PROGRAM BOOK
The 3rd INTERNATIONAL CONFERENCE OF ESSENTIAL OILS (ICEO) 2021

"Improving Added Value by Authentication and Sustainability Innovation on Essential Oils Industry"
November, 18th 2021

Organized by:
Faculty of Agro-Industrial Technology
Universitas Padjadjaran

Co-hosted by:

Patpi

Sponsored by:

DEWAN ATSIRI INDONESIA

indesso

haldin

Content

MSC 05. THE NUTRITION VALUE OF INSTANT CASSAVA-CORN NOODLES THROUGH NANOFOTIFICATION OF WINGED BEAN AND KONJAC FLOUR

Satrijo Saloko*, Ahmad Alamsyah, Siska Cicillia, Ramdhani Perkasa
Faculty of Food Technology and Agroindustry, University of Mataram
, Jl. Majapahit No.62 Mararam 83126, Indonesia

****Corresponding author: s_saloko@unram.ac.id***

ABSTRACT

This study aims to determine the effect of nanofortification on instant cassava-corn noodles that used fermentation treatment of winged bean flour and konjac flour on the physicochemical, sensory properties, morphology and size particle of instant corn noodles. The experimental design used was a completely randomized design (CRD) with one factor. Factors carried out were the addition of fermented (P1) and non-fermented (P2) winged bean flour formulations and konjac flour which consisted of six treatments, namely P1.1 (15% : 0%); P1.2 (10% : 5%); P1.3 (5% : 10%); P2.1 (15% : 0%); P2.2 (10% : 5%); P6 (5% : 10%). Each treatment was repeated three times so that 18 samples were obtained. The measured noodle quality parameters were chemical quality (moisture, ash, protein, and crude fiber), physical quality (color, cooking time, cooking loss, rehydration, and elongation), organoleptic qualities (taste, color, aroma and texture), and morphology and size particle of noodle. . The effect of fermentation treatment and the concentration of winged bean flour gave significantly different effects on water, ash, protein, crude fiber, cooking loss, cooking time, rehydration, texture scoring and color both hedonic and scoring. The best treatment was obtained at P1.1 (15% fermented winged bean flour: 0% konjac flour) with 6.83% water; 3.16% ash; 14.10% protein; 1.08%, fiber; L value 52.34; °Hue 76.07; cooking time 11.53 minutes, cooking loss 3.02%, elongation 9.81%; rehydration 11.46 minutes. The agglomeration form of noodle because of ball milling processed with size particle 7.643 µm.

Keywords: *Nanofortification, instant noodle, konjac flour, wing bean flour*

FAKULTAS TEKNOLOGI INDUSTRI PERTANIAN

DEWAN ATSIRI INDONESIA

Patpi Indonesian Food Technologist Association

APAI

CERTIFICATE

Number: 50.11.18/PCT/ICEO/2021

is awarded to

Dr. Satrijo Saloko

As

Participant

in 3rd International Conference of Essential Oils (ICEO) 2021

hosted by Faculty of Agro-Industrial Technology, Universitas Padjajaran,18th November 2021

Jatinangor, 18th November 2021

Dean Faculty of Agro-Industrial Technology

Dr. Ir. Sarifah Nurjanah., M.App.Sc.

Conference Chair of ICEO 2021

Dr. Fitry Filianty, S.TP., M.Si

THE NUTRITION VALUE OF INSTANT CASSAVA-CORN NOODLES THROUGH NANOFORTIFICATION OF WINGED BEAN AND KONJAC FLOUR

Satrijo Saloko*, Ahmad Alamsyah, Siska Cicillia, Ramdhani Perkasa

Faculty of Food Technology and Agroindustry, University of Mataram ,
Jl. Majapahit No.62 Mararam 83126, Indonesia

Corresponding author: s_saloko@unram.ac.id

ABSTRACT–**This study aims to determine the effect of nanofortification on instant cassava-corn noodles that used fermentation treatment of winged bean flour and konjac flour on the physicochemical, sensory properties, morphology and size particle of instant cassava-corn noodles. The experimental design used was a completely randomized design (CRD) with one factor. Factors carried out were the addition of fermented (P1) and non-fermented (P2) winged bean flour formulations and konjac flour which consisted of six treatments, namely P1.1 (15% : 0%); P1.2 (10% : 5%); P1.3 (5% : 10%); P2.1 (15% : 0%); P2.2 (10% : 5%); P6 (5% : 10%). Each treatment was repeated three times so that 18 samples were obtained. The measured noodle quality parameters were chemical quality (moisture, ash, protein, crude fiber), physical quality (color, cooking time, cooking loss, rehydration, elongation), organoleptic qualities (taste, color, aroma and texture), morphology and size particle of noodle. . The effect of fermentation treatment and the concentration of winged bean flour gave significantly different effects on water, ash, protein, crude fiber, cooking loss, cooking time, rehydration, texture scoring and color both hedonic and scoring. The best treatment was obtained at P1.1 (15% fermented winged bean flour: 0% konjac flour) with 6.83% water; 3.16% ash; 14.10% protein; 1.08%, fiber; L value 52.34; °Hue 76.07; cooking time 11.53 minutes, cooking loss 3.02%, elongation 9.81%; rehydration 11.46 minutes. The agglomeration process occurs in noodle due of ball milling processed so that the size particle of noodle aroud 7.643 µm.**

Keywords – **Nanofortification; instant noodle; konjac flour; wing bean flour**

I. INTRODUCTION

Noodles are the main raw material for wheat flour. Noodles are not considered authentic Indonesian food when viewed from the raw material. Noodles are known as noodles in English, in Japanese they are called ramen, udan, kisimeen, while in Italian they are known as spaghetti [1]. According to data from the World Instant Noodles Association (WINA) (2018), global demand for instant noodle products has reached 103.62 billion packs. In this case, global demand has increased compared to 2017 where in that year it was only 100 billion packs of instant noodles. Indonesia occupies the second largest consumer, namely 12.54 billion packs after China/Hong Kong with 40.3 billion packs in 2018.

Corn noodles are noodles with the main raw material of corn flour. The manufacture of corn noodles has actually been widely studied, but the noodles are still not widely traded. The research that has been done includes: making wet and dry noodles; manufacture of corn noodles with flour and corn starch as raw materials; variations in process design and formulation to produce the best corn noodles in terms of the physical and chemical properties of corn noodles; and technology package for corn noodle production [2].

Corn is a food that has the potential to be processed into non-rice and non-wheat staple food so that it can reduce dependence on rice and wheat. The nutritional content of corn is not inferior to rice or wheat. Corn has advantages as a functional food with high content of dietary fiber, Fe and beta-carotene (pro-vitamin A) [3]. Corn flour is processed from corn which has different characteristics from wheat flour which is the main ingredient commonly used in making noodles. Wheat flour contains gluten, a complex protein that can give wheat noodles elastic and chewy properties. This type of protein is not found in corn flour. Therefore, to anticipate this, it is necessary to add other flour that has content that is able to make the noodle dough easy to print and expand. The type of flour that can be added to the process of making corn noodles is mocaf (modified cassava flour) [4].

Mocaf is flour from cassava which is processed through the principle of modifying cassava cells by fermentation. Some of the advantages of mocaf are higher soluble fiber content than cassava flour, higher mineral content than rice and wheat, higher digestibility than cassava tapioca. Mocaf complex carbohydrate content is higher (87.3%) compared to wheat flour (60-68%). Mocaf fiber content is also higher (3.4%) compared to wheat flour (2-2.5%). Lower moisture content in mocaf (6.9%) results in a longer shelf life, while lower ash content (0.4%) makes mocaf whiter than wheat flour (1.3%) [5]. The addition of mocaf cannot be an alternative as an ingredient that is able to make the noodle dough not easily broken so that other additional ingredients are needed that are able to make the noodle dough chewier. In general, instant noodle products on the market tend to have low nutritional value, so it is necessary to add ingredients that can increase the nutritional content of instant noodles such as winged bean flour and konjac flour [6].

Konjac flour (*Amorpophallus oncophillus*) is flour made from konjac tubers which has the highest viscosity naturally derived from tubers. Konjac flour is the thickest fiber in nature, which has a thickening strength 10 times greater than cornstarch starch. Konjac flour thickens with a satin softness and a glossy outer appearance. Konjac contains a substance that has the ability to make a chewy dough, namely glucomannan. The content of glucomannan in konjac flour is able to bind water and form a stable gel in hot conditions [7]

Winged bean (Psophocarpus tetragonolobus) is a tropical plant that is very abundant in Indonesia. Winged bean plants are easy to cultivate. Seeds are a type of grain found in the old pods of winged bean. Its chemical composition resembles the chemical composition of soybeans, which are widely known sources of vegetable protein [8]. According to Putri [9], the water content of winged bean flour is 6.91%, ash content is 4.02%, fat content is 26.63%, protein content is 46.01% and carbohydrates are 23.34%. Besides containing high enough nutrients, winged bean seeds also contain cyanide acid (HCN) which is toxic [10]

Efforts are being made to improve the quality of food substances and reduce the HCN content in winged bean seeds, including microbiological processing through the fermentation process. The fermentation process is the activity of microorganisms that can produce products with better texture, flavor, aroma and nutritional quality characteristics than the original raw materials, and is a protein enrichment process, namely protein enrichment from these ingredients [11]

II. MATERIALS AND METHODS

A. Materials

The materials used in this research are corn which is processed into corn flour, cassava which is processed into mocaf flour, konjac tubers which are processed into konjac flour, winged bean seeds which are processed into winged bean flour, RAPRIMA tempe yeast, water, salt, eggs, CMC and baking powder.

The tools used are baking sheet, basin, dropper, volume pipette, knife, basin, gas stove, winnowing pan, spoon, kleong, blender, 100 mesh sieve, analytical balance, noodle maker, plastic gloves, desiccator, mask, 100 ml measuring cup, 250 ml Erlenmeyer, Cabinet dryer, porcelain cup, test tube, small kjeldahl flask, large kjeldahl flask, distillation machine, and titration equipment

B. Methods

This research uses an experimental method which carried out in the laboratory. The experimental design in this study was a completely randomized design with a single factor: the proportion of winged bean flour (fermented and non-fermented), konjac flour with six treatments, namely P1.1 (15% : 0%), P1.2 (10% : 5%), P1.3 (5% : 10%), P2.1 (15% : 0%), P2.2 (10% : 5%), and P2.3 (5% : 10%) The mixtures are added 65% corn flour and 20% mocaf flour. Each treatment was repeated 3 times to obtain 18 experimental units.

Observational data were analyzed using Analysis of Variance at 5% significance level using Co-stat software. If there is a significant difference, then it is further tested with the Real Difference (HSD) for all parameters at a 5% significance level.

C. *Sample Preparatioan*

1) Corn Flour Making

The process of making corn flour begins by separating the damaged corn kernels from the good ones then washing them with water, then soaking them for 24 hours with 5% whiting water added which aims to accelerate the softening of the corn kernels, then the washing process is carried out again to remove the remaining residue. Whiting was followed by draining process, using a cabinet dryer with a temperature of 55°C for 24 hours, then after the corn kernels were dry the milling process was carried out using a rice crusher (milling), after grinding, to obtain fine corn flour. It was then sieved using a 100-mesh sieve.

2) Mocaf Making

The first process of making mocaf is sorting the cassava to separate good and damaged cassava, then the process of stripping to the inside of the skin, then washing it with clean water to remove mucus on the tubers and reduce HCN levels of the cassava, after that, the process of peeling it using grater is carried out. Get the cassava in small pieces to facilitate the drying process, then the fermentation process is carried out by soaking it in water for 72 hours, where the water is replaced every 24 hours. The drying process is carried out after that, using a cabinet dryer with a temperature of 55°C for 2 hours. Before drying the cassava, it is better for the cassava that have been fermented to be washed and drained to speed up the drying process. After tha, the flouring process is carried out and the cassava was sieved using a 100-mesh sieve to obtain a fine flour.

3) Non-Fermented Winged Bean Flour

The process of making non-fermented winged bean flour includes sorting or separating the good seeds from the damaged ones, then the washing process using running water aims to remove dirt that sticks to the seeds, then the soaking process for 24 hours, then after soaking the water used is then drained and then afterwards The winged bean seeds are boiled for 30 minutes with the aim of making the seed coat soft so that it is easy to peel, then the process of peeling the winged bean seeds is carried out, then the drying process is carried out using a cabinet dryer at a temperature of 50°C for 15 hours, after the seeds are dry then the milling process is carried out to obtain Winged bean flour which in the last stage is carried out by sifting to obtain a fine flour.

4) Fermented Winged Beans Flour

The process of making fermented winged bean flour includes the process of sorting or separating the good seeds from the defective/damaged ones, then washing it to remove the dirt that sticks before the seeds are soaked for 24 hours. After the seeds are peeled then the seeds are drained and then be boiled again with the same time as the initial boiling. The aim of this process is to soften the texture so they can be penetrated by fungal mycelia which makes the tempeh compact, then the draining process is carried out and cooling before the fermentation process, when the seeds are dry enough after being cooled, a fermentation process is carried out using RAPRIMA, tempe yeast as much as 5 grams per 1 kg of material, then packaged and incubated for 2 days, after the fermentation process, the seeds that have been in the form of tempeh are cut into small pieces and dried at a temperature of 50°C for 12 hours, then the milling and sifting process was carried out with a 100-mesh sieve to obtain a fine flour result.

5) Instant Cassava-Corn Noodle Making Process

The process of making cassava-corn noodles includes mixing of corn flour, modified cassava flour (mocaf), konjac flour and winged bean flour with the addition of 5g salt, 1g CMC, and 0.3g baking powder, then add water and do the kneading process until smooth, after the dough is smooth, the process is carried out. Steam the cassava-corn noodle for 10 minutes at a temperature of 100°C then cooled at room temperature between 20-25°C, the dough is then cooled and molded using a noodle mold until it forms a noodle strand which is then mold and weighed with a wet weight of 70g and dry weight of 35g. After that, mold and steam it again for 10 minutes and finally dried using a cabinet dryer with a temperature of 50°C for 6 hours and the results obtained noodles with a dry weight of 35g.

6) Parameters

Parameters observed in this study are water content, ash content, crude fiber content, protein content, physical test of cooking loss, cooking time, rehydration, elongation, L value, °Hue and organoleptic tests which included color, aroma, taste, and texture.

III. RESULTS AND DISCUSSION

1. Moisture

The effect of winged bean fermentation treatment and the concentration of konjac flour gave a significantly different effect on instant noodle moisture content. The relationship between the mean and fermentation treatment and the concentration of konjac flour is presented in Figure 1.

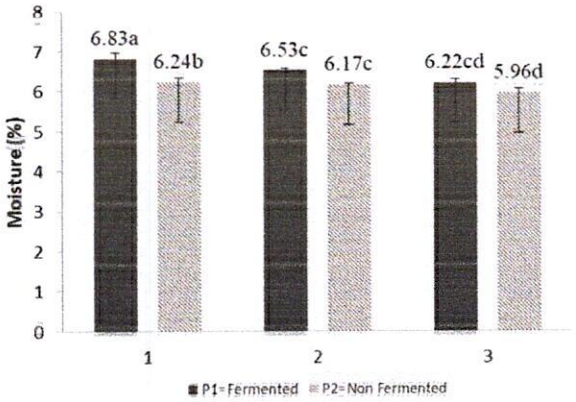

Fig. 1 Effect of fermentation treatment and concentration of konjac flour on the moisture content of instant cassava-corn noodles. Note: P1.1 (15% : 0%); P1.2 (10% : 5%); P1.3 (5% : 10%); P2.1 (15% : 0%); P2.2 (10% : 5%); P6 (5% : 10%).

Figure 1 shows that the less the addition of winged bean flour, both fermented and non-fermented, the less the moisture content of instant corn noodles. The highest moisture content value obtained was at P1.1 (6.83%) and the lowest was at P2.3 (5.96%). This is because the moisture content of the material is influenced by the moisture content in the raw material and processing process [12]. According [12], an increase in protein content is always followed by an increase in the product of moisture content. This was caused by the protein in the food that serves as a binder that can increase the water holding capacity of the material and is hydrophobic, so it requires a large amount of water [14].

According [13], the decreasing water content indicates the breaking of hydrogen bonds between water and glucomannan polymers which triggers the release of intermolecular bonds. Changes in the volume of 3-dimensional tissue is smaller in a larger proportion causing water in the product to be released. The number of connecting zones and 3-dimensional networks is reduced, this change contributes to a decrease in water binding capacity.

2. *Ash*

The effect of winged bean fermentation treatment and the concentration of konjac flour gave a significantly different effect on the ash content of instant cassava-corn noodles. The relationship between the mean and fermentation treatment and the concentration of konjac flour is presented in Figure 2.

Figure 2. Shows that the lower the use of fermented and non-fermented winged bean flour, the lower the ash content of instant noodles. The highest ash content was found in treatment P1.1 (3.16%) and the lowest was in P2.3 (1.48%). This result is in accordance with [14], the higher the addition of winged bean flour, the higher the ash of the dry sponge produced. In addition, the average ash is also increasing (0.67%-0.80%). The results of this study are also in accordance with the research of [15], higher the addition of winged bean flour, the higher the ash content of winged bean biscuits, which ranging from 1.13% - 1.46%.

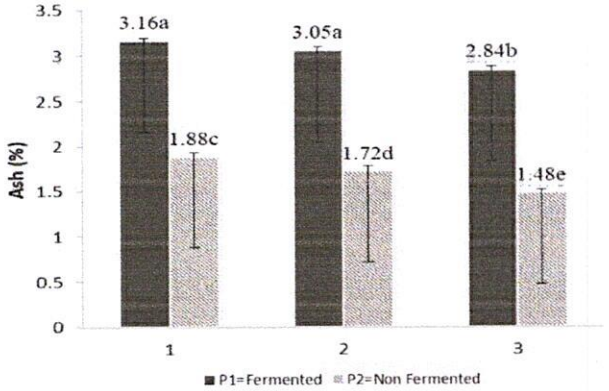

Fig. 2 Effect of fermentation treatment and concentration of konjac flour on the ash of instant cassava-corn noodles. Note: P1.1 (15% : 0%); P1.2 (10% : 5%); P1.3 (5% : 10%); P2.1 (15% : 0%); P2.2 (10% : 5%); P6 (5% : 10%).

3. *Crude Fiber*

The effect of winged bean fermentation treatment and the concentration of konjac flour gave a significantly different effect on the crude fiber content of instant noodles. The relationship between the mean and fermentation treatment and the concentration of konjac flour is presented in Figure 3.

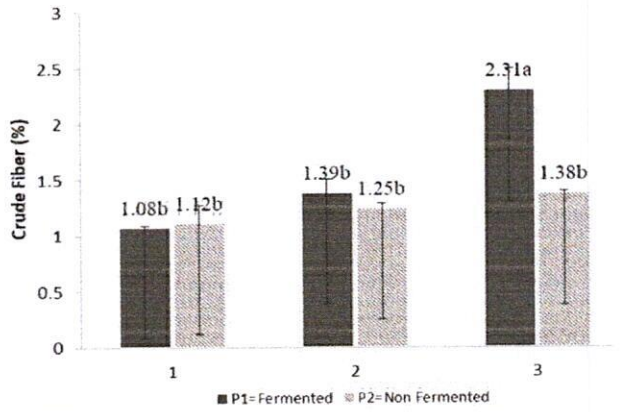

Fig. 3 Effect of fermentation treatment and concentration of konjac flour on crude fiber instant cassava-corn noodles. Note: P1.1 (15% : 0%); P1.2 (10% : 5%); P1.3 (5% : 10%); P2.1 (15% : 0%); P2.2 (10% : 5%); P6 (5% : 10%).

Figure 3 shows that the use of fermented and non-fermented winged bean flour is decreasing crude fiber content increased following the addition of konjac flour. The highest crude fiber content was found in the P1.3 (2.31%) and the lowest was found in the P1.1 (1.08%). The increasing fiber content of instant noodles is due to the high content of laden in konjac flour. Based on research conducted by Mahirdini & Afifah [16] stated that the fiber content of konjac tubers is high and without cholesterol because it is very good for health. Konjac flour has a fairly high fiber content of 2.5%.

Glucomannan has properties as a fiber that is able to absorb water.

4. *Protein*

The effect of winged bean fermentation treatment and the concentration of konjac flour gave a significantly different effect on the protein content of instant corn noodles. The relationship between the mean and fermentation treatment and the concentration of konjac flour is presented in Figure 4.

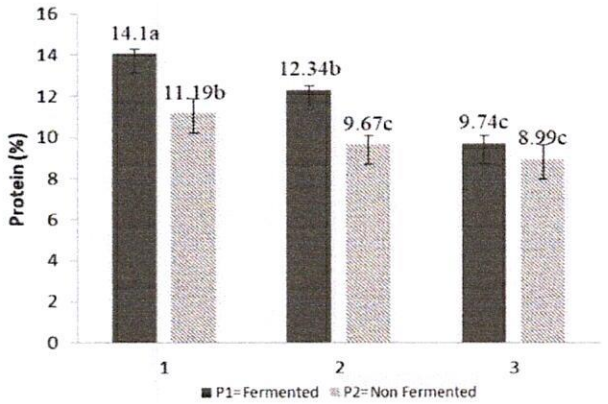

Fig. 4 Effect of fermentation treatment and concentration of konjac flour on protein instant cassava-corn noodles. Note: P1.1 (15% : 0%); P1.2 (10% : 5%); P1.3 (5% : 10%); P2.1 (15% : 0%); P2.2 (10% : 5%); P6 (5% : 10%).

Figure 4 shows that the lower the addition of fermented and non-fermented winged bean flour, the lower the addition of winged bean flour protein content in the instant corn noodles. The highest protein content value was found in the P1.1 treatment of 14.1% and the lowest was found in the P2.3 treatment of 8.99%. This is because the protein content in the raw material of fermented and non-fermented winged bean flour is high so that it affects the protein content of the corn noodles itself. This is in line with the research conducted by [17] on the use of cassava flour and winged bean flour as a substitute for flour in the manufacture of cookies. The results of his research stated that the protein content in cookies increased along with the addition of winged bean flour.

5. *Physical Parameters*

1) Cooking Loss

The effect of winged bean fermentation treatment and the concentration of konjac flour gave a significantly different effect on the cooking loss value of instant noodles. The relationship between the mean and fermentation treatment and the concentration of konjac flour is presented in Figure 5.

Figure 5 shows that the lower the addition of fermented and non-fermented winged bean flour, the lower the loss of cooking value of instant corn noodles. The highest cooking value loss was found in treatment P2.1 of 3.27% and the lowest was found in treatment P1.3 of 2.44%.

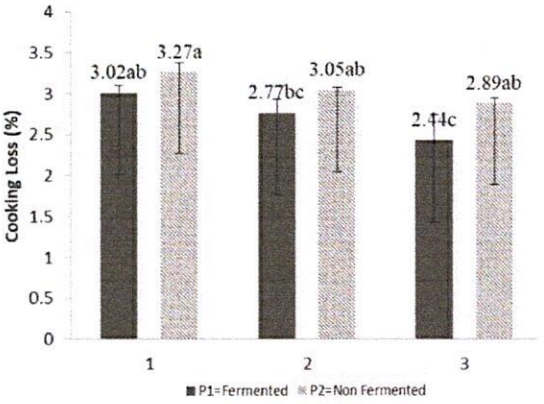

Fig. 5 Effect of fermentation treatment and concentration of konjac flour on cooking loss of instant cassava-corn noodles. Note: P1.1 (15% : 0%); P1.2 (10% : 5%); P1.3 (5% : 10%); P2.1 (15% : 0%); P2.2 (10% : 5%); P6 (5% : 10%).

The high value of cooking loss in treatments that do not use konjac flour is because konjac flour has a function as a developer, thickener and is able to bind water so that water molecules are trapped in the gel structure formed by the addition of konjac flour [20]. Although the protein content of winged bean influences the cooking loss due to the high protein content, however if there is no konjac flour, nothing will function as an additional water binder.

2) Cooking Time

The effect of winged bean fermentation treatment and the concentration of konjac flour gave a significantly different effect on the cooking time value of instant corn noodles. The relationship between the mean and fermentation treatment and the concentration of konjac flour is presented in Figure 6.

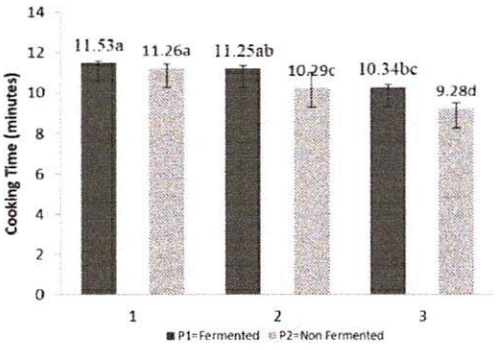

Fig. 6 Effect of fermentation treatment and concentration of konjac flour on cooking time of instant cassava-corn noodles. Note: P1.1 (15% : 0%); P1.2 (10% : 5%); P1.3 (5% : 10%); P2.1 (15% : 0%); P2.2 (10% : 5%); P6 (5% : 10%).

Figure 6 shows that the less the addition of fermented and non-fermented wing wing flour, the lower the cooking time value of instant corn noodles. The highest cooking time value was found in treatment P1.1 of 11.53 minutes and the lowest

was found in treatment P2.3 of 9.28 minutes. Based on [18] research on the addition of Moringa leaf protein concentrate on the physicochemical and organoleptic properties of Mocaf rice, it was stated that the increase in cooking time with the addition of Moringa leaf protein concentrate was caused by the more concentration of Moringa leaf protein added, the time required to cook the noodles. so that the perfect degree of gelatinization tends to increase. And in the statement of [19], presumably because the addition of protein tends to affect the peak temperature of gelatinization so that the gelatinization phase will take longer to reach. This phenomenon occurs because carbohydrates and proteins compete for limited water in the system. The presence of protein will prevent the entry of water into the starch granules.

3) Rehydration

The effect of winged bean fermentation treatment and the concentration of konjac flour gave a significantly different effect on the rehydration value of instant corn noodles. The relationship between the mean and fermentation treatment and the concentration of konjac flour is presented in Figure 7.

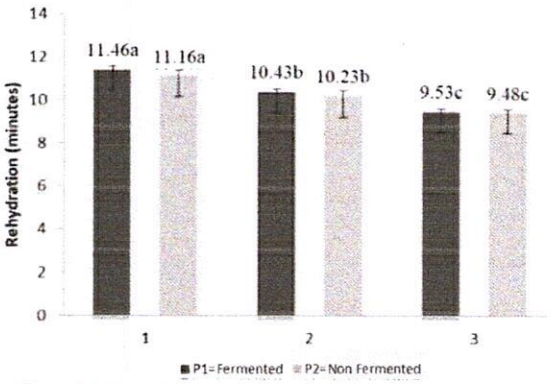

Fig. 7 Effect of fermentation and concentration of konjac flour on rehydration of instant cassava-corn noodles. Note: P1.1 (15% : 0%); P1.2 (10% : 5%); P1.3 (5% : 10%); P2.1 (15% : 0%); P2.2 (10% : 5%); P6 (5% : 10%).

Figure 7 shows that the lower the concentration of fermented and non-fermented winged bean flour, the lower the rehydration value of instant corn noodles. The highest rehydration was found in treatment P1.1 which was 11.45 minutes and the lowest was found in treatment P2.3 which was 9.45 minutes. In the statement of [19], it is suspected that the addition of protein tends to affect the peak temperature of gelatinization so that the gelatinization phase requires more time. This phenomenon occurs because carbohydrates and proteins compete for limited water in the system. The presence of protein will prevent the entry of water into the starch granules. The water used to make starch is gelatinized and bound by protein, so it takes a long time because of this competition.

1. Elongation

The effect of winged bean fermentation treatment and the concentration of konjac flour gave no significant effect on the elongation value of instant noodles. The relationship between the mean and fermentation treatment and the concentration of konjac flour is presented in Figure 8.

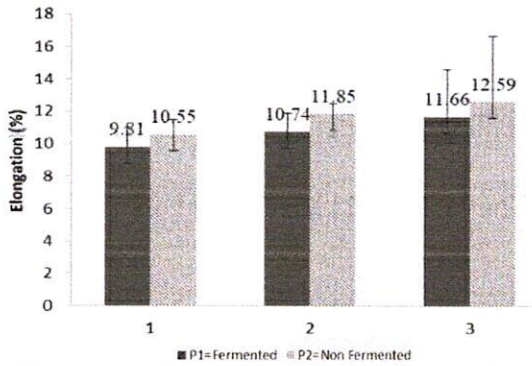

Fig. 8 Effect of fermentation and concentration of konjac flour on the elongation of of instant cassava-corn noodles. Note: P1.1 (15% : 0%); P1.2 (10% : 5%); P1.3 (5% : 10%); P2.1 (15% : 0%); P2.2 (10% : 5%); P6 (5% : 10%).

Figure 8 shows that the lower the use of winged bean flour and the higher konjac flour, the higher the elongation value of instant corn noodles. The highest elongation value was found in treatment P2.3 of 12.59% and the lowest was found in treatment P1.1 of 9.81%. This is because konjac flour contains glucomannan which can bind the material. This is supported by the statement of [20] that glucomannan can form a gel when it binds to water so that when there is an addition of konjac the tensile strength of the noodles is higher. This is also because the decrease in protein will make the elongation of the noodles better. This is supported by a statement from [17] which states that winged bean flour has a high protein content. Flour with a high protein content has a high-water absorption capacity as well. More flour with high protein content is added, while the amount of water in the dough cannot be fully gelatinized and caused the product to be easily broken.

2. L value

The effect of winged bean fermentation treatment and the concentration of konjac flour gave no significant effect on the L value of instant corn noodles. The relationship between the mean and fermentation treatment and the concentration of konjac flour is presented in Figure 9.

Figure 9 shows that the lower the use of fermented and non-fermented winged bean flour, the lower the L value of instant corn noodles along with the increase in konjac flour.

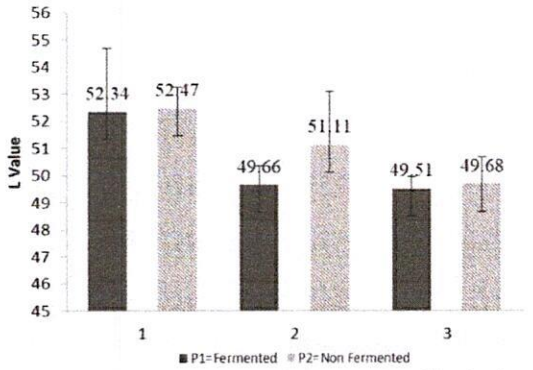

Fig. 9 Effect of fermentation treatment and concentration of konjac flour on the L value of of instant cassava-corn noodles. Note: P1.1 (15% : 0%); P1.2 (10% : 5%); P1.3 (5% : 10%); P2.1 (15% : 0%); P2.2 (10% : 5%); P6 (5% : 10%).

The highest L value was found in the P2.1 treatment of 52.47 and the lowest was found in the P2.3 treatment of 49.51. This is because winged bean flour has a bright color while konjac flour is dark and therefore both affect the L value or brightness level of instant corn noodles. This is in line with the research conducted by [7] regarding the addition of konjac flour in the manufacture of noodles with mocaf flour substitution. In his research, it was shown that the brightness level of noodles tends to decrease with the addition of konjac flour.

3. °Hue

The effect of winged bean fermentation treatment and the concentration of konjac flour gave no significant effect on the °Hue of instant corn noodles. The relationship between the mean and fermentation treatment and the concentration of konjac flour is presented in Figure 10.

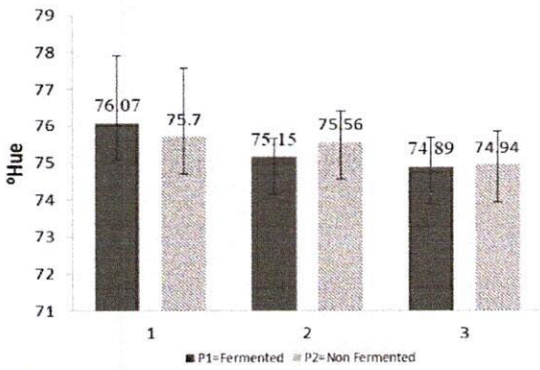

Fig. 10 Effect of fermentation treatment and concentration of konjac flour on °Hue of instant cassava-corn noodles. Note: P1.1 (15% : 0%); P1.2 (10% : 5%); P1.3 (5% : 10%); P2.1 (15% : 0%); P2.2 (10% : 5%); P6 (5% : 10%).

Figure 10 shows that the lower the use of winged bean flour and the higher the use of konjac flour, the lower the °Hue of instant corn noodles. The highest °Hue value was found in treatment P1.1 of 76.07 and the lowest was P1.3 of 74.89. This is due to the addition of konjac flour which has a slightly brown color. In the formulation of the raw materials used there is corn flour which is the main ingredient which has a yellow pigment so that the noodles produced have a dominant yellow color.

6. Organoleptic parameters

1. Taste

The effect of winged bean fermentation treatment and the concentration of konjac flour gave no significant effect on the taste of instant noodles. The relationship between the mean of the fermentation treatment and the mean of concentration of konjac flour is presented in Figure 11.

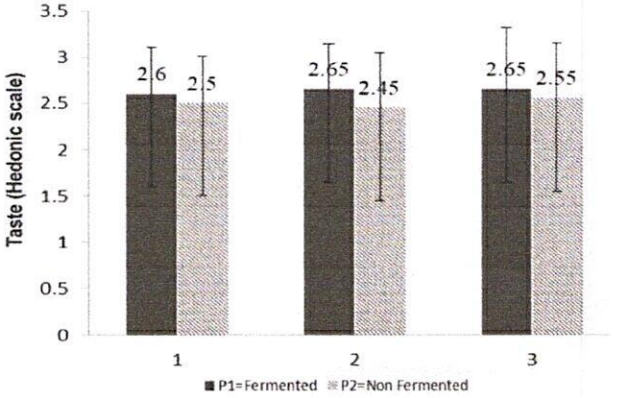

Fig. 11 Effect of fermentation treatment and concentration of konjac flour on the taste (hedonic scale) of of instant cassava-corn noodles. Note: P1.1 (15% : 0%); P1.2 (10% : 5%); P1.3 (5% : 10%); P2.1 (15% : 0%); P2.2 (10% : 5%); P6 (5% : 10%).

Figure 11 shows that the panelists' preference level tends to increase as the use of winged bean flour decreases. The highest value is found in the treatment P1.3 of 2.85 (somewhat like) and the lowest is found in treatment of P2.2 of 2.45 (dislikes). This is in line with [17], regarding the use of cassava flour and winged bean flour as a substitute for flour in the manufacture of cookies, resulting in the higher the addition of winged bean flour, the lower the likes for the taste of cookies. This is because winged bean flour contains a beany after taste. Beany flavor is the typical taste of nuts that could left the after taste in the mouth.

2. Aroma

The effect of winged bean fermentation treatment and the concentration of konjac flour gave no significant effect on the taste of instant noodles. The relationship between the fermentation treatment and the concentration of konjac flour is presented in Figure 12.

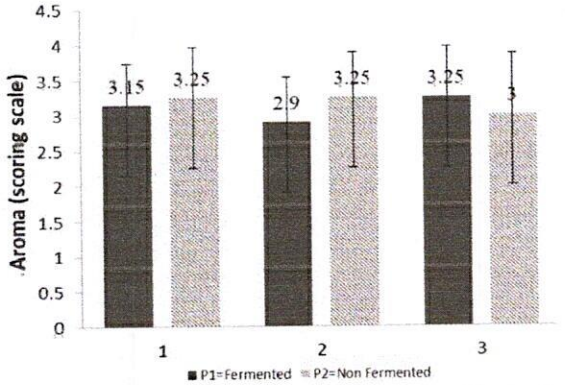

Fig. 12 Effect of fermentation treatment and concentration of konjac flour on the aroma (scoring scale) of instant cassava-corn noodles. Note: P1.1 (15% : 0%); P1.2 (10% : 5%); P1.3 (5% : 10%); P2.1 (15% : 0%); P2.2 (10% : 5%); P6 (5% : 10%).

Figure 12 shows that the higher the addition of fermented winged bean flour and non-fermented winged bean flour, the lower the level of scoring of instant noodle aroma. The highest aroma value was found in treatments P2.1, P2.2, and P1.3 at 3.25 (slightly corn-flavored) and the lowest at 2.9 (slightly corn-scented) in P1.2 treatment. According to [21], winged bean seeds have an unpleasant aroma where this aroma is a distinct and so thick. In his research, he also explained that to reduce the unpleasant aroma of winged bean seeds, a fermentation process was carried out and this method was able to cover up a little of the unpleasant aroma of winged bean seeds.

3. Color

The effect of winged bean fermentation treatment and the concentration of konjac flour gave a significant effect on the color (hedonic scale and scoring) of instant noodles. The relationship between the fermentation treatment and the concentration of konjac flour is presented in Figure 13.

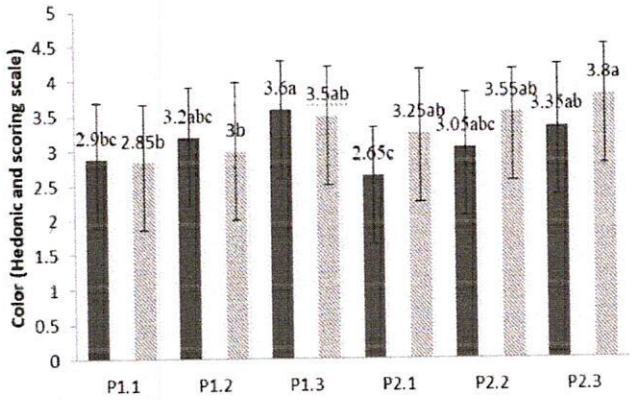

Fig. 13 Effect of fermentation treatment and concentration of konjac flour on the color (scoring and hedonic scale) of instant cassava-corn noodles. Note: P1.1 (15% : 0%); P1.2 (10% : 5%); P1.3 (5% : 10%); P2.1 (15% : 0%); P2.2 (10% : 5%); P6 (5% : 10%).

Figure 13 shows that the less the addition of winged bean flour, the higher the panelists' preference for instant noodles will be. The highest color hedonic value is found in treatment P1.3 of 3.6 (likes) and the lowest is 2.65 in treatment P2.1, while for the scoring scale the highest value is found in treatment P2.3 of 3.8 (light yellow) and the lowest is of 2.85 (yellow white) in treatment P1.1. This is in accordance with the research conducted by [25], which is about the effect of adding winged bean flour to jajan kepeng, which states that the higher the addition of winged bean flour, the lower the panelists' preference for jajan kepeng.

4. Texture

The effect of winged bean fermentation treatment and the concentration of konjac flour had a significant effect on the texture (scoring scale) of instant corn noodles. The relationship between the fermentation treatment and the concentration of konjac flour is presented in Figure 14.

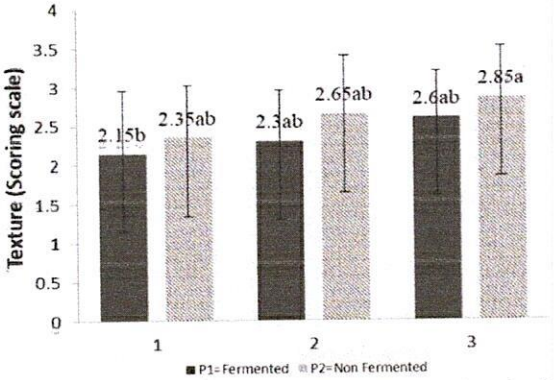

Fig. 14 Effect of fermentation treatment and concentration of konjac flour on the texture (scoring scale) of instant cassava-corn noodles. Note: P1.1 (15% : 0%); P1.2 (10% : 5%); P1.3 (5% : 10%); P2.1 (15% : 0%); P2.2 (10% : 5%); P6 (5% : 10%).

Figure 14 shows that the less the addition of winged bean flour and the increasing addition of konjac flour, the higher the elasticity or texture of instant noodles will be. The highest texture value was found in treatment P2.3 of 2.85 (slightly chewy) and the lowest was found in treatment P1.1 of 2.15 (not chewy). This is because konjac flour contains glucomannan. Based on research conducted by [25] it was stated that the increase in the texture of meatballs was due to the high addition of konjac flour because konjac flour contains glucomannan which is hydrocolloid which functions as binding agents that can bind components or raw materials so that the meatball texture becomes strong and compact.

IV. CONCLUSION

The best treatment was obtained at P1.1 (15% fermented winged bean flour : 0% konjac flour) with 6.83% moisture; 3.16% ash; 14.10% protein; 1.08%, fiber; L value 52.34; °Hue

76.07; cooking time 11.53 minutes, cooking loss 3.02%, elongation 9.81%; rehydration 11.46 minutes. The agglomeration process occurs in noodle due of ball milling processed so that the size particle of noodle aroud 7.643 µm.

ACKNOWLEDGMENT

We gratefully acknowledge the Ministry of Education, Culture, Research and Technology of Republic of Indonesia for research funding and the Faculty of Food Technology and Agroindustry, University of Mataram for the technical support.

REFERENCES

[1] M. Astawan, Making Noodles and Vermicelli, Jakarta: Selh-Help Spreader, 2002.

[2] Isnaini, "Making Instant Noodles Made From Local Riau Corn Flour and Tapioca," 2010.

[3] Suarni and I. Firmansyah, "Corn Rice: Processing and Nutrient Content as Staple Food Ingredients," in *Proceedings of The National Corn Seminar and Workshop*, Makassar, 2005.

[4] F. Lala, B. Susilo and N. Komar, "Characteristic Test of Instant Noodles Made from Wheat Flour With Mocaf Substitution," *Journal of Tropical Commodity Bioprocesses*, pp. 11-20, 2013.

[5] A. Salim, Processing Cassava Flour Into Mocaf Flour, Yogyakarta : Lily Publisher, 2011.

[6] N. Putri, H. Herlinan and S. Achmad, "Characteristics of Mocaf (Modified Cassava Flour) Based on Milling Method and Fermentation Time," *Journal of Agrotechnology* , 2018.

[7] A. Faridah and S. B. Widjarnako, "Addition of Porang Flour in Noodle Making with MOCAF (Modified Cassava Flour) Flour Substition," *Journal of Food Technology and Industry*, pp. 98-105, 2014.

[8] Y. Kartika, "Characteristics of Functional Propertios of Winged Bean (Psophocarpus Tetragonolobus L) Protein Concentrate.," Bogor Agricultural Institute, Bogor, 2009.

[9] Y. Putri, "Study of Winged Bean Flour (Psophocarpus Tetragonolobus (L) DC) Using Wet Milling Method and Analysis of Physicochemical Properties and Functional Characteristics," Bogor Agricultural Institute, Bogor, 2010.

[10] T. Aisjah and Abun, "Bioprocessing of Winged Bean (Psophocarpus Tetragonolobus (L) (DC) By Rhizopus Oligosporus to Increase Pure Protein and Decrease Cyanide Acid," *Journal of Animal Science*, 2012.

[11] Gushairiyanto, "Detoxification and Fermentation of Cassava Tubers Skin with Aspergillus Niger Mold and Its Implications for Goats.," Padjadjaran University, Bandung, 2004.

[12] Desrosier and N. W, The Technology of Food preservation, Third Edition. Translator: Muchji Mulijohardjo., Jakarta: University of Indonesia, 2008.

[13] P. Gaman and S. KB, Introduction to Food Science, Nutrition, and Microbiology., Yogyakarta: Gajah Mada University Press, 1994.

[14] E. Kuswandari, "Effect of Corn Fermentation on Physicochemical Properties of MP-Asi Fortified with Soy Tempe Flour," Lampung University, Bandar Lampung, 2012.

[15] S. Chan and J. Albert, The World of Food Science Konjac Part 1: Cultivation to Commercialization of Component, New York , 2008.

[16] A. Sulaemah, Prarudiyanto. and H. D, "The Effect of Winged Bean Flour Ratio With Wheat Flour on Several Nutrition and Organoleptic Components of Dried Sponge," *Profood*, 2016.

[17] E. Maturahman, F. Atamimi and Subehan, "Formulation and Analysis of Winged Bean (Pshoporcarpus Tetragonolobus L.) Biscuits From Lassua and Manokwari as Alternative Protein Source," *Dynamic Journal* , 2017.

[18] S. Mahirdini and D. Afifah, "Effect of Substitution of Wheat Flour With Porang Flour (Amorphophallus Oncopphyllus) on Protein Content, Dietary Fiber, Fat, and Biscuit Acceptance Rate," *Indonesian Journal of Nutrition.*, pp. 42-49, 2016.

[19] E. Pamungkas, "Utilization of Cassava Flour and Winged Bean in Making Cookies," Sebelas Maret University, Surakarta, 2008.

[20] J. L. Collins and P. Pangloli, "Chemical, Physical and Sensory Attributes of Noodles with Added Sweetpotato and Soy Flour.," *Journal of Food Science*, vol. 62, pp. 622-625, 1997.

[21] R. Wahyuni, "Effect of Addition of Moringa Leaf Protein Concentrate on Physicochemical and Organoleptic Properties of Mocaf Rice," *Faculty of Agriculture*, 2014.

[22] N. Imaningsih, "Gelatinization Profile of Several Flour Formulations for Estimating Cooking Properties.," *Dietary Nutrition Panel*, pp. 13-22, 2012.

[23] S. Koswara, "Tubers Processing Technology.," Bogor Agricultural Institute, Bogor , 2013.

[24] M. Astawan, Healthy With Nuts and Seeds, Cimanggi: Self-Help Spreader , 2009.

[25] M. Khalik, "The Effect of Addition of Winged Bean Flour (Psophocarpus tetragonolobus L) on Protein Levels and Sensory Properties of Kepeng Snacks," Faculty of Food Technology and Agroindustries, University of Mataram, Mataram, 2019.

[26] D. Kurniawati, "The Effect of Concertration of Porang Flour on the Quality of Oyster Mushroom Meatballs," University of Mataram , Mataram, 2019.

[27] Z. Asniwati, "Gelatinization Analysis of Maizena Flour in the Making Fettucine Pasta.," *Agropolitan Journal* , 2016.

[28] M. Arsyad, "The Effect of Addition of Mocaf Flour on the Quality of Biscuit Products," *Agropolitan Journal*, 2016.

[29] F. Amanu and H. Wahono, "Production of Mocaf Flour in Madura (Study of Varieties and Planting Locations) on Quality and Yield," *Journal of Food and Agroindustry* , pp. 161-169, 2014.

[30] A. Ali, P. Usamn and M. Dony, "A Study on the Quality of Instant Noodles Made from Local Riau Corn Flour and Sago Starch," in *Proceedings of the National Seminar*, 2013.

[31] A. Akesowan, "Visxosity and Gel Formation of Konjac Flour from Amorphophallus Ocophyllus," *AU Journal of Technology* , pp. 139-146, 2002.

[32] L. Darrah, M. MD and Z. MS, "Breeding, Genetics, and Seed Corn Production," in *Study of Quality Addition of Corn Noodle Products During Storage and Estimation of Shelf Life in the Arrhenius Method*, Bandung, University of Pasundan, 2003.

[33] P. Citra, A. Sukma and K. Haryani, "Utilization of Iles-iles (Amorphophallus Onchophyllus) as a Chewing Material in Tofu Making," *Journal of Chemical and Industrial Technology*, pp. 78-85, 2012.

[34] U. Biyumna, W. Windarti and N. Diniyah, "Characteristics of Dry Noodles Made from Breadfruit Flour (Artocarpus Altilis) and Addition of Eggs," *Journal of Agrotechnology* , 2017.

[35] A. Billina, W. Sri and S. Diding, "Physical Study of Wet Noodles With Addition of Seaweed.," *Journal of Agricultural Engineering Lampung*, pp. 109-116, 2014.

[36] K. Balqis, "Effect os Drying and Rehydration Methods on Physical Characteristics of Tekwan," University of Sriwijaya, 2018.

[37] R. Bakhrin, Zuhidin. and D. Seno, "Study of Making Tempe from Rubber Seeds.," *Agrium Journal* , pp. 108-111, 2013.

[38] P. D. Sugiyono, Metode Penelitian Kuantitatif Kualitatif Dan R&D, Bandung: Alfabeta, 2013.

[39] C. L. Griffin, Invitation to Public Speaking: National Geographic Edition (6th ed.), Boston : Cengage Learning, 2018.

[40] J. Glazer and A. Rubinstein, "Debates and Decisions: On a Rationale of Argumentation Rules," p. 4, 2000.

[41] E. Dwianingsih, "Chemical and Sensory Characteristics of Tempe With Variations in Soybean/Rice Raw Materials and Addition of Angkak and Variations in Fermentation Time," Sebelas Maret University , Surakarta, 2010.