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Some Chemical and Physical Properties of Kenikir (*Cosmos caudatus*) Powder During Storage and Its Application on Instant Noodle

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Abstract **Original Research Article**

This research was aimed to observe the physical and chemical properties of kenikir powder during storage and its application for instant noodle homemade. The experiment was done on two stage conduted on randomized factorial completely design The first stage was used two factors, namely kenikir powder particle sizes (M) consisted of three level (60, 80, 100 mesh), and storage period time (T) consisted of five level (0, 7, 14, 21, 28 days). The second stage was used two factors, namely kenikir powder proportion for instant noodle flour material (K) consisted of five levels (0, 5, 10, 15 and 20%), and kenikir powder particle sizes (U) consisted of three levels (60, 80 and 100 mesh). Result of the experiment proved that the treatment of paricle sizes, storage time and their interactions had a significant effect on moisture content, browning index, water sorption index and water solubility index of kenikir powder. The kenikir powder proportion, particle sizes and their interactions had significant effect on textural value, elongation, water absorption capacity, swelling capacity and fiber content of instant noodle. The highest fiber content of instant noodle was found on K_4U_2 treatment performed the fiber content of 5.29%.

Keywords: *Cosmos caudatus*, powder, instant noodle, fiber.

INTRODUCTION

Kenikir (*Cosmos caudatus*) is widely use on Indonesia cuisine and herbal industries. It was also found at many south east asia countries, such as at Malaysia commonly known as ulam raja. It was getting attention by Malaysian herbal industries to be developed in tea form and grows up to about 1-8 feet tall, hairless or sparsely hairy, leaves are finely dissected, 10-20 cm long and having 20-26 species worldwide [1]. Kenikir (*Cosmos caudatus*) is a tropical plant as member of Asteraceae genusoriginated from Central America and some other tropical climate areas and its young leaves are frequently be consumed as fresh vegetable or appetizers because it has specific taste and aroma [2]. Kenikir leave contains active compounds of phenol, flavonoid, saponin, tannin, protein 3%, lipid 0.4%, carbohydrate, calcium and a vitamin [3].

Kenikir has not been used optimally and is very easily damaged, so it takes the right steps to process it. One of the kenikir processing is by making kenikir powder. Making kenikir leaf powder can be done using the oven drying method. Quality degradation of kenikir powder causes a lack of quality in subsequent product processing. Kenikir powder can effect to attributes food because the Primary quality attributes of a food include color, texture, flavor and nutritional value [4].

Kenikir powder can be processed as an ingredient for making instant noodles because one of the most preferred food products of Indonesian people is instant noodles. The average consumption of instant noodles in Indonesia in 2017 reached 12,620 packs/million dishes (WINA, 2018). In general, instant noodles are made from wheat flour with very low fiber content [5]. Therefore the addition of kenikir leaf powder to instant noodles is expected to be one alternative to meet the needs of fiber in humans.

It is hoped that kenikir leaves can be used as one of alternatives in order to fulfill fiber requirement for humans. This study used kenikir leave powder as additional compound which is put into instant noodle dough.

MATERIALS AND METHODS

Kenikir powder processing

Kenikir leaves are washed and air-dried for 2 hours. Subsequently, it was dried within oven at temperature of 50^{o}C for 16 hours. The previously dried kenikir leaves are blended and subsequently sieved by using sieve of 60, 80 and 100 mesh sizes. It is then stored within a room having room temperature of 28^{0}C (±2°C) and it is observed according to the designed treatments. Ziplock plastic used in this study was Polypropylene plastic (PP).

Instant noodle processing with addition of kenikir leaves powder

Instant noodle processing was done according to the method from [6] Instant noodle processing is started with weighing of ingredients consisting of wheat flour, kenikir pulp, kenikir powder, egg, water and table salt according to the requirement based on total wheat flour of 300 g. Dough is kneaded 10 times. Thin dough sheet is cut to length with 1-2 mm width by using noodle cutter roll. After the formation of noodle, it was followed by the steaming process for 5 minutes at temperature of 100°C. The steamed noodle is cooled down at room temperature and subsequently is fried at temperature of 150^{o}C for 109 seconds.

Desaign of experiment

This research was conducted in two parts. Part I is the kenikir powder using a Factorial Complete Randomized Design with two treatment factors and three replications including the size of a kenikir powder (M) consisting of M_1 (60 mesh), M_2 (80 mesh), M_3 (100 mesh) and length storage period of kenikir (T) consists of T_0 (0 days), T_1 (7 days), T_2 (14 days), T_3 (21 days), T_4 (28 days). Part II instant noodles with addition of kenikir powder using a Factorial Complete Randomized Design with two treatment factors and three replications including the concentration of kenikir powder (K) consisting of K_1 (0% (w/w)), K_2 (5% (w/w)), K_3 (10% (w/w)), K_4 (15% (w/w)), K_5 (20% (/ w)) and the size of a kenikir powder (U) consists of U_1 (60 mesh), U_2 (80 mesh), U_3 (100 mesh).

The physical and chemical analysis

The physical analysis for kenikir powder was browning index used chromameter [7]. The chemical analysis of kenikir powder was consisted of moisture content [8], water sorption index and water solubility index [5]. The chemical analysis of kenikir instant noodle was consisted of water sortion capacity, swelling capacity and fiber content [9]. The physical analysis for kenikir instant noodle was texture used texture analyzer with probe TA 39 cylinder [10].

RESULTS

The values of moisture content, browning index and water sorption index of kenikir powder during storage was shown in Table 1. The values of final load, elongation, water sorption capacity, swelling capacity and fiber content of instant noodle can be seen in Table 2. Results of analysis of variance showed that M factor (kenikir powder sizes), T factor (storage period) and their interactions had significant effect on moisture content, browning index, water sorption index and water solubility index.

Table 1. Moisture Content, Browning Index and Water Sorption Index of Kenikir Powder During Storage

Treatment	Moisture content	Browning index	Water sorption index	Water solubility index
M_1T_0	6.48 ± 0.09^{g}	34.19 ± 1.00^{i}	0.11 ± 0.03^{j}	0.27 ± 0.01^{f}
M_1T_1	8.16 ± 0.10^{f}	34.80 ± 0.33^{i}	0.12 ± 0.01^{j}	0.28 ± 0.01^{f}
M_1T_2	8.32 ± 0.07^{f}	35.57 ± 0.09^{i}	0.14 ± 0.03^{j}	0.32 ± 0.04^{f}
M_1T_3	8.76 ± 0.10^{f}	37.28 ± 0.69^{h}	0.19 ± 0.01^{i}	0.35 ± 0.02^{e}
M_1T_4	8.76 ± 0.10^{f}	38.80 ± 2.89^{h}	0.27 ± 0.01^{g}	0.38 ± 0.01^{c}
M_2T_0	8.59 ± 0.61^{f}	37.29 ± 0.66^{h}	0.21 ± 0.03^{i}	0.26 ± 0.01^{f}
M_2T_1	9.20 ± 0.16^{e}	38.80 ± 0.53^{g}	0.29 ± 0.02^{f}	0.30 ± 0.05^{f}
M_2T_2	9.55 ± 0.60^{d}	40.63 ± 0.26^{f}	0.31 ± 0.03^{e}	0.33 ± 0.06^{f}
M_2T_3	10.05 ± 0.59^{d}	42.47 ± 0.36^{d}	0.39 ± 0.01^{c}	0.38 ± 0.01^{c}
M_2T_4	10.47 ± 0.63^{c}	43.76 ± 0.62^{c}	0.42 ± 0.05^{c}	0.40 ± 0.02^{b}
M_3T_0	8.70 ± 0.42^{f}	38.04 ± 0.77^{h}	0.23 ± 0.01^{h}	0.31 ± 0.02^{f}
M_3T_1	9.91 ± 0.76^{d}	41.31 ± 1.21^{e}	0.35 ± 0.02^{d}	0.36 ± 0.04^{e}
M_3T_2	10.70 ± 0.16^{c}	44.01 ± 1.27^{c}	0.42 ± 0.02^{c}	0.37 ± 0.04^{d}
M_3T_3	10.98 ± 0.99^{b}	46.01 ± 0.97^{b}	0.52 ± 0.02^{b}	0.40 ± 0.02^{b}
M_3T_4	11.90 ± 0.74^{a}	48.04 ± 0.54^{a}	0.62 ± 0.02^{a}	0.42 ± 0.01^{a}

Note: value followed by the different letter is significantly different, according to Tukey's at the probably level of 5%

Table-2: Values of Final Load, Elongation, Water Sorption Capacity, Swelling Capacity and Fiber Content of Instant Noodle

Treatment	Final load	Elongation	Water sorption capacity	Swelling capacity	Fiber content
K_1U_1	44.80 ± 4.80^{d}	145.30 ± 1.00^{a}	107.00 ± 3.53^{c}	10.23 ± 1.33^{b}	2.76 ± 0.17^{f}
K_1U_2	50.73 ± 3.89^{c}	139.15 ± 2.88^{a}	107.67 ± 2.45^{b}	$10.07 \pm 0{,}59^{b}$	2.77 ± 0.09^{ef}
K_1U_3	78.87 ± 0.876^{a}	147.70 ± 3.29^{a}	110.67 ± 1.86^{a}	10.90 ± 0.85^{a}	2.60 ± 0.17^{f}
K_2U_1	45.00 ± 2.96^{d}	116.40 ± 1.81^{b}	102.00 ± 1.08^{f}	9.30 ± 1.06^{d}	3.22 ± 0.11^{de}
K_2U_2	$39{,}47 \pm 0.90^{d}$	96.65 ± 4.54^{c}	103.00 ± 2.00^{e}	9.40 ± 0.99^{c}	3.29 ± 0.07^{d}
K_2U_3	$39{,}67 \pm 6.21^{d}$	115.60 ± 5.16^{b}	104.33 ± 1.37^{d}	7.63 ± 0.92^{e}	3.44 ± 0.13^{d}
K_3U_1	$48{,}43 \pm 9.51^{c}$	100.50 ± 2.62^{c}	99.33 ± 1.50^{g}	7.00 ± 1.04^{f}	4.10 ± 0.09^{c}
K_3U_2	$44{,}83 \pm 2.11^{d}$	65.85 ± 1.34^{e}	99.67 ± 1.42^{g}	8.73 ± 1.04^{d}	4.14 ± 0.09^{c}
K_3U_3	30.60 ± 3.94^{e}	76.85 ± 1.43^{d}	101.67 ± 1.66^{g}	5.96 ± 0.93^{f}	4.47 ± 0.04^{bc}
K_4U_1	40.70 ± 1.13^{d}	34.75 ± 4.57^{g}	96.67 ± 0.87^{g}	6.63 ± 1.29^{f}	4.83 ± 0.09^{ab}
K_4U_2	61.60 ± 5.97^{b}	42.15 ± 2.41^{g}	97.33 ± 1.66^{g}	5.43 ± 0.02^{f}	5.29 ± 0.56^{a}
K_4U_3	21.67 ± 2.45^{e}	58.00 ± 8.17^{f}	98.33 ± 0.70^{g}	4.57 ± 1.04^{f}	4.93 ± 0.07^{ab}

Note : Value followed by the different letter is significantly different, according to Tukey's at the probably level of 5%

Results of analysis of variance showed that K factor (concentration of kenikir powder addition), U factor (mesh sizes) and their interactions had significant effect on textural value, elongation, water sorption capacity, swelling capacity and fiber content of the produced instant noodle. The highest fiber content was found on instant noodle added with kenikir powder having size of 80 meshes with magnitude of 20%.

DISCUSSIONS

The highest moisture content of kenikir powder was found on M_3T_4 treatment. This is due to the fact that kenikir powder has hygroscopic property and it absorbs water from the environment during storage. In addition, moisture content of powder during initial storage facilitates microbe to decompose carbohydrate into glucose. Glucose decomposed by microbe had produced water so that the longer the storage period, the higher the moisture content within kenikir powder [11].

The browning index value of kenikir powder had increased during storage period due to contact with oxygen in air as well as increase of temperature during drying process. The higher the mesh size or the finer the sieved kenikir powder, the higher the water sorption index. This is due to the fact that higher mesh size.

Produced smaller particle size of kenikir powder which in turn increase water sorption index. Water sorption indexof food products is affected by protein denaturation, starch gelatinization and swelling of crude fiber during powder processing [12]. Water sorption indexon kenikir noodle was affected by hydrophilic group and gel formation capacity of macro molecule, i.e. starch which experience gelatinization and dextrinization. The more gelatinized and dextrinized starch on noodle result in increase of water sorption capacity by kenikir noodle [13].

Table 2 showed that elongation value of kenikir noodle was affected by addition of wheat flour and kenikir powder concentration on noodle. Wheat flour having high protein content can affect rubbery property on the produced instant noodle. Kenikir noodle forms cohesive dough, elastic and easily stretched. This stretching is due to gluten [5]. The more gluten content in wheat flour, the higher the elongation value of the produced instant noodle. The appeal of the western dietery pattern to the youger generation is of particular concern as globalisation of fast food has affected their eating behaviours [14].

Water sorption capacity of kenikir noodle is affected by protein content on noodle and addition of kenikir pulp in dough. According to the study by [15], flour having higher protein content had higher water sorption capacity than that of lower protein content at the same amount of water addition. Moisture content in kenikir noodle affects granule swelling and the magnitude of dissolved amylose. Gelatinization process affects flexibility or elongation capacity of the produced instant noodle [16]. And then Temperature greatly ects the dehydration of wet food material and the rehydration of dried food. The water sorption capacity of starchy food is greater at temperatures higher than the gelatinization temperatur [17].

Swelling capacity of kenikir noodle is affected by the increase of kenikir powder addition which in turn will increase protein and lipid content that form complex bounding with starch; therefore, water sorption by starch is disturbed and causing the volume of noodle did not develop. Water sorption on kenikir instant noodle is affected by water sorption capacity of kenikir powder. The higher the water sorption, the more water can be absorbed by kenikir noodle resulting in higher swelling capacity of noodle [18]. cooking So that Higher starch damage is associated with poor noodle color, undesirable high loss, and excessive surface swelling [19].

Textural value of noodle is affected by the reaction of noodle ingredients such as protein, lipid, ash content and water. This reaction produces hard texture on surface of kenikir noodle. The different results of textural analysis on kenikir noodle might be due to different addition of kenikir concentration. The addition of wheat flour, egg and kenikir powder will form gluten in noodle dough resulting in the texture that does not break easily. In the texture study, crispiness was perceived as a combination of the sound generated and the fracture of the product as it was bitten completely through with the back molars [20]. Egg has a role as good emulsifier to accelerate water hydration so that the texture of noodle is more fluffy [21].

The increase of noodle fiber content is directly proportional to kenikir powder addition. According to the study by [22], kenikir has relatively high fiber content with magnitude of 1.6 g in 100 g edible parts. If noodle cooking, Noodle consists of protein network filled with starch granules. During cooking, the texture of the noodle starts to disintegrate and soften due to the swelling of starch granules [23].

CONCLUSIONS

The physical and chemical changes had occurred on kenikir powder during storage. The addition of kenikir powder on instant noodle processing had a signifficant effect on the average values of final load, elongation, water sorption capacity, swelling capacity and fiber content of the produced instant noodle.

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