Effect of Addition White Oyster Mushroom (*Pleurotus ostreatus*) and Carrot (*Daucus carota L*) in Probiotic Duck Nugget on Water Content, Cholesterol, Crude Fiber, Protein, Calcium and Organoleptic Value

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***Abstract*—** This research was aimed to determine the effect of interaction between white oyster mushroom (*Pleurotus ostreatus*) and carrot (*Daucus carota L*) on water content, crude fiber, cholesterol, protein, calcium and organoleptic value in probiotic duck nugget. The method used in this study was experimental method by using a randomized block 3 x 3 factorial design with two replications as a group. The factor A consisted of white oyster mushroom, namely A1: 0%, A2: 10%, A3: 20%, and the factor B consisted of carrot, namely B1: 0%, B2: 10%, B3: 20%. The parameters measured were water content, crude fiber, cholesterol, protein, calcium and organoleptic value in probiotic duck nugget. Based on the research, there was very significant interaction (P<0.01) in addition of white oyster mushroom and carrot to decreased of cholesterol and increased the percentage of crude fiber. On water content there was no significant interaction (P<0.05). The percentage of addition 20% of white oyster mushroom and carrot able to decreased cholesterol to 10.25 mg/dl and increased the crude fiber to 2.74.The results showed that there was a significant interaction (P<0.05) between the white oyster mushroom and carrot on calcium value. On protein and organoleptic value did not show significant interaction (P<0.05). The percentage of addition 10% of white oyster mushroom and 20% of carrot in probiotic duck nugget could be the best result on value of protein 15.06%, calcium 1.14% (114.24 mg/100 g) and organoleptic that consisted of color 2.04, texture 1.72 and flavor 1.96.

Keywords — probiotic duck nugget, white oyster mushroom, carrot, protein, cholesterol

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I. Introduction

One poultry meat producer is a duck. Duck meat can contribute a source of protein for the human body. Protein source from outside the body is best of animal protein, but the source of animal protein in general have high cholesterol levels.

Selection of probiotic duck meat because the meat is expected to be more healthy, due to consumption of probiotic by ducks during maintenance. Nugget with the addition of white oyster mushroom (*Pleurotus ostreatus*) as a source of fiber and calcium, which can increase calcium levels nugget. Carrot (*Dancus carota* L) as an antioxidant to contain beta-carotene which can prevent the oxidation of Low Densinty Lipoprotein (LDL) so that decreased cholesterol level. Interaction between white oyster mushroom and carrot are expected to improve the nutritional content of food such as increased level of protein and calcium. White oyster mushroom (*Pleurotus ostreatus*) can be source of protein, calcium and fiber in the form of polysaccharides.

Ducks species that widely farmed in Indonesia is *Anas domesticus* [1]. Giving probiotic in the form of *Pediococcus pentosaceus* with a dosage of 2 ml/tail ($1.27x10^7$ cfu/g) for broiler by Purwati reported that the cholesterol levels which given of probiotic is 80mg/g, while not given probiotic is 145 mg/g [2].

White oyster mushroom according is a fungus that lives on rotting wood, sawdust, straw or waste cotton waste. This fungus has a hood body that blossom into a funnel shape like a shallow or oyster shells and resemble the ears [3].

Carotene in vegetables can't be fully absorbed by the body. The range of the ability to absorb carotenoids derived from vegetables only 33-58%, or an mean of 50%. Not all of the absorbed carotene is converted into vitamin A. FAO-WHO Group has entered into the calculations that half of the carotene will be converted into vitamin A [4].

The purpose of this study was to determine the optimal addition of white mushroom (*Pleurotus ostreatus*) and carrot (*Daucus carota* L) at the nugget ducks probiotic. The hypothesis of this study is the interaction between the addition

of white oyster mushroom (*Pleurotus ostreatus*) and carrot (*Daucus carota* L) at the Probiotic Duck Nugget to increased levels of water content, crude fiber, cholesterol, protein, calcium and probiotic organoleptic duck nuggets.

II. Material And Method

Research procedures for the manufacturing process steps nugget is the first probiotic duck meat separated from the bones weighing 500g, prepare the dough. White oyster mushroom and carrot that had been weighed and then separate and mixed into the meat along with the dough in accordance with the treatment. The dough nuggets ducks probiotic after mixed (according to treatment) in print and then steamed for 30 minutes. Flouring process is performed after cold nugget of steamed, then packed in vacuum plastic and stored freezer for 16 hours. Materials used nugget Creation Research hearts duck duck meat is probiotic singer Sikumbang Jonti (*Anas domesticus*).

This study used an experimental method with Randomized Design factorial 3 x 3 and 2 repetitions as a group, these treatments are:

Factor A is the addition of white oyster mushroom slices, consisting of :

A1: Without white oyster mushroom 0%

A2: The addition of oyster mushroom 10%.

A3: The addition of white oyster mushroom 20%

Factor B is the addition of carrot shavings, consisting of :

B1: Without carrot 0%

B2: The addition of carrot 10%.

B3: The addition of carrot 20%

The mathematical model used in accordance with the design [5] :

$$Yij = \mu + \alpha i + \beta j + (\alpha\beta ij) + Kk + \Sigma ijk$$

Information :

Yij = Value observations on experimental unit that are subjected to the level of factor A-I level of factor B j and k replicates all.

μ = Mean common

A factor αi = Effect of the i-th stage

βj = Effect of factor B to level-j

αβij = Influence of interaction of factors A level of all I, factor B to level-j

Kk = Influence group all k

Σijk = Effect of errors on trial units that are subjected to the A level-I, factor B level all replicates all j and k.

To determine the effect of treatment given to the observed variables would require a further test by using Duncan's Multiple Range Test (DMRT) [5].

III. Result And Discussion

A. Water Content

TABLE 1
WATER CONTENT OF PROBIOTIC DUCK NUGGET WITH THE ADDITION OF WHITE OYSTER MUSHROOM AND CARROT

Factor A	Factor B			Mean
	B1	B2	B3	
A1	42.589	43.655	44.334	43.526
A2	44.033	44.601	45.335	44.656
A3	43.292	46.641	47.264	45.732
Mean	43.304	44.965	45.644	

From table 1 it appears that the water content of the resulting nuggets were on the mean 42.589% to 47.624%. ANOVA test results showed that the white oyster mushroom (factor A) to the percentage of 20% did not significantly affect water level, so does the percentage of carrot (factor B) to the extent of 20%. Comparison of the treatment difference in the composition of white oyster mushroom and carrot are also not significant ($p < 0.05$) increase in the water content of the probiotic duck nuggets.

The percentage increase factor A and factor B were not significantly different due to the content of water each no mutually mendominasai, the higher the substitution of each factor will reduce the percentage of other ingredients that are not effect to increase the water content.

B. Crude Fiber

TABLE II
CRUDE FIBER PROBIOTIC DUCK NUGGET WITH THE ADDITION OF WHITE OYSTER MUSHROOM AND CARROT

Factor A	Factor B			Mean
	B1	B2	B3	
A1	0.347 ^{e}	1.180 ^{d}	1.248 ^{d}	0.925
A2	1.196 ^{d}	1.380 ^{d}	1.891 ^{c}	1.489
A3	1.246 ^{d}	2.100 ^{b}	2.744 ^{a}	2.030
Mean	0.930	1.553	1.961	

Description : The mean with different lowercase superscript showed highly significant (P <0.01)

From table 2 can be concluded that the substitution of white oyster mushroom and carrot are very significant in increasing the fiber content of coarse nugget ducks probiotic, so also there are interactions both in raising crude fiber. Nugget produced had a crude fiber content 0.565% to 2.744%. Composition substitution between factor A and factor B to varying increments of 20% more exalted crude fiber content in the nugget.

C. Cholesterol

TABLE III
CHOLESTEROL PROBIOTIC DUCK NUGGET WITH THE ADDITION OF WHITE OYSTER MUSHROOM AND CARROT

Factor A	Factor B			Mean
	B1	B2	B3	
A1	23.05 ^{a}	19.75 ^{b}	16.2 ^{d}	19.67
A2	17.7 ^{c}	15.0 ^{e}	12.4 ^{g}	15.05
A3	14.05 ^{f}	11.7 ^{h}	10.25 ^{i}	12.00
Mean	18.27	15.48	12.97	

Description: The mean with different lowercase superscript showed highly significant (P <0.01)

From Table 3 it can be seen the mean total cholesterol duck nuggets highest probiotic is 23,05mg / ml and the lowest was 10.25 mg / ml. Oyster mushroom which acts as one of the contributors to the crude fiber can act as a cholesterol-lowering nor with the antioxidant content of carrot so that they can interact with each other in reducing the cholesterol content in the nugget. Levels of antioxidant activity in carrot used in the manufacture of probiotic duck nuggets of the most well is 13.901%.

The content of oyster mushroom are seeded on cholesterol reduction not only in terms of their fiber content but also in terms of its role as prebiotics that support the growth of probiotic in the form of Lactic Acid Bacteria (LAB) contained in meat. LAB which is coupled with the prebiotic probiotic can also act as natural antioxidants and can also interact with cholesterol levels duck nuggets probiotic.

D. Protein

TABLE IV
PROTEIN PROBIOTIC DUCK NUGGET WITH THE ADDITION OF WHITE OYSTER MUSHROOM AND CARROT

Factor A	Factor B			Mean
	B1	B2	B3	
A1	16.46	15.58	15.13	15.72[a]
A2	16.04	15.15	15.06	15.41[a]
A3	15.65	15.00	13.05	14.57[b]
Mean	16.05[a]	15.24[b]	14.41[c]	15.23

Description: The mean with different lowercase superscript showed highly significant (P <0.05)

The absence of these interactions caused by protein content in carrot is lower than the white oyster mushroom and meat, but the analysis of variance showed the influence significantly different (P <0.05) on each factor.

The protein content of duck nuggets probiotic treatment with factor A (oyster mushroom) and factor B (carrot) cannot pass the protein content of meat nuggets. This is due to the white oyster mushroom lower protein content than meat where white mushroom protein content is 10.5% and protein content of carrot that were not as white oyster mushroom or meat which is about 0.93%, so that did not show an interaction between treatments. Protein oyster mushroom is a globular protein, globular protein is a protein that is damaged in processing. This protein has a same type of characteristics that is easily denatured. It supported the opinion [6] which explains that protein oyster mushroom is the same globular proteins with the protein in meat. [4] added a globular protein is a protein that is spherical, soluble in saline solution and a dilute acid solution and easily denatured by the influence of temperature, salt concentration, solvent acids and bases.

E. Calcium Level

TABLE V
CALCIUM PROBIOTIC DUCK NUGGET WITH THE ADDITION OF WHITE OYSTER MUSHROOM AND CARROT

Factor A	Factor B			Mean
	B1	B2	B3	
A1	0.99[cd]	0.97[cd]	0.87[de]	0.94
A2	0.98[cd]	1.04[c]	1.14[b]	1.05
A3	1.26[a]	0.94[d]	0.80[de]	1.00
Mean	1.08	0.98	0.94	

Description: The mean with different lowercase superscript showed highly significant (P <0.05)

Results of analysis of variance showed interaction between factor A and factor B to the level of calcium nugget effect ducks probiotic significantly different (P <0.05). The results of a further test multiple range Duncan's show that the interaction of treatment to calcium levels Probiotic Duck Nugget in the treatment of A3B1 (1:26%) were significantly different (P <0.05) to the treatment A2B3 (1:14%), A2B2 (1:04%), A1B1 (0.99%), A2B1 (0.98%), A1B2 (0.97%), A3B2 (0.94%), A1B3 (0.87%) and A3B3 (0.80%). Significantly different (P> 0.05) levels of calcium in duck nuggets probiotic caused by the content of calcium from oyster mushroom and carrot into substitute calcium in duck nuggets probiotic which calcium content of the oyster mushroom is higher than calcium duck meat probiotic. Interaction factor A (oyster mushroom) and factor B (carrot) shows calcium levels increased, resulting calcium substitution of factor A (oyster mushroom) and factor B (carrot) on meat probiotic duck nugget. However, in line with the addition of factor B (carrot) calcium levels will decrease while the addition of factor A (oyster mushroom) increase calcium levels, this is because the white oyster mushroom vegetable material mineral sources of calcium.

F. Organoleptic Value

Color

TABLE VI
RATING APPEARANCE COLOR PROBIOTIC DUCK NUGGET (%) AT VARIOUS PERCENTAGE GIVING WHITE OYSTER MUSHROOM AND CARROT

Factor A	Factor B			Mean
	B1	B2	B3	
A1	1.68	2.08	2.24	2.00
A2	2.12	2.08	2.04	2.08
A3	2.12	2.28	2.16	2.19
Mean	1.97	2.15	2.15	

In Table 6 shows no interaction significantly different (P> 0.05) between the white oyster mushroom (factor A) and carrot (factor B) towards the organoleptic assessment nugget color duck probiotic. Seen in the table shows that the mean value of probiotic organoleptic color duck nuggets ranged from 1.68 – 2.28. Organoleptic color probiotic duck nuggets highest in A3B2 treatment is 2.28, and the lowest in the treatment of A1B1 is 1.68. *Friedman's* analysis of variance results showed that the treatment factor A (oyster mushroom) and factor B (carrot) were not significantly different (P> 0.05) to the mean value of color organoleptic duck nuggets produced probiotic. This shows that the of oyster mushroom and carrot no real effect on the organoleptic color on duck nuggets probiotic. This is because the flavor has a role gives aroma, flavor, and color in the aroma of meat nugget nuggets so overcome by the probiotic duck condiments provided. In line with [7] which states condiment used to flavor, odor, and color in cooking.

Not significantly different (P> 0.05) treatment given nuggets of duck probiotic between this treatment due to treatment factor A (grated carrot) into giver natural color content of the probiotic duck nugget do not get the attention of the panelists for the provision of flour panir lining the nugget is the same color , so the color is visible outside the nugget color.

Texture

TABLE VII
RATING APPEARANCE TEXTURE PROBIOTIC DUCK NUGGET (%) AT VARIOUS PERCENTAGE GIVING WHITE OYSTER MUSHROOM AND CARROT

Factor A	Factor B			Mean
	B1	B2	B3	
A1	1.80	2:20	2:00	2:00
A2	1.96	2:20	1.72	1.96
A3	1.92	2:04	2:00	1.99
Mean	1.89	2:15	1.91	

Table 7 shows no interaction significantly different (P> 0.01) in between factor A (oyster mushroom) and factor B (carrot) to assessment of organoleptic texture nugget ducks probiotic, showed that the mean value of organoleptic texture Probiotic Duck Nugget range between 1.72 - 2:20. Organoleptic texture probiotic duck nuggets highest in A1B2 treatment is at 2.20 and the lowest in the treatment of A2B3 is 1.72. In the treatment of carrot 10% indicate a preferred texture it is because carrot have a moisture content lower than that of white oyster mushroom formed so that the texture is more neutral. *Friedman's* analysis of variance results showed that the oyster mushroom and carrot are not significantly different (P> 0.05) to the mean value of probiotic organoleptic texture duck nuggets produced. This shows that the treatment factor A (oyster mushroom) and factor B (carrot) effect did not significantly affect the organoleptic texture duck nuggets probiotic.

Not significantly different (P> 0.05) treatment given probiotic duck nuggets between treatments is due to the addition of the treatment of white oyster mushroom and carrot which contain fiber, fiber will make being loud and uniform texture. Good fiber content in meat duck nuggets of probiotic and the oyster mushroom and carrot are millstones affect the texture of the duck nuggets probiotic. In line with [8] which states substituting white oyster mushroom will affect the texture becomes coarse nugget.This is due to the fiber content owned oyster mushroom and milling may also affect the texture nuggets, milled meat texture is different from the texture of meat intact. This is because during the milling process is believed to occur severance of muscle fibers by a grinding machine, thus affecting the texture of ground beef. Oyster mushroom and carrot has a soft texture and easily combined with duck meat. In line with the opinion of [9] states oyster mushroom has a texture that is similar to poultry meat is chewy, white with a relatively neutral flavor, making it easier to integrate.

Organoletptik value indicates a better result from substituting chicken nuggets with oyster mushroom on research [8] with a value of 3:04 (scale 1-5) and research nugget carrot [10] with a value of 3.60 (scale 1-5). The results showed that the organoleptic value of texture nugget probiotic treatment ducks in a row 1.72 - 2:20 in the range of love, it means the treatment is still preferred by the panelists.

Flavor

TABLE VIII
RATING APPEARANCE FLAVOR PROBIOTIC DUCK NUGGET (%) AT VARIOUS PERCENTAGE GIVING WHITE OYSTER MUSHROOM AND CARROT

Factor A	Factor B			Mean
	B1	B2	B3	
A1	1.88	2.12	2.00	2.00
A2	1.84	2.24	1.96	2.01
A3	1.84	2.04	2.20	2.03
Mean	1.85	2.13	2.05	

Table 8 shows no interaction significantly different (P <0.05) between the white oyster mushroom (factor A) and carrot (factor B) to the organoleptic assessment duck flavor nuggets probiotic, showed that the mean value of probiotic organoleptic taste of duck nuggets ranged between 1.84 - 2.24. Organoleptic taste probiotic duck nuggets highest in A2B2 treatment is 2.24, and the lowest in the treatment of A2B1 and A3B1 is 1.84.

In the treatment of oyster mushroom 10% and 20% in the untreated carrot give small organoleptic 1.84 for oyster mushroom provides a softer texture caused by the water content although not significantly different. Treat balance showed a high value organoletik 2.24. [11] states that the water content is an important component in the food, because the water can affect the appearance, freshness, texture and taste of food. In line with that it is caused by the existence of a balancing aroma, texture, flavor from a combination of animal and vegetable materials. In materials water content will affect the effects that arise, especially the duck meat that people in general do not like is the distinctive flavor and texture. hard. A factor in treatment (oyster mushroom) and factor B (carrot) will balance it, even though the treatment was not significantly different address.

Friedman's analysis of variance results showed that the treatment factor A (oyster mushroom) and factor B (carrot) were not significantly different (P> 0.05) to the mean value of probiotic organoleptic taste duck nuggets produced. This shows that the administration of oyster mushroom and carrot no real effect on the organoleptic taste the duck nuggets probiotic.

Not significantly different (P> 0.05) treatment given probiotic duck nuggets between this treatment due to treatment factor A (oyster mushroom) and factor B (carrot) Balancing taste of duck meat probiotic so that it becomes more accepted by the panelists [12]. The treatment process also affects the taste nuggets that will be accepted by the panelists. In fact comestible community environment that is processed through the fried process preferred. [13] describes this process aims to produce a product that expands and crisp, besides increasing the flavor, color and shelf life of the final product. In addition glutamic acid content in white oyster mushroom and carrot can also cause a bad taste when cooked. Supported by [14] which states oyster mushroom contains glutamic acid which can cause taste savory, savory and delicious.

Showed better organoleptic value of quail meat sausage with the addition of white oyster mushroom on research [15] is 1.97 (scale 1-3) and nugget carrot on research [10] with a value of 3:10 (scale 1-5). The results showed that the organoleptic taste value probiotic treatment nugget ducks in a row 1.84 – 2.24 in

the range of like, it means the treatment is still preferred by the panelists.

IV. CONCLUSION

The results showed interaction addition of oyster mushroom and carrot very significant effect on levels decrease cholesterol and increase crude fiber, but does not affect the water content. The substitution of white oyster mushroom and carrot until addition of 20% resulted in decreasing cholesterol levels are 10.25 mg/dl and increases up to 2.722% crude fiber and produce high levels of water that does not exceed 60% in accordance with the Indonesian National Standard. The Probiotic Duck Nugget also shows the interaction increases significantly different calcium levels, increased calcium best is 1.14%, 15.05% protein content and organoleptic value on a scale like showing no real interaction but still in keeping with Indonesian National Standard.

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REFERENCES

[1] Wakhid, A. 2010. Breeding and Business Ducks. PT. Agromedia, Jakarta.

[2] Purwati, E., Jafrinur, Andri, H. Purwanto and Surjamen. 2013. "Business Innovation Ranch Broiler With Probiotic Profitable and Non Avian Flu At Farmers Cooperative Business Solutions Business Partner Top Alumni in Payakumbuh West Sumatra". Had a seminar at the National Seminar and workshop: Increase Innovation in Tackling Kemiskinan- LIPI. Bandung September 30 to October 1, 2013.

[3] Suriawiria, U. H. 2009. "Success Beragrobisnis Wood Shitake Mushroom, Ear, oysters". Sower Swadaya, Jakarta.

[4] Winarno, F. G, 2004. "Food Chemistry and Nutrition". P.T. Gramedia Pustaka Utama. Jakarta.

[5] Steel, R. G. D and J. H. Torrie. 1995. Principles and Procedures of Statistics. Translators: Sumantri, B.Jakarta: PT. Gramedia Pustaka Utama.

[6] Muchtadi D. 2000. Vegetable, source of fiber and antioxidants would prevent degenerative diseases. Department of Food Technology and Nutrition, FATETA, Institut Pertanian Bogor.

[7] Maryati, H. S., 2000. "Procedures for Food". Rineka Cipta, Jakarta.

[8] Permadi, S.N., Mulyani, S., and Hintono, A. 2012. "Levels Fiber Properties Appearance dn yield Chicken Nugget substituted with White Oyster Mushroom (Pleurotus ostreatus)". Journal of Food Technology Applications, Vol.1 # 4

[9] Dahlia, S. N. 2014. "The Effect of Addition of White Oyster Mushroom (Pleurotus streatus) on the Quality and Value Appearance salvage Shredded Meat Quail (Coturnix Coturnix Japonica)". Essay. Andalas University. Padang.

[10] Melisa, N. 2011. "The Effect of Mixing Flour and Wheat Flour Tofu Dregs as a binder material Nugget Quality Of Carrot (Daucus carota L)". Essay. Study Program of Agricultural Technology. Faculty of Agricultural Technology. Andalas University. Padang

[11] Legowo, A. M. and Nurwanto. 2004. Analysis of Food. Lecture diktat. Livestock Technology Studies Program. Faculty of Animal Husbandry, Diponegoro University. Semarang. 54 p.

[12] Purwati, E., S. N. Aritonang and Husmaini, 2015. Quality and Food Safety Animal Product. Minang Kabau Press. Padang West Sumatra. ISBN 602955273-7

[13] Ketaren, S. 2008. "Introduction to Technology Oils and Fats Food", Jakarta. University of Indonesia

[14] Donowati, T. 2008. Oyster Mushroom (Pleurotus ostreatus) to Improve Food Security and Environmental Rehabilitation. Jakarta.

[15] Putra, R. J. 2013. "The Effect of Addition of White Oyster Mushroom (Pleurotus streatus) The protein content, fat content, Moisture, Fibre and Value Appearance Sausage Meat quail rejects". Essay. Andalas University. Padang.