Chemical and Sensory Characteristics of *Boranan* Instant Chili Sauce with Different Coconut Milk Powder Concentration, Rice Flour, and Dry Grated Coconut

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ABSTRACT

Sego Boranan is a special food from Lamongan, East Java. They are cooked rice with various dishes flavored with a special chili sauce called *Boranan* sauce. Sauce consists of many ingredients with complex process production. Therefore, the study aimed to make *Boranan* sauce formulation coming from dry-based ingredients. Conversion of *Boranan* sauce recipe from fresh ingredients into powder preparations was carried out using water content data. Coconut milk powder, rice flour, and dry-grated coconut concentration was optimized within 9 sample formulations. All the samples were observed in chemical and sensory characteristics. The parameters observed included pH, proximate test, and preference test (color, aroma, texture, spices taste, and overall). The best formulas were compared with freshly made *Boranan* sauce. The pH and water content were not influenced significantly, in the other hand, the others (color, fat content, texture, aroma, taste, and overall sensory parameters) showed significant differences. Based on the preference test, high preference with a score of 7.91 acceptance value from a 10 scale was gained by both K2S1R1 and K1S2R1 samples. Although the panelist gave a "like" score, both samples showed significant sensory acceptance and proximate value differences from fresh-made *Boranan* sauce. The selected formula K2S1R1 was made from 4.5% dry grated coconut, 2.25% coconut milk powder, and 2.25% rice flour. The Rehydrated K2S1R1 sample had 70.7% (wet basis) water content, 1.4% ash content, 17.5% absorbent content, 0.5% protein content, and 8.8% carbohydrate content.

Keywords: Chili; coconut; instant sauce; Lamongan; Sego *Boranan*

INTRODUCTION

Traditional food is food that has been made since the days of our ancestors and continues today. Traditional food contains elements of uniqueness in each region and has its historical value (Mardhiyyah, 2019; Suter, 2014). One of the interesting traditional foods for potential development is *Sego Boranan*. *Sego Boranan* or *Sego Boran* or *Boranan* rice is one of Lamongan's special culinary which is known for its spicy flavor (AL-Furoidah & Nurlaela, 2019; Asworo, 2012; Susanto, 2016). *Boranan* culinary is rice served with various side dishes such as chicken, milkfish, *Sili* fish, intestine, omelet, *ndog-ndogan* /forerunner of eggs, tofu, and tempeh which is given spicy seasoning or can be called *Boranan* chili sauce (Rahma, 2021; Suwandojo, 2020).

The word *Boranan* comes from the word *boran* (Javanese language) which means a giant rice bowl made

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of bamboo (Ismawati, 2021). The main characteristics of *Sego Boranan* are 1) the sellers place rice in *boran*; 2) the dishes served with thick gravy/seasoning, *rempeyek* (crisp and thin crackers made from flour and peanuts, shrimps or small fish) and *urap* (vegetable veggies); and 3) the presence of empok, pletuk, and fish (milkfish, curses, or *sili*) and the dishes (Ismawati, 2021; Rahma, 2021; Ramadhan & Handayaningrum, 2021; Suwandojo, 2020).

This cuisine can be enjoyed along with Lamongan North Beach Line (*pantura)* close to Lamongan Station on Babat-Surabaya main province road or Jenderal Sudirman Street, starting from Lamongan Plaza to Surajaya Station, Lamongan (Ismawati, 2021). *Sego Boranan* traders make a temporary mat on the roadside for selling the cuisine. Generally, traders start to open their shades in the afternoon until early morning. Traditionally, the people of Lamongan generally eat *Sego Boranan* as a family dinner menu, or a menu when they get home from work on the bus/after getting off the train at Lamongan Station.

Sego Boranan has also been widely known outside Lamongan community and has become one of the culinary tourism. Lamongan Regency Government itself has registered *Sego Boranan* as Lamongan Geographical Indication (Lamongan, 2019). The increase in *Sego Boranan* sellers shows that the interest of the people outside Lamongan in this cuisine is quite high. Even the sales of *Sego Boranan* from 1994 to 2015 did not decline, but it had developed very rapidly until now (Pamungkas & Murtini, 2015). The uniqueness of *Sego Boranan* lies in its distinctive seasoning or *Boranan* chili sauce. Spicy flavors combined with various spices produce a distinctive flavor.

Boranan chili sauce is made from many spices and herbs (Rianti *et al.*, 2022) with large amounts of chilies, and has thick characteristics (Ismawati, 2021). Eleven kinds of herbs and spices are used in *Boranan* formulation. They are candlenuts, shallots, coriander, kaempferia galangal, galangal, garlic, cumin, curly red chili, cayenne pepper/small chili, lime leaves, and leeks. The addition of roasted grated coconut and rice flour made sauce thick. The production of *Boranan* chili sauce starts with cleaning the herbs and spices, grinding, cooking with water, adding the roasted grated coconut and rice flour until gets the proper thickness, and adding seasoning such as salt and sugar (Rianti *et al.*, 2022).

On the other hand, increased levels of community activity and instant lifestyle persist in every part of human activity, including the need for seasoning in food production. Millennial people tend to want everything fast, easy, and practical (Oyesiji *et al.*, 2019). Likewise, in the case of food, people prefer what can be processed and served quickly and easily. Various food preparations serve as an alternative to developing products instantly. Instant food is a kind of cuisine that is served directly or without long cooking.

The public wants everything practical like instant food or drinks. Instant products can be divided into two categories, namely instant food groups and instant dishes. Instant food is food that can be prepared quickly, easily, practical, and nutritionally maintained. Instant foods are half-cooked foods that must be given special treatment before being eaten, for example by heating, cooking or simply adding plain water or boiling water (Oyesiji *et al.*, 2019), such as instant noodles. Moreover, instant dishes are food that is ready to eat without any preparation, such as ready-to-eat sausage.

Instant seasoning is a mixture of several spices with a predetermined composition and can be directly used as a seasoning for cooking certain foods (Ayu W *et al.*, 2016). Instant seasoning was prepared by drying process followed by powdering thus mixing (Yuasa *et al.*, 2017; Yuniastri & Putri, 2019). Some Indonesian cuisines such as *rawon, soto, rendang*, etc., which are generally complex seasoning and cannot be served quickly, have been innovated in the form of instant seasoning (Yuniastri & Putri, 2019). Therefore, this technology could be used to produce instant *Boranan* chili sauce from dry ingredients.

The high interest and the complexity of formulations and production process in *Boranan* chili sauce are driving the innovation of making instant *Boranan* chili seasoning or sauce. Therefore, the study objective was to make instant *Boranan* chili sauce formulation from dry-based ingredients, to ensure that consumers get instant seasoning that could be prepared by simply cooking with water. The shifting from freshly made into instant seasoning might bring different sensory acceptance and chemical characteristics (Siripongvutikorn *et al.*, 2009; Yuasa *et al.*, 2017). The organoleptic and chemical characteristics of *Boranan* chili sauce were also being analyzed in this study.

METHODS

Boranan sauce/seasoning consisted of eleven spices and five other ingredients, namely candlenut, shallots, coriander, kaempferia galangal, galangal, garlic, cumin, curly red chili, cayenne pepper/small chili, lime leaves, and leeks. Other ingredients were coconut milk powder, dry-grated coconut, rice flour, sugar, salt, and water. All spices used were fresh and purchased in the local market.

The manufacture of instant *Boranan* seasoning was done using dried spices-based ingredients. The spices

such as candlenuts, shallots, coriander, kaempferia galangal, galangal, garlic, cumin, curly red chili, and cayenne pepper/small chili, were obtained in powder. They bought from Hypermart Supermarket. While lime leaves and leeks were bought from the Gresik traditional market. Dry grated coconut on the market generally is a type of dry grated coconut that has been taken its fat or coconut milk. Therefore, in the manufacture of instant spices *Boranan* from these dried preparations, the ingredients are formulated to consist of coconut milk powder and dry grated coconut. Commercial rice flour is also an important ingredient that influences the texture and the development of sauce flavor. Coconut milk powder, rice flour (Rose Brand brand), and dry grated coconut were bought from Toko Bahan Kue (Tobaku) in Gresik.

Sample Preparation and Formulation

There were nine treatments of *Boranan* seasoning formulations, as in Table 1.

In conventional, the production of *Boranan* chili sauce started with boiling chili using a pot (Jawa pot, Indonesia), then all spices (except lime leaves and leeks) were mashed (Philips Blender, Indonesia) and then roasted with grated coconut in dry pan (Jawa-aluminum pot, Indonesia). Boiled chilies and roasted herbs then mashed (Philips Blender, Indonesia). The spices were then sautéed (Jawa-aluminum pot, Indonesia), and a solution of rice flour was added so that it thickened, just before boiling orange leaves and sliced leeks were added. *Boranan* chili sauce was ready to be used after boiling.

The steps of *Boranan* instant sauce production are described below. It was a slightly different process production compared to conventional *Boranan* sauce production. All dry-based spices (in powdered form), including candlenut, shallots, coriander, kaempferia galangal, galangal, garlic, cumin, curly red chili, cayenne pepper/small chili, (Hypermart Gresik, Indonesia) are mixed based on the formula in Table 1. The amount of dry ingredients was calculated from the original fresh ingredients formula that was converted into dry ingredients based on the water content using Equation 1.

$$weight\ of\ dry\ ingredients = \frac{100}{100\text{-}WC_d}\ x\left[\frac{100\ -\ WC_f}{100}\ x\ weight\ of\ fresh\ ingredients\right] \quad (1)$$

Notes:
WC_f: water content of fresh ingredients
WC_d: water content of dry ingredients

Table 1. Formulation of *Boranan* seasoning sauce

Material (g)	K0S0R4 (%)	K0S1R3 (%)	K0S2R2 (%)	K1S0R3 (%)	K1S1R2 (%)	K1S2R1 (%)	K2S0R2 (%)	K2S1R1 (%)	K2S2R0 (%)
Candlenut	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50
Garlic	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50
Red onion	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25
Coriander	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50
Galangal	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75
Kaempferia galangal	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37
Curly chili	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
Cayenne pepper	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75
Grated coconut	0.00	0.00	0.00	2.25	2.25	2.25	4.49	4.49	4.49
Coconut milk powder	0.00	2.25	4.49	0.00	2.25	4.49	0.00	2.25	4.49
Cumin	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50
Rice flour	8.99	6.74	4.49	6.74	4.49	2.25	4.49	2.25	0.00
Sugar and salt	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
Water	74.91	74.91	74.91	74.91	74.91	74.91	74.91	74.91	74.91
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Notes: * K0: 0% dry grated coconut, K1: 2.25% dry grated coconut, K2: 4.5% dry grated coconut, S0: 0% coconut milk powder, S1: 2.25% coconut milk powder, S2: 4.5% coconut milk powder, R0: 0% rice flour, R1: 2.25% rice flour, R2: 4.49% rice flour, R3: 6.74% rice flour, R4: 8.99% rice flour

An amount of dry grated coconut (K) and coconut milk powder (S) based on Table 1 formula and all the mixed powdered spices are mixed in dry mixer (Philips Blender, Indonesia) to produce dry mix of *Boranan* instant sauce. Therefore, dry mix was roasted (Jawa-aluminum pot, Indonesia) for around 2 minutes. To dehydrate th roasted dry mix of Bornaan, water and rice flour (R) (Rose Brand, Indonesia) were added. In the final, a sheet of lime leaves and fried leeks were added to *Boranan* instant sauce, and sauce boiled. Dehydrated *Boranan* instant sauce samples were collected from a pan and packed in food-grade plastic boxes.

Chemical Analysis

The nine samples of dehydrated *Boranan* instant sauce analyzed chemical characteristics. Chemical laboratory analysis related to the nutritional value was done by performing proximate analysis. The proximate analysis consists of water content content by oven method which is dried by oven (Memmerth, Germany), ash content by furnace (Thermo Fisher, USA) method, protein content by Kjeldahl method, fat content by Soxhlet method based on the Association of Official Analytical Community (AOAC (Association of Official Analytical Chemists), 1997) and analysis of carbohydrate by difference. For protein and fat analysis, the glass apparatus (Iwaki, Japan) was used. The hot plate (Thermo Scientific, USA) was used for the process. The pH was determined using a pH meter (Eutech, USA). This assay was done in triplicate. Lastly, for chemical analysis, the selected dehydrated *Boranan* instant sauce sample was compared to the proximate analysis with the freshly made *Boranan* sauce. The result is shown in Table 4. This assay was also done in triplicate.

Sensory Evaluation (Meilgaard *et al.*, 1999)

There were two kinds of sensory analysis in this study. They were the hedonic test among 9 samples of dehydrated *Boranan* instant sauce and the discriminative test among the selected dehydrated *Boranan* instant sauce and the freshly made *Boranan* sauce different from the control test. All sensory analyses were conducted in the morning and the afternoon at UISI's laboratory. Based on (Meilgaard *et al.*, 1999), the minimum number of panelists in the hedonic test was 70. In this study, the evaluation test of the product was performed by 75 panelists who declared themselves to be familiar with *Sego Boranan*. They are between 17 and 30 years old, selected among students and employees from the university.

Samples (around 15 grams) were served at room temperature (around 25°C) in a 200 ml cup, and fried potatoes were used as the carrier. The samples were coded with random three-digit codes and served one by one to the panelists, with a pause of around 15 minutes for three samples. Water at room temperature and sliced bread were provided for the panelist to clean the palate between the samples' assessment and avoid sensory fatigue. Each panelist had 3-6 samples each day, so in total, the panelists tested in two days for nine samples.

To verify the samples' acceptance of *Boranan* seasoning or sauce, the hedonic/preference test was applied using a 10-cm line scale. Panelists pointed to the 10-cm line and the length was measured. Ranging from extremely dislike (0 cm) to extremely like (10 cm). The complete scale is 10 = very, very like, 8 = really like it, 7 = like 6 = a little like 5.5 = like enough, 5 = between dislike and like, 4 = a little dislike, 3 = don't like it enough, 2 = don't like it, 1 = very dislike, and 0 = really don't like it, they were based on Labelled Affective Magnitude (LAM) scale (Kemp *et al.*, 2011). The samples' acceptance was analyzed in many attributes, i.e., color, aroma, texture, flavor, and overall impression.

Lastly, the selected formula was tested by different from the control test. In this discriminative test, the number of panelists was 30 panelists (Meilgaard *et al.*, 1999). The panelists were different from the previous panelists, and they did not have to declare themselves as being familiar with *Sego Boranan*. To verify the samples' difference from control samples, the test was applied using the scale of the 7-point differences, ranging from no difference or same (score 0) to extreme difference (score 6). The samples' difference was used to rate the overall impression.

Statistical Analysis

The water content, lipid, pH, sensory hedonic/acceptance data, and sensory discriminative data of each sample were submitted to analysis of variance (ANOVA) at a significance level of 5%, with different formulations as sources of variation, using the software of SPSS version 20.0. The Duncan test was applied to determine the difference in the samples' data means for each analysis. On the other hand, the Dunnet test was applied in sensory discriminative data to determine the difference between the selected formula sample and the freshly made *Boranan* chili sauce sample. The proximate analysis of freshly made and instant *Boranan* sauce was analyzed using a t-test.

RESULTS AND DISCUSSION

Chemical Characteristics

The development of new traditional food-based products is one of the trends and at the same time

Table 2. Water content content (wet basis), fat (wet basis), and pH content of *Boranan* sauce*

Sample**	Water content (%)	Fat content (%)	pH
K0S0R4	77.60±4.16^{a}	4.07±1.47^{a}	6.16±0.07^{a}
K0S1R3	74.81±5.79^{a}	4.49±0.58^{ab}	6.17±0.05^{a}
K0S2R2	74.69±6.61^{a}	4.88±0.27^{abc}	6.21±0.10^{a}
K1S0R3	79.97±4.42^{a}	5.59±0.12^{abc}	6.15±0.07^{a}
K1S1R2	77.49±3.86^{a}	5.98±0.98^{abcd}	6.17±0.05^{a}
K1S2R1	77.45±1.94^{a}	5.34±0.21^{abc}	6.19±0.09^{a}
K2S0R2	75.12±4.16^{a}	6.98±1.61^{cd}	6.14±0.04^{a}
K2S1R1	77.39±2.40^{a}	6.59±1.05^{bcd}	6.17±0.05^{a}
K2S2R0	75.82±6.68^{a}	7.90±0.20^{d}	6.20±0.07^{a}

Notes: *Analysis was done in dehydrated *Boranan* instant sauce samples. Data are presented as mean± SD (n=3). Value with different superscript letter within the column is statistically different ($p<0.05$) by using the Duncan test.
** K0: 0% dry grated coconut, K1: 2.25% dry grated coconut, K2: 4.5% dry grated coconut, S0: 0% coconut milk powder, S1: 2.25% coconut milk powder, S2: 4.5% coconut milk powder, R0: 0% rice flour, R1: 2.25% rice flour, R2: 4.49% rice flour, R3: 6.74% rice flour, R4: 8.99% rice flour

attempts to solve the problem of food products in Indonesia. Likewise, with this *Boranan* chili sauce formulation. Dry preparations of spices were chosen as a solution to the practicality of making herbs. Dried herbs are also easily available on the market. The water content and fat content were selected to characterize all 9 samples of *Boranan* instant sauce. Chemical characteristics observed were water content, fat content, and pH (Table 2).

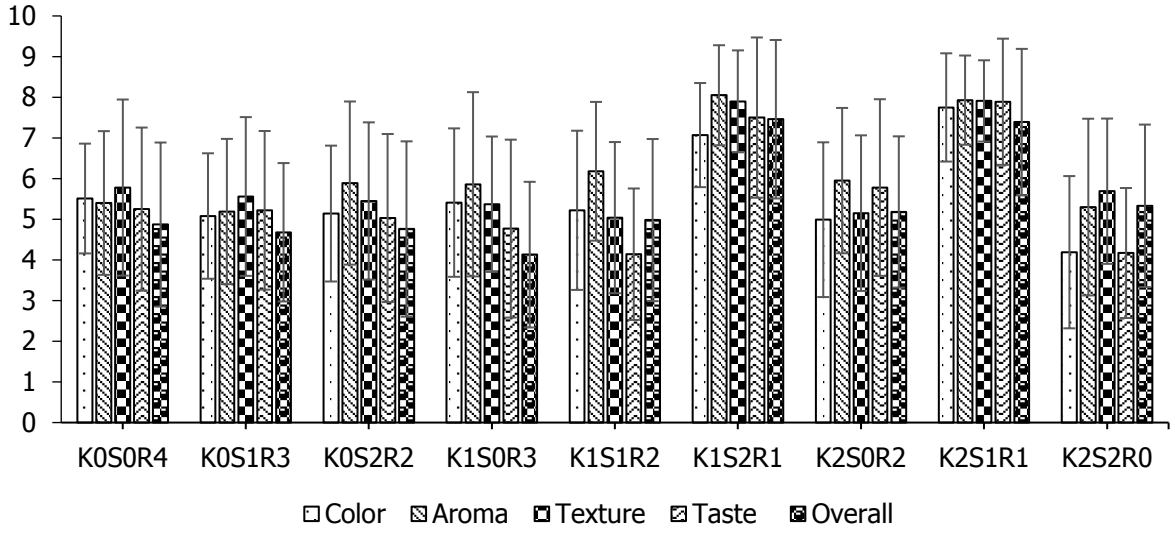
Table 2 shows that the difference between coconut milk powder, rice flour, and grated coconut powder in the formulation had no significant difference in the pH value, with a range of 6.15-6.21. This pH range was similar to other pH of chili sauce they were 5.73 - 6.40 (Suhartini *et al.*, 2019). The resulting sauce has shown that all samples had a low acidic pH. It was caused by ingredient composition that consisted of spices that originally had acidic pH, such as chili (Renate *et al.*, 2014). This value of *Boranan* chili sauce pH still needs additional treatment to get a long shelf life. It was the same with commercial chili sauce. Although the pH of commercial chili sauce composed of chili, garlic, and seasoning was in the range below 4.5 (Gamonpilas *et al.*, 2011), commercial chili sauce also used antimicrobial agents and additives.

The water content was not affected by the formulation treatment, with a range of 74% to 77% (Table 2). There was no significant in water content caused by the number of waters that added was also the same (74.91%). It was different from the hypothesis that the addition of more grated coconut and rice flour would give a higher water content. Rice flour would absorb water and produce a sticky texture (Baxter *et al.*, 2004).

While the fat content showed a significant difference. The K2S2R0 formulation has a fat content of 7.90%, the highest compared to eight other samples. The K0S0R4 seasoning sample has the lowest fat content, which is 4.07%. Those two samples had differences in the amount of dry grated coconut and coconut milk powder, a higher amount of those two ingredients caused higher fat content. (Fauzan & Rustanti, 2013) states that the fat content in coconut milk powder is 2.5% while in dry grated coconut, it is 15%. The fat content of sauce formulations would influence the texture and acceptance of the product (Usawakesmanee *et al.*, 2005). Although in this study sensory acceptance of the two samples above was similar.

Sensory Characteristics

The difference in chemical characteristics above also affects sensory characteristics of *Boranan* sauce samples. A total of 75 untrained panelists were asked to test the preferences of *Boranan* sauce sample. Sensory characteristics observed included color, aroma, texture, taste, and overall. Various formulations of coconut milk powder, rice flour, and dry-grated coconut have a great influence on color characteristics. Two samples with the highest color preference values were obtained, namely the K1S2R1 sample (7.07) and the K2S1R1 sample (7.75). The other seven samples only had color preference values in the range 4.19-5.41 (Figure 1).



Notes: *Analysis was done in dehydrated *Boranan* instant sauce samples. Data are presented as mean± SD (n=75). Value with different superscript letter within the same pattern of each bar is statistically different ($p<0.05$) by using the Duncan test. ** K0: 0% dry grated coconut, K1: 2.25% dry grated coconut, K2: 4.5% dry grated coconut, S0: 0% coconut milk powder, S1: 2.25% coconut milk powder, S2: 4.5% coconut milk powder, R0: 0% rice flour, R1: 2.25% rice flour, R2: 4.49% rice flour, R3: 6.74% rice flour, R4: 8.99% rice flour. *** 0 = really, really don't like it. 1 = very dislike. 2 = don't like it. 3 = quite dislike. 4 = a little dislike. 5 = between dislike and like. 5.5 = like enough. 6 = a little like. 7 = like. 8 = really like it. 10 = really, really likes

Figure 1. Panelist acceptance value of *Boranan* instant sauce

Instant *Boranan* chili sauce has a red color that comes from chili powder color. Chili powder was made from crushed red pepper which has a strong spicy flavor. Although the amount of chili powder used in all nine samples was the same, it produced different results in color acceptance by panelists. It was caused by the amount of coconut milk powder, rice flour, and dry-grated coconut powder that contributed to the product's color brightness. The hydration process in the cooking of dried powder spices into cooked seasoning sauce would affect the amount of water absorbed and produce different levels of brightness between sauce samples. This produced the difference in red color sauce, even though the amount of chili powder used was the same in every formulation. Other study about the color of instant seasoning was also observed. It was reported that in contrast to the paste-based instant tom yum soups, powder-based and liquid-based instant tom yum soups tended to have a lighter color and a lower number of particles and oil (Kitsawad & Tuntisripreecha, 2016). Powder-based instant tom yum soups were easier to swallow since the components were completely dissolved in water during preparation. These phenomena might also happen in *Boranan* chili sauce.

The texture and aroma characteristics also obtained significant results. Both the K1S2R1 and K2S1R1 *Boranan* sauce samples had higher preference values than the other seven samples. The texture characteristics of K1S2R1 and K2S1R1 samples had the same value preferences of 7.91 (like). The other seven samples got a texture preference value in the range of 5.04-5.78 (like enough to be a little like). The dehydrated *Boranan* instant sauce produced an aqueous paste texture (Figure 2). As with color characteristics, the effect of cooking with water and heat would affect the interaction of powdered coconut, coconut milk, and rice flour to produce different textures. Figures 2 and 3 show the appearance of each sample of *Boranan* instant sauce (dehydrated mix of spices).

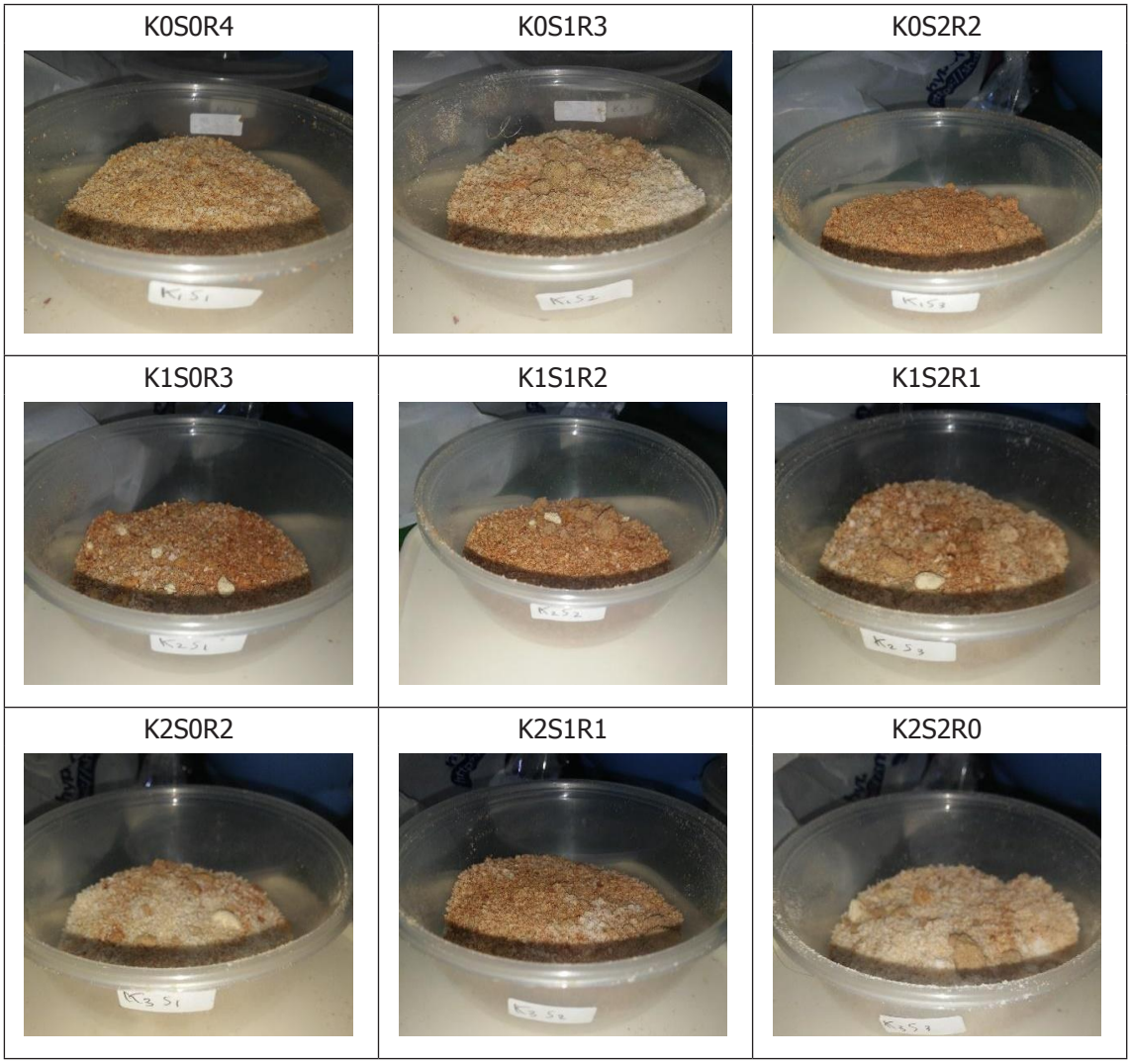
A lower concentration of dry-grated coconut (K) and rice flour (R) produced aqueous pasta sauce and vice versa. It was in line with other study that showed higher rice flour concentration increases the thickness of Gochujang (Kwon *et al.*, 2015). When rice is ground, amylopectin molecules are broken down into low molecular weight fragments by the mechanical force applied. Flour with a fine particle size has more swelling power and is thus more prone to forming rigid gel structures than coarse-particle rice flour (Margasahayam & Balraj, 2018). All three ingredients (K, S, and R) were important for obtaining the optimum texture of *Boranan* sauce that was liked by the panelist and described just like freshly made *Boranan* chili sauce (Ismawati, 2021).

* K0: 0% dry grated coconut, K1: 2.25% dry grated coconut, K2: 4.5% dry grated coconut, S0: 0% coconut milk powder, S1: 2.25% coconut milk powder, S2: 4.5% coconut milk powder, R0: 0% rice flour, R1: 2.25% rice flour, R2: 4.49% rice flour, R3: 6.74% rice flour, R4: 8.99% rice flour

Figure 2. Dehydrated *Boranan* instant sauce samples

The aroma attribute also shows that two samples of K1S2R1 and K2S1R1 are the most preferred samples among other samples. Panelists perceived the aroma of *Boranan* chili sauce as spicy aroma, produced from chili powder. The panelists preferred a spicy aroma but not strong enough that make them sneeze. It was stated that for the seasoning the flavor (aroma) should be fresh and specific (Farrell, 1998). It stated that the number of components and interactions between components have positive correlations in increasing the hedonic score of muffins from composite flour(Hari Purnomo *et al*., 2012). A combination of powdered coconut, coconut milk powder, and rice flour in the right formula would produce a good consistency of sauce texture and influence the flavor release. researcher stated that the quality of red chili powder is also determined by the particle size & color(Margasahayam & Balraj, 2018). Smaller particles aid in flavor release during cooking while a bright color connotes freshness.

The attributes of aroma, color, texture, taste, and overall, from K1S2R1 and K2S1R1 samples show higher preference values, and they are significantly different from the other seven samples. Both samples have a favorite value on a scale of 7 (like), while the other seven samples only on a value of 4-5 (a slight dislike up to between dislike and like). Products with K1S2R1 and K2S1R1 formulations were thereby selected as panelist preference products. The selected products will be tested for the differences from



Notes: * K0: 0% dry grated coconut, K1: 2.25% dry grated coconut, K2: 4.5% dry grated coconut, S0: 0% coconut milk powder, S1: 2.25% coconut milk powder, S2: 4.5% coconut milk powder, R0: 0% rice flour, R1: 2.25% rice flour, R2: 4.49% rice flour, R3: 6.74% rice flour, R4: 8.99% rice flour

Figure 3. Dry mix of *Boranan* instant sauce spices

Table 3. Differences between fresh *Boranan* sauce (control) and dehydrated *Boranan* instant sauce

Sample*	Differences**	Significance
K1S2R1	1.36	$p < 0.001$
K2S1R1	1.27	$p < 0.001$

Notes: *K0: 0% dry grated coconut, K1: 2.25% dry grated coconut, K2: 4.5% dry grated coconut, S0: 0% coconut milk powder, S1: 2.25% coconut milk powder, S2: 4.5% coconut milk powder, R0: 0% rice flour, R1: 2.25% rice flour, R2: 4.49% rice flour, R3: 6.74% rice flour, R4: 8.99% rice flour
**0 = no difference/same. 1= slightly different .2= a little different 3= moderate 4= quite different 5=different 6=very different

Boranan sauce products made in conventional ways. The control of *Boranan* sauce was made from fresh spices. The result of differences with the control test is shown in Table 3.

Both samples showed significant differences with control or original freshly made *Boranan* chili sauce. This is due to the differences in sample raw materials. Instant *Boranan* sauce used dry material while *Boranan* control used wet material. Different concentration of coconut milk powder, rice flour, and dry-grated coconut in the sample caused a difference from the control. Sauce flavor was influenced by drying process. Based on (Ge *et al.*, 2020), the volatile flavor compounds of pepper would be lost during hot air drying. Therefore, it made great differences between the sample and the control.

Table 4. Results of proximate analysis from the K2S1R1 dehydrated *Boranan* instant sauce sample and the fresh *Boranan* sauce (control)

No.	Nutritional component (in wet based)	K2S1R1 sample**	Fresh *Boranan* sauce
1	Water content content (%)	70.73 ± 0.09[a]	73.42 ± 0.08 [b]
2	Ash content (%)	1.44 ± 0.03 [a]	1.44 ± 0.03 [a]
3	Fat content (%)	17.50 ± 1.68 [a]	21.23 ± 0.08 [b]
4	Protein content (%)	0.55 ± 0.09 [a]	0.83 ± 0.09 [b]
5	Carbohydrate content (%)	8.78 ± 0.21 [a]	3.08 ± 0.06 [b]

Notes: *Data are presented as mean± SD (n=3). Value with different superscript letter within the row is statistically different ($p<0.05$) by using a t-test.
** K2: 4.5% dry grated coconut, S1: 2.25% coconut milk powder, R1: 2.25% rice flour

Determination of The Best Formula of Instant *Boranan* Chili Sauce

Although both samples have significant differences from the freshly made *Boranan* sauce, the K2S1R1 has a lower basic production cost/cheaper than the K1S2R1 sample. A 20 gram-sachet of coconut milk powder has price around Rp 2.500,00. While, 250 gram of dry-grated coconut has price around Rp 25.000,00. The price of dry-grated coconut is cheaper than coconut milk powder. The K2S1R1 used lower coconut milk powder concentration (2.25%) than K1S2R1 formula (4.49%). From the calculation, the price of the K2S1R1 and K1S2R1 formula respectively were Rp 4.721/pack and Rp 4.871/ pack (Price were calculated in July 2022). Therefore, the K2S1R1 sample was selected as the best formulation. Moreover, almost all hedonic score in the K2S1R1 sample was higher than the K1S2R1 sample. The hedonic value of color was 7.75, the value of aroma was 7.93, the value of texture was 7.91, the value of taste was 7.89 and the value of overall was 7.39 (Figure 1).

The K1S2R1 samples and the freshly made *Boranan* sample were analyzed using the proximate test. The result of the proximate test is shown in Table 4. The differences in raw materials not only caused different sensory values but also the nutritional value. In some cases, dry ingredients might lose some fat or protein due to drying process (Margasahayam & Balraj, 2018). Therefore, fresh *Boranan* sauce has higher fat, water content, and protein content, significantly.

All three ingredients (K, S, and R) were important to produce the acceptable instant *Boranan* chili sauce although not all parameters were significantly affected. The freshness of spices and herbs also needs to be considered for the next study in affecting the quality of the product, specifically because the production was still on a household/domestic scale. As (Margasahayam & Balraj, 2018) stated spices are powdered to release flavor but higher temperature during grinding and storage has deteriorative effects on its quality.

CONCLUSION

In conclusion, various concentration of coconut milk powder, rice flour, and dry-grated coconut showed no variance in pH. However, the other parameters (color, fat content, texture, aroma, taste, and overall sensory parameter) gave significant differences. Based on the preference test, the highest score was obtained by both K2S1R1 and K1S2R1 samples. The K2S1R1 sampe showed higher score in almost all hedonic parameter so that itwas selected as the best formula. K2S1R1 sample was made from 4.5% dry grated coconut, 2.25% coconut milk powder, and 2.25% rice flour. The dehydrated *Boranan* instant sauce with K2S1R1 formula has 70.7% water content, 1.4% ash content, 17.5% fat content, 0.5% protein content, and 8.8% carbohydrate content.

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CONFLICT OF INTEREST

There is no conflict of interest with any party in this study.

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