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Addition of Kecombrang Flower Flour (*Etlingera elatior*) to the Characteristics of Red Beans Noodles

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ABSTRACT: Along with the times, many types of food have changed both in terms of taste, appearance, and presentation. One of the foods favored by the community and easy to serve as wet noodles. Wet noodles supplemented with 10% red bean flour are expected to help fulfill protein. The moisture content of wet noodles reaches 52%, so the shelf life is relatively short. Kecombrang can be used as a preservative to extend the shelf life of wet noodles. This research was conducted to obtain physical, chemical, organoleptic, and shelf life characteristics based on red bean wet noodles' Total Plate Count (TPC). The experimental design used in this study was a single factor Randomized Block Design (RBD), namely the addition of kecombrang flower flour with five treatment levels, namely 1%, 2%, 3%, 4%, and 5%, from 100 g flour (90 g wheat flour + 10 g red bean flour). Each treatment was repeated three times to obtain 15 experimental units. The results showed that the highest water content was 64,33%, the brightest color was in the 1% treatment with a value of 5Y 9/3, while the darkest shade was in the 5% treatment with a value of 5Y 7/2, the highest texture was 37,78 mm/g/ s, the most elevated protein was 14,09%, the highest ash content was 1,17%, the concentration of addition of 5% kecombrang flower flour was able to extend the shelf life of red bean wet noodles for 48 hours, organoleptic characteristics showed that the panelist acceptance rate was at a concentration of 1% - 3 % based on the overall rating.

Keywords: Kecombrang, Red beans, Shelf life, Wet Noodles.

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INTRODUCTION

Along with the times, many types of food have changed for the better in terms of taste, appearance, and presentation. Processing, preservation, and other ingredients make the food more interesting. Food presented practically makes people more selective in choosing the right healthy and nutritious food. One of the foods favored by the community and easy to serve is noodles because noodles can be performed practically and do not take a long time to process. One type of noodle that is much favored by the community is a wet noodle.

The National Standards Agency (2000) states that wet noodles are a product of wet food made from wheat flour and permitted food additives with or without the addition of other food ingredients and the typical shape of noodles that are not dried. Currently, wet noodle products circulating in the market are not nutritionally sound because wet noodles' protein and vitamin content are still relatively low. One ingredient with high protein and vitamins that can be used as flour supplementation wheat in the manufacture of wet noodles is red beans.

Wet noodles supplemented with red bean flour are expected to help fulfill protein because red beans contain vegetable protein, which is very important in improving nutrition. Based on research results by Kardina and Eka (2017), the proportion of addition of red bean flour is 10% in making wet noodles is the most preferred proportion of consumers based on test results preference with a protein content of 7.65%, where the substitution of red bean flour affect the protein content of wet noodles. The more proportions are added, the more protein content will increase.

Wet noodles have a moisture content of up to 52%, so their shelf life is relatively short. Damage to wet noodles is usually characterized by changes in physical quality, such as mold growth, smelling sour and mucus is formed, and changes in texture and stickiness (Enjelina et al., 2019). However, the shelf life of wet noodles is so short that it can be overcome by adding natural preservatives while making wet noodles. One of the natural preservatives that are safe and healthy for consumption is kecombrang. Kecombrang is thought to be one of the natural preservatives that can be used to extend the shelf life of wet noodles.

One of the benefits of kecombrang in food is an antimicrobial that can prevent the growth of molds, bacteria, and yeasts, which are thought to have potential as antioxidants and alternative natural preservatives. Chemical components of flower kecombrang consist of alkaloids, flavonoids, polyphenols, essential oils, saponins, and steroids (Lingga et al., 2016). The use of kecombrang in the form of dry flour is more effective as an antimicrobial than its new form because kecombrang flour will be more awake availability and easy to store and use at any time kecombrang flour will be used as a food additive as long as the ingredients are not damaged (Istianto, 2008).

The addition of kecombrang flour can be directly mixed when manufacturing the dough after the dough is formed. If it is mixed at the beginning of the making, it is feared that it will reduce the activity of the kecombrang flour. Results obtained from the addition of kecombrang flour affect the taste, texture, color, preference value of the panelists, and shelf life of mackerel fish balls (Naufali and Rukmini, 2014). Using 3% kecombrang flower powder in tofu products can maintain shelf life for three days (Naufalin et al., 2014). Using 2% flour kecombrang flowers on cuko pempek can extend the shelf life as long as there is no foam in storage and there is no change in the viscosity of cuko pempek (Fitriansyah et al., 2017).

Food products made from wet noodles are not sold out in the market a day, so they must be stored. This research aims to obtain physical, chemical, organoleptic, and shelf life characteristics based on Total Plate Count (TPC) on peanut wet noodles red with kecombrang flower flour.

MATERIALS AND METHODS

This research was conducted from March to April 2021 at the Agricultural Technology Laboratory, Department of Agricultural Technology, Faculty of Agriculture, Bengkulu University. The main ingredients used in making wet noodles are red beans and kecombrang, used as flour.

The materials used for analysis are analytical balance (kern 440 – 35N), oven (Memmert UN-110), aluminum cup, desiccator, Mobile Munsell soil color chart application, penetrometer (Humbolt), Kjeldahl flask, fume hood, measuring flask, flask distillation, porcelain dish, furnace (Thermo scientific), beaker, spatula, glass stirrer, hotplate, test tube, test tube rack, petri dish, Erlenmeyer, glass bottle, blue tip, autoclave, mortar, vortex mixer (Velp scientifica), micropipette (Dragon lab), colony counter (Erma optical works, Ltd) and spirit lamp.

The experimental design used was a Randomized Block Design (RBD), with the basis of grouping that is replication. The consideration of grouping is based on the day of manufacture because wet noodles are susceptible to damage. The factor used is the addition of kecombrang flower flour with 5 treatment levels, namely K1 = 1%, K2 = 2%, K3 = 3%, K4 = 4%, K5 = 5%, from 100 g flour (90 g wheat flour + 10 g red bean flour). Each treatment was repeated three times so that 15 experimental units were obtained. This research consists of 2 stages: preliminary research and main research. Preliminary research was conducted to determine the shelf life of wet noodles without adding red bean flour and kecombrang flower flour.

The main research began with preparing the materials used in kecombrang flowers and red beans. Then proceed with making kecombrang flower flour through sorting, washing, size reduction, and drying using an oven with an initial temperature of 40°C for 2 hours, followed by a temperature of 60°C for 10 hours flouring using a blender. Making red bean flour goes through sorting, soaking for 24 hours, washing, drying in an oven for ±12 hours at 60°C, and flouring. Making red bean wet noodles through the stages of mixing, kneading, forming flat sheets, forming noodle strands, boiling, cooling, and lubricating using cooking oil.

Physical characteristics testing consists of water content based on SNI 2987: 2015 (BSN, 2015), color test by comparing the color of wet noodles with the color chart on the Mobile Munsell soil color chart (Priandana et al., 2014) and the hardness level by measuring the depth of needle penetration. on the penetrometer (Mujiono, 2012). Chemical characteristic tests consist of testing for protein content (Sudarmadji et al., 1997) and ash content by weighing the remaining minerals from the combustion of organic matter (Sudarmadji et al., 1997). Total Plate Count (TPC) testing to determine the shelf life of wet noodles by counting the number of microbes that grow on the cup during storage at 12 hours, 24 hours, and 48 hours at room temperature based on SNI 2987: 2015 (BSN, 2015). Thirty untrained panelists carried out the test to determine the level of preference. The story of preference testing is done visually with the senses of sight (color), touch (texture), smell (aroma), and taste (taste).

The data obtained from the research results will be analyzed using variance or ANOVA (Analysis of Variance) at the 5% level. If it has a significant effect, it will be continued with DMRT (Duncan's Multiple Range Test) to determine the impact of each treatment. For analyzing organoleptic characteristics data using non-parametric statistics, namely Friedman Test. The software used to process the resulting data is using SPSS 23.

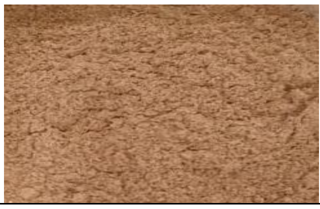
RESULTS AND DISCUSSION

Based on the data obtained, the result of the color test are shown in Table 1. Moisture content, texture, protein content, ash content, Total Plate Count (TPC) during storage 12 hours and 48 hours, organoleptic assessment of color, texture, aroma, taste, and overall are shown in Table 2 - 6.

Color

From Table 1. known that the addition of kecombrang flower flour causes the color of the red bean wet noodles to become darker. The brightest shade of wet noodles was found in the

Table 1. Color of red bean flour, kecombrang flower flour, dough, and wet noodles red beans with the addition of kecombrang flower flour

Sample	Munsell Color Chart Notation	Wet Noodle Color
Red Bean Flour	5Y 9/1	
Kecombrang Flower Flour	7,5YR 7/6	
After kneading	10YR 8/3	
K1 (Adding 1 g of kecombrang flower flour)	5Y 9/3	
K2 (Adding 2 g of kecombrang flower flour)	5Y 9/2	
K3 (Adding 3 g of kecombrang flower flour)	5Y 8/3	
K4 (Adding 4 g of kecombrang flower flour)	5Y 8/2	
K5 (Adding 5 g of kecombrang flower flour)	5Y 7/2	

acquisition of 1% kecombrang flower flour with a value of 5Y 9/3, while the darkest color was found in the expansion of 5% kecombrang flower flour with a value of 5Y 7/2. The brightness level of the wet noodles visually looks different. The difference in the brightness level of the color produced by wet noodles is the formation of color derived from kecombrang flower flour because kecombrang flowers have phenolic compounds that are easily oxidized to produce a brownish color (Shahidi, 1995)

Preliminary Research

Pre-study results showed that wet noodles without adding red bean flour and kecombrang flower flour had a shelf life of 12 hours at room temperature storage. The resulting wet noodles were placed in mica plastic and stored at room temperature. Wet noodles were observed visually with the senses of sight (color), touch (texture), and smell (aroma), and observations were made on the state of wet noodles during storage. Wet noodles stored for more than 12 hours cause the wet noodles to smell stale and slimy and mold to grow. This is in line with Widyaningsih (2006) statement that wet noodles have a relatively short shelf life of 10 to 12 hours at room temperature with a water content of up to 52%, after which the noodles will smell sour slimy. The results of this pre-study were used as a reference for observing the growth of the number of microbes in the Total Plate Count (TPC) of wet noodles.

Physical characteristics

Moisture content

The moisture content of red bean wet noodles ranged from 63.67% to 64.33%, with the highest value in the 1% treatment and the lowest in the 5% treatment. The ANOVA results showed that the addition of kecombrang flower flour had a significant effect on the moisture content of red bean wet noodles. From Table 2. the results of the DMRT further test known that the concentration of addition of 1% kecombrang flower flour did not give a significant difference to the attention of 2% and 3%, but the addition with a higher concentration (4% and 5%) gave a very substantial difference to the decrease in the water content of the noodles. Wet red beans. The grouping of wet noodle making has a significant effect on reducing the water content of red bean wet noodles.

The higher concentration of kecombrang flower flour addition causes the water content of wet noodles to decrease. The decrease in the water content of red bean wet noodles was due to less and less wheat flour as a compactor for wet noodle dough and the addition of kecombrang flower flour, causing less water absorption. This is because the water content of kecombrang flower flour (4.5%) is lower than that of wheat flour (10%) and red bean flour (10%). The decrease in water content of wet noodles is in line with Naufalin et al. (2014) that kecombrang flower powder causes lower water content in fish and tofu as the use of kecombrang flower powder increases.

Table 2. Moisture Content and Hardness of Red Bean Wet Noodles With The Addition of Kecombrang Flower Flour

Treatment	Moisture Content	Hardness
K1 (1%)	64,33 ^{c}	37,78 ^{d}
K2 (2%)	64,17 ^{bc}	36,89 ^{c}
K3 (3%)	64,00 ^{abc}	36,00 ^{b}
K4 (4%)	63,83 ^{ab}	35,55 ^{ab}
K5 (5%)	63,67 ^{a}	35,00 ^{a}

Hardness

The penetrometer measurements show that the larger the number produced, the softer the texture, and vice versa; the smaller the number created, the more complex the surface. The ANOVA results showed that the addition of kecombrang flower flour had a significant effect on the texture of red bean wet noodles. From Table 2. on DMRT further test results known that the addition concentration of 1%, 2%, and 3% kecombrang flower flour gave a significant difference from the 5% concentration. Still, the addition with a concentration of 4% did not provide a substantial difference in making the red bean wet noodle texture harder. The grouping of wet noodle making has a significant effect on the surface of red bean wet noodles.

The hardness value of wet noodles range from 35.00 mm/g/s to 37.78 mm/g/s. The more the addition of kecombrang flower flour, the texture of wet noodles becomes harder. 100 g of kecombrang flowers contain 1.20 g of dietary fiber (Yusuf, 2014). This is in line with the research results by Naufalin and Rukmini (2014); the use of Kecombrang powder with high concentrations causes a decrease in the elasticity of mackerel fish balls because kecombrang powder can reduce the water content of mackerel fish balls. The texture of wet noodles is getting harder with increasing use of Kecombrang flower flour, in line with the water content of wet noodles, which decreases with increasing use of Kecombrang flower flour in making red bean wet noodles.

Chemical test

Protein content

One of the things that affect the protein content of wet noodles is the type of flour used. The flour used in making wet noodles is high protein flour and red bean flour so that the protein content in wet noodles increases. The protein content of red bean wet noodles is 6.17% - 14.09%. The ANOVA results showed that the addition of kecombrang flower flour had a significant effect on the protein content of red bean wet noodles. From Table 3. on DMRT further test results known that the concentration of adding kecombrang flower flour of 1%, 2%, and 3% gave a very significant difference to the attention of 4% and 5% in reducing the protein content of red bean wet noodles. The grouping of wet noodle making has a significant effect on the decrease in protein content of red bean wet noodles.

The results showed that the protein content of red bean wet noodles decreased. This is presumably because the water content in the wet noodles has not been drained optimally. The results obtained are not in line with the research results by Molerman (2014), which states that the higher the percentage of kecombrang use, the higher the protein content because 100 g of kecombrang contains 1 g of protein. Although the protein content of wet noodles has decreased, red bean wet noodles can be consumed and used as foods that contain high protein because the protein content of wet noodles has met the quality requirements of wet noodles, which is at least 6.0% (BSN 2987, 2015).

Ash content

The ANOVA results showed that the addition of kecombrang flower flour had a significant effect on the ash content of red bean wet noodles. From Table 3. on DMRT further test results known that the concentration of adding kecombrang flower flour of 1%, 2%, and 3% gave a very significant difference to the attention of 4% and 5% in increasing the ash content of red bean wet noodles. The grouping of wet noodle making has a significant effect on increasing the ash content of red bean wet noodles.

The addition of kecombrang flower flour increased the ash content of red bean wet noodles by 0.50% - 1.17%. In this case, kecombrang has a higher ash content than high protein flour. In 100 g of kecombrang, there is 1.40 g of ash content, while high protein wheat flour only has an ash content of 0.62%.

Table 3. Protein and Ash Content of Red Bean Wet Noodles With The Addition of Kecombrang Flower Flour

Treatment	Protein Content	Ash Content
K1 (1%)	13,43 b	0,50 a
K2 (2%)	13,04 b	0,67 a
K3 (3%)	14,09 b	0,67 a
K4 (4%)	6,17 a	1,17 b
K5 (5%)	7,00 a	1,17 b

This is in line with the research results by Molerman (2014), that the more the addition of kecombrang flowers in the manufacture of crackers, the ash content in the crackers will increase because the added kecombrang contains mineral salts such as calcium, potassium, and phosphorus. The results of Muawanah's research (2012) show that the high ash content of jelly candy at 0.15% is thought to be due to the contribution of minerals in the kecombrang flower preparation, which is added in the manufacture of jelly candy.

Total Plate Count (TPC)

Storage for 12 hours

The ANOVA results showed that the addition of kecombrang flower flour significantly affected the Total Plate Count (TPC) of wet noodles during 12 hours of storage. From Table 4. on the DMRT further test known that the concentration of the addition of kecombrang flower flour gave a very significant difference in suppressing the amount of microbial growth in red bean wet noodles during 12 hours of storage.

The addition of kecombrang flower flour to red bean wet noodles suppressed the Total Plate Count (TPC) during 12 hours of storage. The amount of microbial growth ranged from 0.10 x 10^6 colonies/g to 0.21 x 10^6 colonies/g. Krismawati's research (2007) explained that kecombrang has a high concentration of antioxidants and a large enough strength to ward off free radical compounds to prevent oxidation. The number of microbes stored for 12 hours in wet noodles still meets the quality requirements of wet noodles, a maximum of 1 x 10^6 colonies/g (BSN 2987, 2015).

Table 4. Total Plate Count of Red Bean Wet Noodles with Addition of Kecombrang Flower Flour during 12 Hours, 24 Hours and 48 Hours Storage.

Treatment	Total Plate Count		
	12 Hours	24 Hours	48 Hours
K1 (1%)	0,21 x 10^6 e	0,34 x 10^6 e	2,89 x 10^6 c
K2 (2%)	0,20 x 10^6 d	0,32 x 10^6 d	2,62 x 10^6 bc
K3 (3%)	0,17 x 10^6 c	0,30 x 10^6 c	2,45 x 10^6 bc
K4 (4%)	0,15 x 10^6 b	0,28 x 10^6 b	1,76 x 10^6 b
K5 (5%)	0,10 x 10^6 a	0,25 x 10^6 a	0,42 x 10^6 a

Storage for 24 hours

The ANOVA results showed that the addition of kecombrang flower flour significantly affected wet noodles' Total Plate Count (TPC) during 24-hour storage. From Table 4. on the DMRT further test known that the concentration of the addition of kecombrang flower flour had a very significant effect in suppressing the amount of microbial growth of red bean wet noodles during 24-hour storage. The grouping of wet noodle making has a significant impact on the microbial growth of red bean wet noodles.

The addition of kecombrang flower flour to red bean wet noodles suppressed the Total Plate Count (TPC) during 24-hour storage. The amount of microbial growth ranged from 0.25 x 10^6 colonies/g to 0.34 x 10^6 colonies/g. Kusumawati's research (2015) showed that kecombrang with high concentrations had an inhibitory power against microbes, as indicated by the increasing content of antimicrobial active ingredients in the form of saponins, tannins, and flavonoids that we're able to inhibit microbial growth. The number of microbes stored for 24 hours in wet noodles still meets the quality requirements of wet noodles, a maximum of 1 x 10^6 colonies/g (BSN 2987, 2015).

Storage for 48 hours

The ANOVA results showed that the addition of kecombrang flower flour significantly affected the Total Plate Count (TPC) of wet noodles during 48 hours of storage. From Table 4. on DMRT further test results known that the concentration of addition of 1%, 2%, 3%, and 4% kecombrang flower flour had a very significant effect on the concentration of addition of 5% kecombrang flower flour in determining the amount of microbial growth of red bean wet noodles during 48 hours storage.

The addition of kecombrang flower flour to red bean wet noodles could not suppress the Total Plate Count (TPC) during 48 hours of storage. The amount of microbial growth ranged from 0.42 x 10^6 colonies/g to 2.89 x 10^6 colonies/g. This is presumably due to low concentrations of kecombrang flower flour resulting in rapid microbial activity, but the higher the addition of kecombrang flower flour, the more antimicrobials will diffuse to damage bacterial cell walls. Based on Andriansyah's research (2017), the longer the storage, the more antimicrobials are used to inhibit microbial growth so that antimicrobial levels will decrease, which will provide an opportunity for microbes to multiply. The amount of microbial growth with the addition of 1% - 4% kecombrang flower flour does not meet the quality requirements of wet noodles. In comparison, the addition of 5% kecombrang flower flour still meets the quality requirements of wet noodles, which is a maximum of 1 x 10^6 colonies/g (BSN 2987, 2015).

Organoleptic

Color

From Table 5. known that the panelists' level of preference for the color of red bean wet noodles ranged from 3.17 to 3.70 (rather like-like). The highest level of preference for the color of wet noodles was found in the addition of 1% kecombrang flour, and the lowest level of preference was found in the addition of 5% kecombrang flour. The color of wet noodles with the addition of 1% kecombrang flower flour is yellow, like the color of wet noodles in general. In comparison, adding 5% kecombrang flower flour causes the color of the wet noodles to look brown, thereby reducing the panelists' preference level.

Friedman test results show a difference in the average level of color preference for adding kecombrang flower flour to red bean wet noodles. With the addition of kecombrang flower flour to red bean wet noodles, the panelists' acceptance rate decreased. The panelists' acceptance of the color of wet noodles dropped presumably because the color of wet noodles got darker with the addition of kecombrang flower flour. The lightest shade is indicated by a 5Y value of 9/3, and the darkest color is characterized by a 5Y value of 7/2. The resulting wet noodles are bright yellow compared with wet noodles without adding red bean flour and kecombrang flower flour.

Table 5. Organoleptic test of red bean wet noodles with the addition of kecombrang flower flour

Treatment	Levels of pleasure				
	Color	Texture	Aroma	Flavor	Overall
K1 (1%)	3,70	3,73	3,50	3,67	3,87
K2 (2%)	3,57	3,70	3,63	3,53	3,67
K3 (3%)	3,57	3,67	3,40	3,43	3,63
K4 (4%)	3,30	3,63	3,13	3,27	3,43
K5 (5%)	3,17	3,63	3,37	3,00	3,33

Texture

From Table 5. known that the panelists' level of preference for the texture of red bean wet noodles ranged from 3.63 to 3.73 (rather like-likes), where the highest level of preference was found in the addition of 1% kecombrang flower flour, and the lowest level of choice was found in the addition of kecombrang flower flour 4 % and 5%.

Friedman test results showed no difference in the average level of texture preference for adding kecombrang flower flour to red bean wet noodles. The texture of red bean wet noodles was observed visually using the sense of touch by looking at the level of elasticity of the soaked noodles. The results of the measurement of texture characteristics show an increasing level of hardness with increasing use of kecombrang flower flour, but this is not in line with the results of the panelists' preference level test because the use of ingredients in making wet noodles uses the same proportions so that only the difference in the addition of kecombrang flower flour distinguishes the addition solids in the soaked noodles.

Aroma

From Table 5. known that the panelists' level of preference for the aroma of wet noodles produced ranged from 3.13 to 3.63 (somewhat like), where the highest level of preference was found in the addition of 2% kecombrang flower flour, and the lowest level of choice was found in the 4% kecombrang flower flour addition treatment. Friedman test results showed no difference in the average level of preference for the aroma to the treatment of adding kecombrang flower flour to red bean wet noodles. Kecombrang has a distinctive and robust aroma where. This aroma comes from the essential oil compounds in kecombrang (Molerman, 2014). This is what causes the kecombrang aroma to be more dominant than the typical aroma of the resulting wet noodles.

However, the smell produced is not too strong when testing wet noodles with the addition of kecombrang flower flour. This happens because of the boiling process in wet noodles, which causes the components that make up the aroma of kecombrang to evaporate. When the panelists smell the aroma, there is no difference between the samples. This is in line with the results of Bahari's research (2019), that kecombrang flower essence added to the Velva dough, which undergoes a heating process, causes a decrease in the distinctive aroma of kecombrang flowers to the evaporation of volatile compounds.

Flavor

From Table 5. known thaThe panelists' level of preference for the taste of the resulting wet noodles ranged from 3.00 - 3.67 (rather like - likes), where the highest level of preference was in the addition of 1% kecombrang flower flour because the taste of wet noodles was still almost the same as the taste of wet noodles. The lowest preference level was found in adding 5% kecombrang flower flour.

Friedman test results shown a difference in the average level of taste preference for adding kecombrang flower flour to the resulting red bean wet noodles. The panelists' acceptance of the taste of red bean wet noodles decreased as the use of kecombrang flower flour increased. When wet noodles are eaten, the taste of kecombrang in wet noodles is too strong, so the panelists don't like it. This is because the results of Lestari's research (2015) show that kecombrang flowers have a distinctive taste that sticks to the tongue after consumption due to the presence of polyphenolic compounds, which causes the preference for the flavor to decrease.

Overall

From Table 5. known that the overall preference level of the panelists on the wet noodles produced ranged from 3.43 to 3.87 (rather like-likes), where the highest level of acceptance was found in the addition of kecombrang flower flour by 1% the lowest level of acceptance was found in the addition of flower flour. kecombrang as much as 5%.

Friedman test results show a difference in the overall average level of preference for adding kecombrang flower flour to red bean wet noodles. Overall, the highest panelist acceptance rate was found in red bean wet noodles with the addition of 1% kecombrang flower flour. Red bean wet noodles added with 1% kecombrang flower flour have a bright color like soggy noodles in general, the texture is quite soft, and the aroma and taste of kecombrang are not too strong. Giving kecombrang flower flour to red bean wet noodles can be done at a low level.

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