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Effects of different levels of *Chara corallina* on rice seasoning (Furikake) quality

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Abstract Results found the amount of *Chara corallina* required for best quality of dry rice seasoning, made from fish mixed with *C corallina*. It was shown that suitable basic formula for a protein supplement, was composed of 60 % dried fish meat, 10% white sesame, 10% black sesame, 5% soy sauce, 10% chili powder, 3% sugar, 2% salt and 7.5 % *C. corallina*. Proximate composition of this product was 3.41% moisture, 4.62% ash, 1.34% fat, 9.10% protein,12.56% crude fiber and 68.96% total carbohydrate. Energy and water activity were 545.9 kcal/100g and 0.43, respectively. Liking score of the developed product was 7.12±0.81, which showed overall acceptation of the product. Physical quality found that rice seasoning, mixed with 7.5% *C. corallina* had a brightness value (*L**) of 45.27±0.12, a red value (a*) of 5.53±0.16, and a yellow value (b*) of 11.48±0.07. Rice seasoning, made from fish and *C. corallina* is recognized as an alternative product, for consumers who wish to consume nutritional added food, with their rice staple.

Keywords: Rice seasoning, *Chara corallina*, Furikake

Introduction

Furikake, or rice seasoning, is a dry seasoning originating in Japan. It is made from sesame seeds, seaweed, dried fish, dried small fish, and salt (Phonchalempong and Rattanapanon, 2025). It is sprinkled on rice, vegetables, and fish. The traditional method of making furikake is red rice, which uses a mixture of glutinous rice and red beans. Later, various ingredients were example, sesame seeds and other dry ingredients. Japanese rice seasonings generally consist of a mixture of dried fish, sesame seeds, chopped seaweed, sugar, salt and monosodium glutamate, as well as other flavourful ingredients such as frozen salmon pieces, shiso, eggs, miso powder and vegetables. In comparison, Thai seasonings consist of chili pastes that are dry, such as Nam Phrik Nork and Nam Phrik Pla Fu,

In Thailand, many researchers have been interested in developing rice seasonings with various forms or flavors, including rice seasoning with

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pickled plum (Nimitkiatklai *et al*., 2019), rice seasoning from local fermented soybeans (Rachasom *et al*., 2020), fish rice seasoning with dried sea grapes (Sripawatkul *et al*., 2021), rice seasoning from gourami (Nuchnum, 2008), rice seasoning with budu and rice salad flavor from smoked Nile tilapia (Chanasit, 2011), rice seasoning from fish mixed with crispy fried sea bass skin (Mahae *et al*., 2021), etc. All of these create added value and worth for local resources. This benefits in line with the era and consumption preferences of Thai people.

Chara corallina is an algae belonging to the Charophytes group (Chankaew *et al*., 2020). It is consumed in some southern provinces, by eating it fresh like other domestic vegetables. Locals believe that these algae can help treat diabetes and stomach disease. In addition to local beliefs about the medicinal properties of *Chara corallina*, there are also foreign research reports showing *Chara corallina* to have bioactive compounds. Zaman *et al*. (1998) reported that methanol extract of this alga contained 23 types of fatty acids, most of which were unsaturated fatty acids (63.5%). They also found 4 types of sterols. When the methanol extract, ethanol extract, and isolated sterols were tested for their antimicrobial activity, they found that these compounds inhibited some types of microorganisms and fungi.

Freshwater macroalgae utilization in aquaculture, whether to promote growth or replace fishmeal and even to improve aquatic health, has been studied and applied for a long time. Examples include Spirulina (Arthrospira) and green algae (Cladophora), which have demonstrated high effectiveness in freshwater aquaculture. However, there are no research reports on cultivation of edible local freshwater algae in southern regions of Thailand, in an organic manner. Preliminary studies found that *Chara corallina* has high nutritional value, particularly with a high protein content, chlorophyll and carotenoid, and high valuable of phytochemicals (Chankaew *et al*., 2020; 2024).

In addition, Wattanakul *et al*. (2021) studied the nutritional value and amino acids of hydrolyzed Kamkung algae (*Chara corollina*). They found that the nutritional value and bioactive compounds in hydrolyzed Kamkung algae to be higher than those in dried algae powder, particularly in terms of phenolic compounds and antioxidants. Amino acid content analysis revealed significantly higher levels of hydrolyzed Kamkung algae in dried algae powder, and the essential amino acids were fully present. Total amino acid content of protein hydrolysate was 61,768 mg/100 g, higher than the total amino acid content in dried algae powder (34,427 mg/100 g). Due to these beneficial properties, *C. cinerea* makes it an interesting food ingredient. *C. cinerea* is also interesting in terms of safety for consumption, as it has been reported that this group of algae (Characean algae) is often found in clean water (Singh *et al*., 2013). *C. cinerea* also has a higher chlorophyll content than other freshwater algae and *C. cinerea* can be easily

cultivated in greenhouses (Chankaew *et al*., 2023). This type of algae, therefore, has interesting potential, in adding nutritional value to food products. It can be developed into a rice topping powder, adding nutritional and flavor value to rice. Addition of dried, yellow-striped fish, adds further nutritional value to the rice topping powder.

The aim of this study was to develop a formula and production process for a rice seasoning, containing Kamkung algae (*Chara corollina*), determining the sensory characteristics of different concentrations of *Chara corallina* powder rice seasoning product. The physicochemical characteristics and sensory evaluation were also determined to provide further guidance on best concentrations of *C. corallina* for a powder rice seasoning product.

Materials and methods

Sample preparation

Ten kilograms of fresh yellow stripe trevally fish were washed in clean, flow-through water. The fish were then filleted and deboned (retaining only the fish meat). The fillets were washed with 1% brine prepared by dissolving 10 g of salt in 1000 ml of water. Washed fish were weighed and steamed in a steamer lined with banana leaves, at a water temperature of 95-100°C for 10 minutes. Steamed fish were then roughly ground with a ladle for 10 minutes. The ground fish were spread onto a baking tray and baked at 70°C, for 3 hours, until the moisture content reached no more than 8% (Thai Industrial Standards Institute, 1987). The dried yellow stripe trevally fish was left to cool to room temperature and weighed. The fish were then vacuum-packed, for testing in rice seasoning (Furikake) powder production.

The percentage yield of dried yellow stripe trevally fish was calculated by using the formula (actual dry fish weight / fresh fish weight used) x 100.

$$\% \text{ Yield} = \frac{\text{Weight of dried yellow stripe trevally fish}}{\text{Weight of Fresh yellow stripe trevally fish}} \times 100$$

The determination of physical characteristics involved the evaluation of dried yellow stripe trevally fish that were focusing on moisture content, water activity (aw) and colour parameters. The analysis included performing three replicates for sample. Moisture content was analysed using a moisture meter (model: Sartorius, MA150, Germany) for the chemical characteristics. Analysis of water activity (aw)was completed using a aw measuring instrument (model: Lab MASTER-aw by Novasina,

Switzerland). Three-gram samples of dried yellow stripe trevally fish were placed in individual containers, to determine the (aw) value. The values were measured, and results were reported as the average value.

Colour determination was conducted using a colour meter (model: CR- 400 by Konica Minota, Japan), which was calibrated with a standard reference plate. Colour measurements were expressed in terms of L*, which denotes lightness on a scale from 0 (black) to 100 (white); a* values (+, -) indicate the degree of redness or greenness; b* values (+, -) indicate the degree of yellowness and blueness. The analysis included performing three replicates for each sample.

Effect of different levels of Chara corallina on the quality of rice seasoning (Furikake)

The experiment was conducted using a completely randomized design (CRD) with four treatments, each replicated three times. Four different concentrations of *Chara corallina* powder (2.5%, 5.0%, 7.5%, and 10%w/ w) were mixed with ingredients in the formulation. Consequently, four *Chara corallina* powder concentrations of rice seasoning were produced (Table 1).

Table 1. Four essential ingredients for the preparation of rice seasoning

Ingredients (g)	*Chara corallina* powder concentrations (%)			
	2.5	5.0	7.5	10.0
dried yellow stripe trevally fish	60	60	60	60
roasted white sesame seeds	10	10	10	10
roasted black sesame seeds	10	10	10	10
ground chili peppers	10	10	10	10
light soy sauce	5	5	5	5
sugar	3	3	3	3
salt	2	2	2	2

In the production of rice seasoning, the initial step involved thoroughly combining dried yellow stripe trevally fish, roasted white sesame seeds, roasted black sesame seeds and ground chili peppers by hand in a large bowl. Light soy sauce, sugar and salt were stirred to dissolve until no sugar grains. Then, all of ingredients and *Chara corallina* powder were added and blended until homogenous. The resulting mixture, was then dried in a hot air oven (BINDER, Model FD 720, Germany), at 50 ^{o}C, for 30 min. After this time, the rice seasoning was allowed to cool for transfer to a sealed vacuum bag, before undergoing analysis for physicochemical properties and sensory evaluation.

Sensory characteristics of the four different concentrations of *Chara corallina* powder were assessed, involving a sensory evaluation, conducted

with 30 untrained panelists, chosen from staff and students of the Department of Food Innovation and Business at Rajamangala University of Technology Tawan-ok, located in Chanthaburi Campus. A 4-gram sample, consisting of rice seasoning (Furikake) powder containing *Chara corallina* algaeat 2.5, 5, 7.5, and 10 % along with 70 grams of cooked rice, was given to each panelist for sensory testing (Chanasit, 2011). The panelists utilized a nine-point hedonic scale, where by 1 represented "extremely dislike" and 9 indicated "extremely like" (Watts et al., 1989). Each panelist evaluated the samples based on criteria including colour, aroma of algae, taste, texture, and overall acceptability.

Moisture content was analyzed using a moisture meter (model: Sartorius, MA150, Germany) for the chemical characteristics, while the caloric determination was decided through a bomb calorimeter (model: Parr, 610 calorimeters, USA). Analysis of water activity (aw) was completed using a aw measuring instrument (model: Lab MASTER-aw by Novasina, Switzerland). Three-gram samples of dried yellow stripe trevally fish were placed in a container to determine the (aw) value. The values were measured, and results were reported as an average value.

Colour determination was conducted using a colour meter (model: CR- 400 by Konica Minota, Japan), which was calibrated with a standard reference plate. The colour measurements were expressed in terms of L*, denoting lightness on a scale from 0 (black) to 100 (white); a* values (+, -) indicating degree of redness or greenness; b* values (+, -) indicating degree of yellowness and blueness.

Comparison of physicochemical properties of Chara corallina rice seasoning powder with commercial rice powder

The best formulation of *Chara corallina* rice seasoning powder was compared with two commercially available rice seasoning powder products and evaluated for physical and chemical quality. The selected rice seasoning powders for this research were Hon Katsuo brand and Nichifuri brand, available in local markets.

The proximate composition of the rice seasoning powder samples, including moisture, protein, fat, carbohydrate, ash, and fiber, was determined following the methods outlined by the Association of Analytical Chemists (AOAC, 2010). Carbohydrate content was calculated by subtracting the combined weight of moisture, protein, fat, ash, and fibre from the total dry matter.

Moisture content was analyzed using a moisture meter (model: Sartorius, MA150, Germany) for the chemical characteristics, while the caloric determination was achieved through a bomb calorimeter (model: Parr, 610 calorimeters, USA). Analysis of water activity (aw) was completed using a aw measuring instrument (model: Lab MASTER-aw by

Novasina, Switzerland). Three grams samples of dried yellow stripe trevally fish were placed in separate containers, to determine the (aw) value. The values were measured and results reported as the average value.

Statistical analysis

All experimental treatments were done in three replications (n = 3), with the results being indicted as mean ± standard deviation (SD). The data was statistically analysed by one-way analysis of variance (ANOVA), with significant differences determined, using Duncan's multiple range test (DMRT) at a 95% confidence level ($p<0.05$).

Results

The preparation of raw materials and the production process of dried yellow stripe trevally fish

This process is done by washing 10 kilograms of fresh yellow stripe trevally fish with water. The fish are then sliced into pieces and further washed with 1% brine solution. The fish pieces are steamed in a steamer lined with banana leaves at a temperature of 95-100 ^{o}C for 10 minutes. The steamed fish is then roughly ground. Then it is dried in a hot air oven at 70 ^{o}C for 3 hours, until the moisture content does not exceed 8 percent. After that, it is left to cool at room temperature (Figure 1).

An initial assessment was conducted on the properties of this dried yellow stripe trevally fish to be used, as an ingredient in rice seasoning products made from *C. corallina*. It was found that the production volume calculation (%Yield) is 19.50. Color parameters, lightness (L), redness (a*), and yellowness (b*) were 59.64±0.43, 0.74±0.42 and 16.71±0.78, respectively. The moisture content, and water activity (aw) were 5.48±0.01and 0.48±0.00, respectively (Table 2)

Table 2. Physical quality of dried yellow stripe trevally fish

%Yield	Color parameter			Moisture	Water
	L*	a*	b*	content (%)	Activity
19.50	59.64±0.43	0.74±0.42	16.71±0.78	5.48±0.01	0.48±0.00

Figure 1. Process of dried yellow stripe trevally fish

The quality of dried yellow stripe trevally fish was found to be in accordance with the product standards of the fish floss, fish scales and dried fish meal industries TIS 700-2530. The definition of the term dried ground fish means products made from edible whole fish cooked dry and crushed or fluffy. The unseasoned product must have moisture content not exceeding 8 percent and should be packed in clean, dry, tightly closed, and moisture-proof containers.

Effect of different levels of Chara corallina on the quality of rice seasoning (Furikake)

The formulation of rice seasoning (Furikake) powder containing *Chara corallina* at four different concentrations (2.5%, 5.0%, 7.5%, and 10% w/w), as presented in Figure 2.

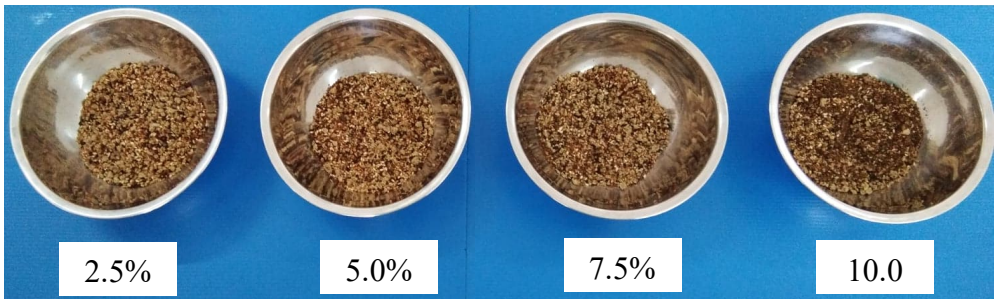

Figure 2. Images of rice seasoning (Furikake) powder containing *Chara corallina* using four different concentrations (2.5%, 5.0%, 7.5%, and 10% w/w, respectively

The sensory properties of the four formulations of rice seasoning (Furikake) powder containing *Chara corallina* algae were evaluated and illustrated in Table 3. The substitution of *Chara corallina* algae powder resulted in decreased preference scores for color, aroma, taste, texture, and overall aacceptance, which was significant. ($p \leq 0.05$). The formulation with 7.5 % w/ w *Chara corallina* algae powders, notably, exhibited the highest acceptability. Hence, this particular formulation (7.5%) of rice seasoning (Furikake) powder containing *C. corallina* algae was selected for further study.

Table 3. Sensory score of rice seasoning (Furikake) powder containing *Chara corallina* algae

Content of *Chara corallina* (%)	**Sensory evaluation**				
	Color	Aroma	Taste	Texture	Overall Acceptance
2.5	7.13±0.88^{a}	6.45±0.76^{b}	6.38±0.78^{b}	6.33±0.66^{c}	6.58±0.79^{b}
5	7.03±0.67^{a}	6.88±0.90^{a}	6.50±0.74^{a}	6.75±0.67^{ab}	6.80±0.69^{ab}
7.5	6.78±0.76^{a}	6.67±0.95^{ab}	6.88±0.77^{a}	6.98±0.66^{a}	7.12±0.81^{a}
10	6.32±0.70^{b}	6.62±0.91^{ab}	6.60±0.88^{ab}	6.52±0.76^{bc}	6.70±0.69^{b}

Note: Mean followed by different letters in the same column differs significantly ($p \leq 0.05$)

The evaluation of the sensory quality in terms of aroma found that consumers rated the aroma of the rice seasoning (Furikake) powder containing *Chara corallina* algae between 6.45±0.76 and 6.88±0.90. Consumers rated the smell of rice seasoning powder containing *Chara corallina* algae at 5 percent as the highest, equal to 6.88±0.90, which was not statistically significantly different at the 95% confidence level. Compared to rice seasoning powder containing *Chara corallina* algae of 7.5 and 10 percent, which had scores of 6.67±0.95 and 6.62±0.91, respectively, there was a statistically significant difference at the 95% confidence level with the rice seasoning powder containing *Chara corallina* algae of 2.5 percent. This indicates that adding rice seasoning powder containing *Chara corallina* algae at different levels will result in the *Chara corallina* algae powder having a fishy smell. This increased percentage imparts a higher unique smell of the *Chara corallina* algae.

The physical quality of the rice seasoning (Furikake) powder containing *C. corallina* algae at 2.5, 5, 7.5, and 10 %, is shown in Table 4. No significant statistical differences ($p \leq 0.05$) were observed for all treatments with reference to moisture content. Rice seasoning (Furikake) powder containing 2.5% w/w *C. corallina* powder was significantly ($p \leq 0.05$) lowest in moisture content of 3.74±0.39%. Increasing concentration of *C. corallina* seaweed powder tended to increase the water activity content

of rice seasoning (Furikake). The rice seasoning (Furikake) powder containing 2.5 % w/w *C. corallina* algae was significantly ($p \leq 0.05$) lowest in water activity content of 0.366±0.002%.

Table 4. Physical quality of the rice seasoning (Furikake) powder containing *Chara corallina* algae

Content of *C. corallina* (%)	Moisture content ^{ns} (%)	Water Activity (a_w)
2.5	3.74±0.39	0.366±0.002^{d}
5	3.68±0.07	0.378±0.000^{c}
7.5	3.81±0.21	0.387±0.001^{b}
10	3.91±0.25	0.398±0.002^{a}

Note: Mean followed by different letters in the same column differs significantly ($p \leq 0.05$)

Increasing the number of algae resulted in decreasing the lightness (L*), yellowness (b*), and redness (a*) (Table 5). The significantly lowest values for lightness (L*) and redness (a*) were recorded at 47.83±0.42 and 4.35±0.02, respectively. The yellowness (b*) reduced with higher concentrations of algae powder. Overall, a higher concentration of *C. corallina* algae powder led to rice seasoning power with darker and harder characteristics, and possessing lower moisture content, compared to those with lower concentrations. Lightness (L*) became lower when the number of algae was increased. This may be due to influence from the dark pigment of *C. corallina* which gives these algae their characteristic green-brown color. Within the range of red (+a*) to green (-a*) tonality, green was more predominant, when increasing the *C. corallina* percentage.

Table 5. Color of the rice seasoning (Furikake) powder containing *C. corallina* algae

Content of *C. corallina* (%)	Color parameter (%)		
	L*	a*	b*
2.5	53.47±0.14^{a}	7.38±0.05^{a}	17.86±0.18^{a}
5	51.85±0.76^{b}	7.17±0.12^{b}	16.62±0.24^{b}
7.5	45.27±0.12^{d}	5.53±0.16^{c}	11.48±0.07^{d}
10	47.83±0.42^{c}	4.35±0.02^{d}	12.60±0.08^{c}

Note: Mean followed by different letters in the same column differs significantly ($p \leq 0.05$)

Physicochemical properties of C. corallina rice seasoning powder compared with commercial rice seasoning powder

The best formulation of Chara rice seasoning powder was evaluated for physical and chemical quality, and compared with two commercial rice powders, Hon Katsuo brand and Nichifuri brand, rice seasoning powders available in the local market, selected for this research.

The formulation of rice seasoning (Furikake) powder containing *C. corallina* at 7.5% and 10% w/w), Hon Katsuo brand and Nichifuri brand, can be seen, as presented in Figure 3.

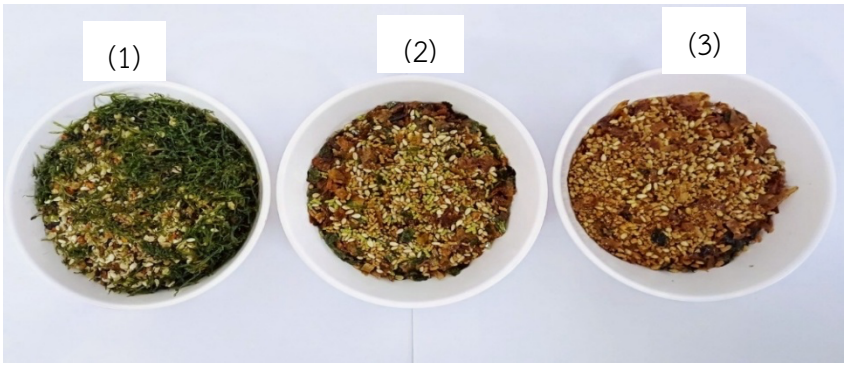

Figure 3. Rice seasoning powder containing 7.5% algae (1) and commercially available products, Hon Katsuo brand (2), and Nishifuri brands (3)

Results of chemical quality testing for protein, fat, carbohydrate, fiber, and ash content, according to the AOAC (2000) method, showed that the rice topping powder containing 7.5% kelp was yellowish green and had a higher Hon Katsuo and Nichifuri brands, which had protein contents of 9.11+0.04, 3.44+0.01, and 3.66+0.08 percent, respectively, as shown in Table 6.

The chemical composition of the rice seasoning powder containing 7.5% algae and two commercially available products, which were Hon Katsuo brand, and Nishifuri brands showed significant differences($p \leq 0.05$) in the lipid, protein crude fiber, and ash content (Table 5).

Lipid content found in rice seasoning powder containing 7.5% *C. corallina* algae, having the highest estimate at 1.34%, while the lowest estimate was recorded to be 0.99% in Hon Katsuo brand. Protein content ranged from 3.44% to 9.11%, with the highest amount being observed in rice seasoning powder containing 7.5% *Chara corallina* algae and the lowest quantity being observed in Hon Katsuo brand. For crude fibre and

carbohydrate content, there were no significant differences with all three samples ($p \leq 0.05$).

Table 5. Chemical composition of the rice seasoning powder containing 7.5% algae and two commercially available products

sample	Chemical composition content (%)				
	Lipid	Protein	Crude fiber^{ns}	Ash	Carbohydrate^{ns}
1	1.34±0.04^{b}	9.11±0.04^{a}	12.56±0.08	4.63±0.06^{b}	68.96±0.22
2	0.99±0.01^{a}	3.44±0.01^{b}	10.17±0.12	13.18±0.06^{a}	70.80±0.16
3	1.42±0.01^{b}	3.66±0.08^{b}	11.38±0.07	12.11±0.03^{a}	69.86±0.12

Note : sample 1 was rice seasoning powder containing 7.5% algae, sample 2 was commercially products, Hon Katsuo brand, sample 3 was commercially products, Nishifuri brands, Mean followed by different letters in the same column differs significantly ($p \leq 0.05$)

The physical composition of the rice seasoning powder containing 7.5% algae and two commercially available products, being Hon Katsuo brand, and Nishifuri brand showed significant differences($p \leq 0.05$) in the moisture content (%) and water activity (aw) (Table 5). Moisture content ranged from 1.44% to 3.42% across all samples.

Table 6. Physical composition of the rice seasoning powder containing 7.5% algae and two commercially available products

sample	Moisture content (%)	Water Activity (a_w)
1	3.42±0.01^{a}	0.43±0.00^{c}
2	1.44±0.01^{b}	0.24±0.00^{a}
3	1.59±0.01^{b}	0.31±0.00^{b}

Note : sample 1 was rice seasoning powder containing 7.5% algae, sample 2 was commercially products, Hon Katsuo brand, sample 3 was commercially products, Nishifuri brands, Mean followed by different letters in the same column differs significantly ($p \leq 0.05$)

When the energy value was examined, it was found that the rice seasoning powder containing 7.5% algae, had an energy value of 545.91 kilocalories per 100 grams, which was higher than the commercially available products, Hon Katsuo and Nichifuri, which have energy values of 436.51 and 475.7 kilocalories per 100 grams, respectively.

For the caloric content analysis of gross energy showed higher levels in rice seasoning powder containing 7.5% algae. Lowest caloric value, which was statistically significant different ($p \leq 0.05$) were recorded with

the commercially products, Hon Katsuo rice seasoning brand, as seen in Table 7.

Table 7. caloric content of the rice seasoning powder containing 7.5% algae and two commercially available products

sample	Caloric content (kcal/ 100g)
1	545.91[a]
2	436.51[b]
3	475.70[b]

Note : sample 1 was rice seasoning powder containing 7.5% algae, sample 2 was commercially products, Hon Katsuo brand, sample 3 was commercially products, Nishifuri brands, Mean followed by different letters in the same column differs significantly ($p \leq 0.05$)

Discussion

The physical quality study of dried yellow stripe trevally fish, dried at 70°C for 3 hours, revealed a moisture content not exceeding 8% (5.48±0.01) and a water activity (aw) of 0.48±0.00. It was found to be in accordance with the product standards of the fish floss, fish scales and dried fish meal industries TIS 700-2530. This is consistent with the research of Nuchnum (2008), which found that there were only 2 conditions that resulted in dried fish meat having the specified properties: at a temperature/time (degrees Celsius/hour) of 60/3 and 70/3, respectively.

In terms of nutritional value (proximate composition), this rice seasoning powder formulation contains 68.96% carbohydrates, 12.56% crude fiber, and 9.11% protein, providing an energy content of 545.91 kcal per 100 grams. This significant content of dietary fiber and carbohydrates results from the cell wall structure of a freshwater alga rich in dietary fiber as well as the inclusion of white and black sesame seeds. This is consistent with the research of Bunsiri *et al. (*2025) to develop rice seasoning (Furikake) using salted seabass sourced from Songkhla Lake. Nutritional analysis revealed that 100 grams of the Furikake provided 315.68 kilocalories, consisting of 3.395 grams of fat, 38.85 grams of protein, 32.43 grams of carbohydrates, 2.28 grams of fiber, 14.16 grams of moisture, and 11.17 grams of ash.

In addition, the findings are consistent with a study on the nutritional value and certain characteristics of commercial furikake containing fish meat that was found that the protein content in five brands of commercial rice seasoning powders was derived from the proportions of fish, fermented soybeans, and sesame seeds. The carbohydrate content came from granulated sugar and sesame seeds, which contain complex carbohydrates.

The dietary fiber content of all five brands of commercial rice seasoning powders was found to be very low, despite containing sesame seeds or seaweed as ingredients (Prachongphan *et al*., 2019).

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Conflicts of interest

The authors declare no conflict of interest.

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