Data Article

Data on the chemical properties of commercial fish sauce products

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\textbf{A B S T R A C T}

This data article reports on the chemical properties of commercial fish sauce products associated with the fish sauce taste and flavor. All products were analyzed in triplicate. Dried solid content was analyzed by moisture analyzer. Fish sauce salinity was determined by a salt meter. pH was measured using a pH meter. The acidity was determined using a titration assay. Amino nitrogen and total nitrogen were evaluated using a titration assay and Combustion-type nitrogen analyzer, respectively.

The analyzed products originated from Japan, Thailand, Vietnam, China, the Philippines, and Italy. Data on the chemical properties of the products are provided in table format in the current article.

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**Specifications Table**

| Subject area            | Chemistry           |
|-------------------------|---------------------|
| More specific subject area | Food Chemistry       |
| Type of data            | Table               |
| How data was acquired   | Moisture analyzer (MX-50, A&D, Japan) |
|                         | Salt meter (B-721, HORIBA, Japan) |
|                         | pH meter (D-52, HORIBA) |
|                         | Combustion-type nitrogen analyzer (SUMIGRAPH NC-220F, Sumika Chemical Analysis Service, Japan) |
| Data format             | Raw, analyzed       |
| Experimental factors    | Pretreatment for the acidity and nitrogen measurements: dilution in distilled water |
| Experimental features   | Solid content analysis in a moisture analyzer. |
|                         | Direct measurements of pH and salinity. |
|                         | Total acidity determination by basic titration with phenolphthalein as indicator. |
|                         | Total nitrogen content determination by elemental analysis. |
|                         | Amino nitrogen content determination by formol titration. |
| Data source location    | Tokyo, Fukuoka and Hokkaido, Japan |
| Data accessibility      | All data are presented in this article |

**Value of the data**

- The presented data on the chemical properties of 46 commercially available fish sauce products from Japan, Thailand, Vietnam, China, the Philippines, and Italy may be used as a reference for culinary studies of the fish sauces and related products.
- The data will be useful for nutritional assessment of the fish sauce products based on the chemical properties of these products.
- The presented data will allow the prediction of consumer preferences with regard to fish sauce products in each country.

1. **Data**

Fish sauce is a popular condiment on account of its distinctive flavor and taste. It is obtained by mixing fish material with salt, which is subsequently fermented under natural conditions [1]. In Japan, fish sauce is mainly used as a condiment in “Nabe” cuisine, a Japanese-style stew [1]. Among the Southeastern Asian countries, the widest variety of fermented fish products is found in Thailand [2]. In Vietnam, the fish sauce is used for dipping in a wide variety of dishes [3]. In China, fish sauce is used as a substitute for soy sauce in some dishes [1]. Patis, a Philippine fish sauce, is used in a citrus fruit soup [2]. The Italian fish sauce is based on Garum, which is the earliest reported fish sauce highly appreciated in the Roman era [4]. In general, fish sauces have a predominantly salty and umami taste, and distinctive flavor [5]. Therefore, data on the following were generated: fish sauce salinity, determining the salty taste; acidity, which roughly reflects the organic acids associated with the distinctive flavor and sour taste of the fish sauce; and nitrogen, representing the amino acids associated with the umami taste. Data on the chemical properties of 46 commercial fish sauce products produced in several countries (Japan, Thailand, Vietnam, China, the Philippines, and Italy) are presented. The origin and materials of the analyzed fish sauce products are provided in (Table 1). The data on their dried solid content, salinity, pH, acidity, and nitrogen content are shown in Table 2.
### Table 1  
Fish sauces used in this study.

| Product ID | Origin | Raw materials |
|------------|--------|---------------|
| J1         | Japan  | Soy sauce, Wheat, Dried bonito shavings, Kelp, and Urchin |
| J2         | Japan  | Soy sauce, Protein hydrolysate, Saccharide, Dried bonito extract, and Fish sauce |
| J3         | Japan  | Soy sauce, Sugar, Mirin, Salt, Dried bonito, and Oyster extract |
| J4         | Japan  | Salt, Mirin, Sugar, Soy sauce, Roasted flying fish, and Alcohol |
| J5         | Japan  | Glucose fructose liquid sugar, Soy sauce, Salt, Dried bonito extract, Mirin, Sugar, and Roasted flying fish |
| J6         | Japan  | Soy sauce, fishes, Fermented seasoning, Salt, Glucose fructose liquid sugar, and Seaweeds |
| J7         | Japan  | Soy sauce, Sugar, Glucose fructose liquid sugar, Vegetable protein hydrolysate, Dried bonito extract, Mirin, Bonito extract, Salt, and Yeast extract |
| J8         | Japan  | Salt, Sugar, Mirin, Soy sauce, Roasted flying fish, Fermented seasoning, Roasted flying fish powder, and Alcohol |
| J9         | Japan  | Soy sauce, Saccharide, Fructose liquid sugar, Fermented seasoning, extract, Honey, Salt, Roasted flying fish, and Fish sauce |
| J10        | Japan  | Soy sauce, Mirin, Sugar, Salt, Roasted flying fish, Yeast extract, Dried bonito flakes, Kelp extract, and Fish and shellfish extract |
| J11        | Japan  | Soy sauce, Sugar, Mirin, Salt, Dried shrimps, Brewed vinegar, Yeast, extract, Fish and shellfish extract, Kelp extract, and Dried shiitake mushroom |
| J12        | Japan  | Soy sauce, Sugar, Mirin, Dried bonito extract, Salt, Kelp extract, Oyster extract, Yeast extract, Shiitake mushroom extract, and Alcohol |
| J13        | Japan  | Soy sauce, Sugar, Roasted flying fish, Salt, Mirin, Yeast, extract, Brewed vinegar, Dried shiitake mushroom, Kelp, and Fish and shellfish extract |
| J14        | Japan  | Soy sauce, Sugar, Bonito extract, Mirin, Salt, Kelp extract, Alcohol, and Seasoning |
| J15        | Japan  | Japanese sandishes “Hata-Hata” and Salt |
| J16        | Japan  | Soy sauce, Sugar, Rice fermented seasoning, Bonito extract, Dried anchovies extracts, Seasoning, and Sweetener |
| J17        | Japan  | Soy sauce, Saccharides, Dried flying fish extract, Salt, Seasoning, Sweetener, and Alcohol |
| J18        | Japan  | Japanese sandishes “Hata-Hata” and Salt |
| J19        | Japan  | Acetes and Salt |
| J20        | Japan  | Deep-sea smelts "Nigisu", Salt, Soybeans, and Barley rice malt |
| J21        | Japan  | Squids, Salt, Rice malt, Sake, and Beer yeast extract |
| J22        | Japan  | Squid intestines and Salt |
| J23        | Japan  | Squid intestines, Salt, and Shochu |
| J24        | Japan  | Codys, Barley rice malt, Salt, Squid intestines, Sugar, and Fructose |
| J25        | Japan  | Pagrus major, Salt, Defatted soy bean meal, Wheat, Rice, and Alcohol |
| J26        | Japan  | Flying fishes, Soybeans and barley rice malt, and Salt |
| J27        | Japan  | Tunas, Salt, and Soybeans and barley rice malt |
| J28        | Japan  | Cutlass fishes, Salt, and Rice malt |
| J29        | Japan  | Anchovies and Salt |
| J30        | Japan  | Soy sauce, Dried bonito extract, Sugar, Salt, Yeast extract, Amino acids, Alcohol, Caramel pigment, Acidifier, Acetic acid, and Thiamine |
| T1         | Thailand | Fish extract and Salt |
| T2         | Thailand | Anchovies, Salt, and Sugar |
| T3         | Thailand | Anchovies extract, Salt, Sugar, and Fructose |
| T4         | Thailand | Sardine extract, Salt, and Sugar |
| T5         | Thailand | Anchovies extract, Salt, and Sugar |
| T6         | Thailand | Seafood, Salt, and Sugar |
| T7         | Thailand | Sardine extract and Salt |
| T8         | Thailand | Seafood extract and Salt |
| T9         | Thailand | Sardine, Salt, and Sugar |
| T10        | Thailand | Sardine extract, Salt, and Sugar |
| T11        | Thailand | Fish sauce, Soy sauce product, Fructose, glucose fructose liquid sugar, Yeast extract, and Amino acids |
| V1         | Vietnam | Fish extract and Salt |
| V2         | Vietnam | Sardine and Salt |
| C1         | China | Anchovies, Salt, and Sugar |
| P1         | Philippines | Mackerel |
| I1         | Italy | Anchovies, and Salt |

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* Rice wine dominantly used for cooking.
* Japanese spirit distilled from sweet potatoes, rice, etc.
| Origin and ID for the products | Dried solid content (%) | Salinity (%) | pH | Acidity (mL/100 mL) | Amino nitrogen (% (w/v)) | Total nitrogen (%) | Amino/total nitrogen (%) |
|-------------------------------|-------------------------|-------------|----|------------------|-------------------------|-------------------|------------------------|
| J1                            | 27.13 ± 1.05            | 16          | 4.48 ± 0.05 | 15.64 ± 0.31 | 0.32 ± 0.13            | 1.08              | 29.67                  |
| J2                            | 27.69 ± 0.47            | 20          | 4.62 ± 0.02 | 8.23 ± 0.12  | 0.39 ± 0.08            | 0.78              | 49.91                  |
| J3                            | 32.78 ± 0.22            | 19          | 4.61 ± 0.01 | 12.12 ± 0.05 | 0.22 ± 0.03            | 0.75              | 29.39                  |
| J4                            | 21.93 ± 0.13            | 15          | 5.54 ± 0.02 | 1.71 ± 0.02  | 0.06 ± 0.01            | 0.32              | 18.75                  |
| J5                            | 20.74 ± 0.31            | 11          | 5.08 ± 0.02 | 3.16 ± 0.02  | 0.14 ± 0.08            | 0.34              | 40.69                  |
| J6                            | 24.06 ± 0.38            | 11          | 4.87 ± 0.04 | 10.87 ± 0.04 | 0.27 ± 0.11            | 0.89              | 30.51                  |
| J7                            | 20.66 ± 0.35            | 17          | 4.84 ± 0.01 | 9.16 ± 0.04  | 0.21 ± 0.16            | 0.64              | 32.89                  |
| J8                            | 18.22 ± 1.74            | 24          | 5.59 ± 0.33 | 1.38 ± 0.01  | 0.05 ± 0.03            | 0.25              | 19.86                  |
| J9                            | 16.12 ± 0.25            | 15          | 4.94 ± 0.01 | 5.07 ± 0.01  | 0.12 ± 0.06            | 0.32              | 37.17                  |
| J10                           | 34.97 ± 1.09            | 25          | 4.51 ± 0.04 | 11.20 ± 0.05 | 0.25 ± 0.05            | 0.85              | 29.58                  |
| J11                           | 27.27 ± 0.50            | 24          | 4.73 ± 0.04 | 4.25 ± 0.01  | 0.11 ± 0.07            | 0.35              | 30.99                  |
| J12                           | 32.21 ± 4.25            | 25          | 4.72 ± 0.04 | 15.74 ± 0.01 | 0.26 ± 0.02            | 1.16              | 22.44                  |
| J13                           | 25.54 ± 0.27            | 24          | 4.82 ± 0.02 | 5.99 ± 0.01  | 0.20 ± 0.05            | 0.52              | 38.80                  |
| J14                           | 26.48 ± 0.91            | 25          | 4.69 ± 0.03 | 12.32 ± 0.04 | 0.38 ± 0.08            | 0.99              | 38.30                  |
| J15                           | 32.13 ± 0.12            | 25          | 5.44 ± 0.05 | 6.59 ± 0.05  | 0.80 ± 0.04            | 1.28              | 62.32                  |
| J16                           | 24.41 ± 0.56            | 25          | 4.81 ± 0.03 | 10.77 ± 0.03 | 0.34 ± 0.12            | 0.56              | 40.88                  |
| J17                           | 35.25 ± 0.14            | 25          | 4.97 ± 0.03 | 9.88 ± 0.0    | 0.73 ± 0.10            | 1.06              | 69.03                  |
| J18                           | 24.39 ± 0.25            | 25          | 5.97 ± 0.11 | 1.98 ± 0.0    | 0.38 ± 0.00            | 0.38              | 100.00                 |
| J19                           | 33.34 ± 0.11            | 25          | 5.33 ± 0.07 | 7.18 ± 0.08  | 0.92 ± 0.18            | 1.72              | 53.43                  |
| J20                           | 29.06 ± 0.16            | 25          | 4.87 ± 0.03 | 13.92 ± 0.07 | 0.94 ± 0.15            | 1.78              | 52.71                  |
| J21                           | 24.53 ± 0.24            | 25          | 5.73 ± 0.04 | 5.47 ± 0.03  | 1.01 ± 0.09            | 1.5               | 67.39                  |
| J22                           | 32.06 ± 0.19            | 25          | 5.36 ± 0.05 | 7.22 ± 0.04  | 1.3 ± 0.27             | 1.98              | 65.63                  |
| J23                           | 26.18 ± 0.32            | 25          | 5.81 ± 0.01 | 9.20 ± 0.01  | 1.16 ± 0.15            | 1.8               | 64.61                  |
| J24                           | 31.29 ± 0.22            | 25          | 5.21 ± 0.01 | 19.70 ± 0.06 | 1.03 ± 0.29            | 2.53              | 40.74                  |
| J25                           | 24.11 ± 1.13            | 25          | 5.33 ± 0.03 | 10.36 ± 0.06 | 0.67 ± 0.11            | 1.52              | 43.93                  |
| J26                           | 31.56 ± 0.17            | 25          | 4.63 ± 0.01 | 27.29 ± 0.39 | 0.80 ± 0.05            | 1.79              | 44.71                  |
| J27                           | 32.41 ± 0.40            | 25          | 4.60 ± 0.01 | 20.55 ± 0.12 | 1.03 ± 0.13            | 1.71              | 60.19                  |
| J28                           | 32.56 ± 0.33            | 25          | 4.94 ± 0.08 | 11.35 ± 0.0   | 1.03 ± 0.17           | 1.47              | 70.18                  |
| J29                           | 34.21 ± 0.31            | 25          | 5.14 ± 0.05 | 8.07 ± 0.01  | 1.19 ± 0.08            | 1.76              | 67.43                  |
| J30                           | 29.19 ± 0.42            | 25          | 4.89 ± 0.03 | 15.77 ± 0.04 | 0.62 ± 0.21            | 1.29              | 47.90                  |
| Thailand                      |                         |             |           |                 |                         |                  |                        |
| T1                            | 35.46 ± 0.02            | 25          | 4.89 ± 0.05 | 10.26 ± 0   | 1.21 ± 0.1             | 2.16              | 56.09                  |
| T2                            | 37.90 ± 0.22            | 25          | 5.11 ± 0.02 | 8.93 ± 0.04  | 0.70 ± 0.07            | 1.63              | 43.02                  |
| T3                            | 34.78 ± 0.06            | 25          | 4.89 ± 0.08 | 9.34 ± 0.05  | 0.81 ± 0.07            | 1.79              | 45.36                  |
| T4                            | 34.29 ± 0.07            | 25          | 4.92 ± 0.01 | 10.19 ± 0.03 | 0.60 ± 0.02            | 1.61              | 37.16                  |
| T5                            | 36.41 ± 0.18            | 25          | 5.12 ± 0.11 | 6.43 ± 0.02  | 0.59 ± 0.0             | 1.32              | 44.57                  |
| T6                            | 33.66 ± 0.68            | 25          | 5.10 ± 0.0  | 8.74 ± 0.07  | 0.60 ± 0.00            | 1.65              | 36.30                  |
| Origin and ID for the products | Dried solid content (%) | Salinity (%) | pH     | Acidity (mL/100 mL) | Amino nitrogen (% (w/v)) | Total nitrogen (%) | Amino/total nitrogen (%) |
|--------------------------------|-------------------------|--------------|--------|--------------------|--------------------------|-------------------|--------------------------|
| T7                             | 35.44 ± 0.06            | 25           | 5.22 ± 0.03 | 6.09 ± 0.01         | 0.63 ± 0.19             | 1.43              | 43.91                    |
| T8                             | 35.81 ± 1.14            | 25           | 5.13 ± 0.03 | 9.25 ± 0.01         | 0.95 ± 0.02             | 2.24              | 42.34                    |
| T9                             | 32.91 ± 0.09            | 25           | 5.25 ± 0.06 | 4.42 ± 0.05         | 0.76 ± 0.03             | 1.44              | 52.91                    |
| T10                            | 34.92 ± 0.34            | 25           | 5.17 ± 0.03 | 5.41 ± 0.02         | 0.52 ± 0.06             | 1.21              | 43.01                    |
| T11                            | 27.51 ± 0.22            | 25           | 5.15 ± 0.01 | 9.11 ± 0.01         | 0.43 ± 0.01             | 1.2               | 35.91                    |
| Vietnam                        |                         |              |         |                    |                          |                   |                          |
| V1                             | 30.20 ± 0.05            | 25           | 4.91 ± 0.09 | 16.49 ± 0.06        | 2.01 ± 0.06             | 2.94              | 68.26                    |
| V2                             | 35.00 ± 4.01            | 25           | 5.10 ± 0.09 | 14.76 ± 0.05        | 1.31 ± 0.15             | 2.95              | 44.38                    |
| China, C1                      | 27.46 ± 0.20            | 25           | 5.17 ± 0.04 | 6 ± 06 ± 0.03       | 0.69 ± 0.27             | 1.36              | 50.70                    |
| Philippine, P1                 | 28.13 ± 0.27            | 25           | 5.13 ± 0.02 | 1.87 ± 0.02         | 0.30 ± 0.05             | 0.49              | 61.05                    |
| Italy, I1                      | 30.05 ± 0.09            | 25           | 4.93 ± 0.0  | 11.73 ± 0.07        | 0.70 ± 0.62             | 1.45              | 48.22                    |

Data are presented as the mean ± SD.
All measurements were done in triplicate, except for salinity and total nitrogen.
2. Experimental design, materials and methods

2.1. Design

Data are presented for the following numbers of different commercial fish sauce products: 30 sauces produced in Japan; 11 sauces from Thailand; two sauces from Vietnam; and one from each of the Philippines, China, and Italy (Table 1). For each fish sauce product, analysis was performed in triplicate.

2.2. Materials

Data for 46 fish sauces are presented. The ingredients of each product described on the product label are summarized in Table 1. For the analysis, the products were assigned product IDs, as follows: J1–J30 for the 30 Japanese products; T1–T11 for the Thai products; V1 and V2 for the Vietnamese products; and P1, C1, and I1 for the Filipino, Chinese, and Italian products, respectively. All fish sauce products were purchased in a local market in Tokyo, Fukuoka, or Abashiri (Japan).

2.3. Solid contents assay

To determine the dried solid content of the fish sauce products, ca. 2 g of fish sauce sample was applied to a moisture analyzer (MX-50; A&D, Japan). The measurements were conducted at 130 °C for 20 min, as described in Ref. [6].

2.4. Salinity and pH measurements

The salinity and pH of the fish sauce products were determined using a salt meter (B-721; HORIBA, Japan) and a pH meter (D-52; HORIBA), respectively.

2.5. Total acidity assay

Total acidity was determined by a titration assay. Briefly, 10 g of fish sauce samples were diluted up to 100 mL with distilled water. Acid content in 10 mL of the diluted sample was determined by titration with 0.1 M NaOH, with 1% (w/v) phenolphthalein solution as a pH indicator.

2.6. Amino acid content determination

The total nitrogen content was determined using SUMIGRAPH NC-220F analyzer (Sumika Chemical Analysis Service, Japan) [7]. Amino nitrogen content was determined using the formol titration method [8]. Briefly, 5 mL of the fish sauce sample was diluted up to 250 mL with distilled water. For the first titration, all of the diluted sample was titrated to pH 8.5 with 0.01 M NaOH. For the second titration, 20 mL of formaldehyde solution (pH 8.5) was added to the diluted sample, and then titrated to pH 8.5 with 0.1 M NaOH. The volume of base consumed in the first and second titration was used for calculating the amino nitrogen content [8]. The amino nitrogen to total nitrogen ratio, i.e., a value of amino nitrogen divided by total nitrogen, was used as an index of protein-to-amino acid conversion rate.
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Transparency document. Supplementary material

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