Tauco Pekalongan, *Soto* Palembang, *Soto* Makasar, *Soto* Purworejo, *Soto* Banjar, and *Soto* Mahakam. Group 2 includes *Soto* Sumenep and *Soto* Mie Udang Lampung. Group 3 includes *Soto* Tenggara Jambi and *Soto* Babat Bali. Group 4 includes *Soto* Grombyang.

As presented in Figure 4, *Soto* Grombyang is separated from other *Soto* types because of its very simple ingredients. It comprises beef, offal, spring onion, shallot, broth, salt, and sugar. Furthermore, regions may influence the similarity of *Soto* ingredients such as *Soto* Medan and *Soto* Bangka (82.9%), *Soto* Kudus and *Soto* Semarang (80%), *Soto* Mahakam and *Soto* Banjar (73.75%), and *Soto* Madura and *Soto* Kediri (72.7%). This is related to the previous review reporting that Indonesian *Soto* cuisine has been developed by local acculturation and availability of natural resources. Therefore, Indonesian *Soto* has unique ingredients and variations (11).

Table 3. Similarity and difference in ingredients of the eight Indonesian *Soto* groups (23).

Soto Group	Similarity (%)	Composition	
		Similarity	Difference
<i>Soto</i> Lamongan and <i>Soto</i> Ambengan	92.3	glass noodles, chicken, egg, bean sprouts, tomato, celery, shallot, fried garlic, chicken broth, salt, sugar, vegetable oil, lime leaves, ginger, turmeric, white pepper, lemongrass, and candlenut	cabbage and bay leaf
<i>Soto</i> Gombang and <i>Soto</i> Surabaya	90	glass noodles, chicken, cabbage, spring onion, celery, shallot fried garlic, salt, sugar, vegetable oil, lime leaves, ginger, bay leaf, turmeric, white pepper, lemongrass, candlenut, and coriander	cassava, egg, bean sprouts, and soy sauce
<i>Soto</i> Pacitan dan <i>Soto</i> Krandengan	86.5	chicken, bean sprout, celery, shallot, fried garlic, chicken broth, salt, sugar, vegetable oil, soy sauce, bay leaf, ginger, turmeric galangal, white pepper, and lemongrass	glass noodles, soy sauce, lime leaves, candlenut, and kencur
<i>Soto</i> Aceh and <i>Soto</i> Betawi	84.2	potato, beef, tomato, spring onion, shallot, fried garlic, beef broth, coconut milk, salt, vegetable oil, lime leaves, bay leaf, ginger, white pepper, lemongrass, and coriander	offal, celery, clove, candlenut, cumin, and curry leaves

Soto Group	Similarity (%)	Composition	
		Similarity	Difference
<i>Soto Medan and Soto Bangka</i>	82.9	bean sprouts, spring onion, shallot, garlic, coconut milk, salt, sugar, vegetable oil, lime, leaves, bay leaf, ginger, turmeric, galangal, white pepper, lemongrass, coriander, and cumin	potato, chicken, beef, offal, tomato, celery, and soy sauce
<i>Soto Kudus and Soto Semarang</i>	80	mashed potato, chicken, egg, bean sprouts, spring onion, celery, shallot, fried garlic, salt, sugar, vegetable oil, soy sauce, bay leaf, galangal, white pepper, and lemongrass	potato, glass noodles, offal, tomato, cabbage, chicken broth, lime leaves, and ginger
<i>Soto Mahakam and Soto Banjar</i>	73.75	mashed potato, glass noodles, chicken, egg, spring onion, celery, shallot, fried garlic, clove, ginger, white pepper, cinnamon, and nutmeg	macaroni, carrot, chicken broth, coconut milk, salt, soy sauce, lime leaves, galagal, cardamon, and mace flower
<i>Soto Madura and Soto Kediri</i>	72.7	egg, celery, shallot, fried garlic, salt, vegetable oil, lime leaves, ginger, turmeric, white pepper, lemongrass, and candlenut	potato, glass noodle, chicken, beef, offal, fish and seafood, chicken broth, beef broth, coconut milk, vegetable oil, lime leaves, ginger, turmeric, white pepper, lemongrass, and candlenut

Clustering analysis also reveals eight Indonesian *Soto* groups (Table 3). The result shows the ingredients that can be used to determine similarities and differences in Indonesian *Soto* types. However, these data should be supported by ethnic, culture, and anthropological aspects to explore each similarity group deeply, which can be a promising research topic about Indonesian *Soto*.

5. Conclusions

Soto is one of the dishes that have a high diversity in Indonesia. The cuisine represents the Indonesian nation because of the diversity of types in each region. *Soto* has no specific definition, and *Soto* cannot be classified scientifically from other cuisines such as soup. Each *Soto* name was based on the name of the community it originates. The variety of spices used gives different tastes. Various solid and liquid ingredients are used. Solid ingredients include carbohydrates, proteins, vegetables, garnish, and additional ingredients. Liquid ingredients consist of broth, herbs, and spices. Most *Soto* recipes use chicken, bean sprouts, soun, boiled egg, garlic, white pepper, red onion, ginger, and bay leaf as the main ingredient.

Author Contributions

LC has written the entire script. A.A.R., N.A., W.D., and H.P. have contributed to analyzing content and writing procedures. K.R. has conducted analysis compilation, outline writing and abstract writing correction, A.S.M. has made dendogram analysis, FH analyzes from an anthropological perspective.

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Not applicable.

Conflicts of Interest

The authors declare that they have no conflict of interests.

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