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National Student Conference on Food Science and Technology

SMART FOOD

Lifestyle and Health Reconciled

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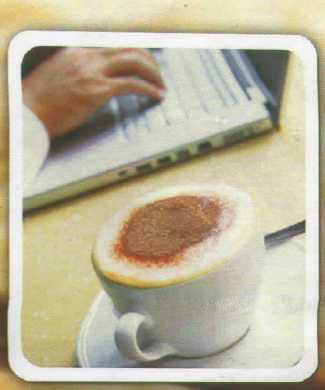

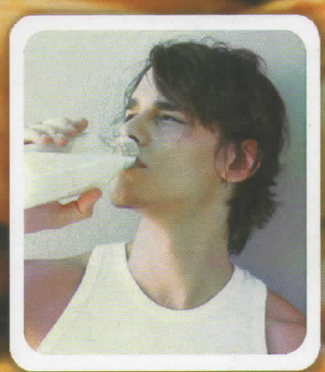

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PREFACE

This publication as an outgrowth of the 8th National Student Conference (NSC) on Food Science and Technology organized by the Food Technology Department, Soegijapranata Catholic University (FoodTech UNIKA). For a relatively small institution like FoodTech UNIKA organizing an annual conference in eight successive years demands a sizeable effort. Since its inception, however, the NSC has been specifically designed as a "for and by the students" event. Thanks to the sustained flow of motivation of FoodTech UNIKA's students, without their powerful energy it will be difficult for the Department to organize the event consistently.

At present we are witnessing is a momentous transformation of the meaning if food. Food is no longer perceived merely as source of nutrition. In fact, there is now an increasing demand that food should contain health promoting agents. This trend has led to hefty growth of functional food. In the early development of functional food, health properties are considered as the primary factor which to some extend may sacrifice the sensory properties (e.g. taste) of food. However, the trend has swiftly moved toward a compromise approach. In the 8th NSC the term "smart food" was used to capture the reconciliation of two values i.e. health and indulgence (taste and lifestyle). The driving factor behind this new development is basic. In any food game, human desire to consume tasteful stuffs is and wiill always be the winner.

This publication includes two papers presented at the plenary session, and thirty two papers discussed in six parallel sessions, i.e. *Food Innovation*, *Food and Health*, *Functional Food*, *Food Quality and Safety*, *Food Chemistry and Analysis*, *and Food for Lifestyle*. It is interesting to note that there is a growing diversity of topics presented at the 8th NSC compared to previous years. However, in terms of quality it is not easy to judge whether a significant progress has really taken place. Although the primary aim of NSC is to provide platform for students of food related fields to experience a flavor of scientific conference conducted entirely in English, quality of the papers should also be at the spotlight. With the growing interest of students from many corners of this country, including those who study overseas, I personally believe that there will be more diverse and higher quality ideas ready to be exchanged in the coming NSC.

Semarang, October 6 - 2009

Budi Widianarko
Chairman of the Steering Committee

FOOD INNOVATION

FOOD AND HEALTH

FUNCTIONAL FOOD

FOOD QUALITY & SAFETY

ANALYSIS OF VITAMIN A AND ANTIOXIDANT ACTIVITY IN INSTANT DRY NOODLE FORTIFIED WITH CRUDE PALM OIL (CPO)

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ABSTRACT

Instant noodle become one of the most popular food in Indonesia because its affordable price and practical serving. Instant noodle is very popular and acceptable, so instant noodle should be fortified with some vitamins to increase the nutritional value. Crude palm oil (CPO) is the biggest natural carotenoid source which is easy to find in Indonesia. CPO contains 500 – 700 ppm of carotenoid and 600 – 1000 ppm of tocopherol and tocotrienol (vitamin E). Natural antioxidant usually used to prevent oxidation in food product. The aim of this research is to increase nutritional quality of instant dry noodle using CPO as β-carotene source and antioxidant. Concentration of CPO was applied in this research i.e. 0% (control), 20%, 30%, and 40% respectively. Evaluation conducted in this research consists of chemical characteristics evaluation (proximate, vitamin A, and antioxidant activity), physical characteristics evaluation (tensile strength, cooking yield, and cooking loss), and sensory evaluation. The result showed that fortification of CPO could increase vitamin A and antioxidant activity. Instant dry noodle with CPO concentration 40% showed the highest vitamin A (24778,77 SI) and antioxidant activity (22,72% discoloration). The large amount of CPO substitution had shown the decrease of tensile strength, and the increase of cooking yield and also cooking loss. According to sensory test, the most acceptable instant dry noodle was instant dry noodle with 20% addition of CPO.

Keywords : *Instant dry noodle, Crude Palm Oil (CPO), vitamin A, vitamin E, antioxidant activity.*

INTRODUCTION

Crude Palm Oil (CPO) is semi solid yellow or red oil product at room temperature that produced by extracion of fruit mesokarp that contain small amount of water and soft fibre (Naibaho, 1988 in Hasanuddin, 2001). The major components in CPO are the carotenes, tocopherols, tocotrienols, sterols, and squalene. CPO contains 500-700 ppm of carotenoids. The major components are α-carotene and β-carotene. CPO, besides being rich in vitamin A, also has a high content of vitamin E, present as tocopherols and tocotrienols, of which 70% are tocotrienols. Carotenes and tocopherols are

antioxidants that can stabilise the oil against oxidation (Gunstone, 2002).

Noodles are a kind of pasta that are generally made from flour, rather than semolina or farina, contain salt in addition to flour and water (Hoseney, 1994). Instant noodle are classified by processes, moisture, and degree of precooking. There are fresh (raw) noodle, wet noodle, dry noodle, fried noodle, instant dry noodle, and instant fried noodle. Instant dry noodle is product which made by steamed process before dried, and contain about 8% moisture (Kruger *et al.*, 1996). This research is considerably used to improve nutrition quality of instant dry noodle which added by CPO as vitamin A resource, antioxidant. It also aimed to found the best formulation instant dry noodle with variety CPO concentrations and consumer acceptance.

MATERIALS AND METHODS

Materials

This research used *Crude Palm Oil* (CPO) from PT. Bonanza Megah Ltd, high protein flour mills from Bogasari Flour Mills (branded by"Kereta Kencana"), eggs, salt, and water.

Methods

Preliminary research was done to analyze of vitamin A, protein, water content ,ash, and antioxidant activity from CPO and to find the formulation of instant dry noodle. The formulation of instant dry noodle making was choosen based on substitution of CPO from sensory analyzes which used rating test with 5 panelists (3 female and 2 male). 20%,30%, and 40% of CPO substitution were choosen for making instant dry noodle. The instant dry noodle then were dried about 2 hours at 70°C.

Table 1. Instant dry noodle formulation

Materials	Level of Substitute (gram)			
	0 %	20 %	30 %	40 %
Flour mills	500	500	500	500
Egg	50	50	50	50
Salt	5	5	5	5
Water	150	120	105	90
CPO	0	30	45	60

Source: Kruger & Matsuo (1996), modified

Instant dry noodle were produced by mixing wheat flour, egg, salt, and water as shown on Table 3 The dough was added by CPO (Table 3) then it was mixed slowly. The result of dough was fed in sheet roller and dough was rest for 20 minutes. The dough was rolled to approximately 1 mm sizes and it was done four times. After that, the dough was fed into the former machine. The noodle was boiled for 5 minutes and it was dried by dehumidifier for 2 hours. The instant noodle was packed by manual sealer.

CPO instant dry noodle as the product was analyzed by chemical, physical, and sensory. Chemical analyze was done to measure water content (thermogravimetry), ash (furnace at 550°C), fat (Soxhlet),

protein (Kjeldahl), total carbohydrate (by difference) (Sudarmadji *et al.*, 1997), vitamin A (Apriyantono *et al*, 1989), and antioxidant Activity (DPPH method) (Williams, 1995). Then, it followed by physical analyzes which include tensile strength (Llyod Universal Testing Instrument), cooking loss, and cooking yield measurements (Seib *et al.*, 2000 modified). Sensory analysis was done using hedonic scale method with 40 panelists (Kruger *et al.*, 1996). Ranking test was done to find overall taste, color, texture and flavor. These results were analyzed with one way anova and data were presented with SPSS for windows 15.0.

RESULTS AND DISCUSSION

Crude Palm Oil is important source of vitamin A and antioxidant. Based on chemical analysis was found 32784.25 ± 1438.42 SI/100 g materials of vitamin A and 35,97 ± 0.87% discoloration of antioxidant activity. And the water content is 3,54 ± 0.07%, protein and ash content are 0.50 ± 0.02%; and 0.06 ± 0.01% respectively.

Chemical Analyzes

Chemical analyzes was done and the result show at Table 3.

The result of analyze water content instant dry noodle is between 4.57–7.08 % (Table

Tabel 2. The result of Chemical test for CPO

Nutrition Content	Result
Water	0.50 ± 0.02% b/b
Ash	0.06 ± 0.01% b/b
Protein	3,54 ± 0.07% b/b
Antioxidant Activity	35,97 ± 0.87 % *discoloration*
Vitamin A	32784.25 ± 1438.42 SI / 100 g materials

Table 3. Result of Chemical Test to Instant Dry Noodle

Testing	Treatment			
	MIK	MIA	MIB	MIC
Water (% w/w)	7.08 ± 0.70^{a}	5.42 ± 0.55^{b}	4.94 ± 0.13^{c}	4.57 ± 0.04^{d}
Ash (%)	1.31 ± 0.05^{a}	1.72 ± 0.74^{b}	2 ± 0.13^{c}	2.31 ± 0.12^{d}
Lipid (% w/w)	1.28 ± 0.04^{a}	7.97 ± 0.13^{b}	10.2 ± 0.27^{c}	12.57 ± 0.13^{d}
Protein (% w/w)	10.49 ± 0.44^{a}	12.08 ± 0.57^{b}	12.95 ± 0.57^{c}	15.64 ± 0.99^{d}
Carbohydrate *by difference* (%)	78.83 ± 0.50^{a}	71.92 ± 0.57^{b}	68.66 ± 0.75^{c}	63.38 ± 1.02^{d}
Vitamin A (SI)	0 ± 0.000^{a}	14116.54 ± 352.39^{b}	18790.22 ± 388.02^{c}	24778.77 ± 412.48^{d}
Antioxidant activity (%)	0.89 ± 0.54^{a}	8.36 ± 0.44^{b}	14.03 ± 0.35^{c}	22.73 ± 1.18^{d}

- The whole result are *Mean ± Standard Deviation*
- The different superscript sign show significant differences (≤0.05) based on Duncan multiple range test.

Key :
MIK : *Control instant dry noodle*
MIA : 20 % CPO and 80% water noodle composition
MIB : 30 % CPO and 70% water noodle composition
MIC : 40 % CPO and 60% water noodle composition

3). The lowest of water content has been shown at 40% concentration of CPO which added to instant dry noodle (4,57%) and the highest is showed on control sample of instant dry noodle (7,08%). These results have fulfilled the requirement of SNI 01-3551-1994 which establish the water content of instant dry noodle is about 8% (Anonymous, 1994[b]). The amount of CPO applied to instant dry noodle influence the water content. Increasing the amount of CPO used can decrease the water content of instant dry noodle due to the substitution of water to CPO.

The ash contents of instant dry noodle are about 1.31 – 2.31%. The large amount of ash and lipid increase due to CPO addition it about 0.06 ± 0.01% and 1.28 – 12.57%. It was happened because CPO contains of 96,2% neutral lipid; 2,4% phospholipid; and 1,4% glycoslipid (Salunkhe *et al.*, 1992).

The protein amount of CPO instant dry noodle is about 10,49 – 11,64%. This is comply with the requirement of SNI 01-3551-1994 that shown the minimal contain of protein is 8 % (Anonymous, 1994[b]). The using of CPO is not significantly influence the protein content of instant dry noodle, because the protein content of CPO is almost zero. The high protein content of instant was come from using of flour mills protein (Anonymous, 1994[b]).

Carbohydrate content decrease CPO substitution. The highest carbohydrate content was found in control instant dry noodle (MIK) (78.83 ± 0.50%). Although the CPO has decreased carbohydrate content, but the more significant decreasing factor is the deformation of gluten because of low water content in CPO. So, the elastic mass that use to absorb carbohydrate, lipid, and protein is did not deform well (Matz, 1992 and Hoseney, 1994).

Vitamin A content in various conduct of instant dry noodle has been shown at table 3. The highest vitamin A had to MIC (40%) was between 24778.77 ± 412.48 SI / 100 g and the lowest found at control instant dry noodle was about 0 ± 0.000 SI / 100 g. These result showed that CPO has increased the vitamin A content compared to itself at 32784.25 ± 1438.42 SI / 100 g (Table 5).

The high amount of CPO added to instant dry noodle increased the antioxidant activity. The highest antioxidant activity was found in MIC (22.73%). The major components in CPO are the carotenes, tocopherols, tocotrienols, sterols, and squalene. CPO contains 500 – 700 ppm of carotenoids. The major components are α-carotene and β-carotene as natural antioxidant have increase the antioxidant activity that use for preventing the oxidation process (Shahidi & Naczk, 1995;

Kandaswami & Middleton, 1997; Rohn *et al*;., 2004 to Sibuea 2005).

Physical Analyzes

Tensile strength analyzes were done and the result show at Table 4.

According to Table 4, the addition of CPO decreased gluten content in composite and continue as well as water addition in it (CPO substitution), and it influenced the forming of gluten. The small amount of gluten decreased the tensile strength of instant dry noodle (Kruger *et al.* 1996)

Cooking yield and cooking loss analyzes was done and the result show at Table 5.

Cooking yield described the capability of instant dry noodle to water absorbtion. The high level of cooking yield showed the amount of water that absorbed into instant dry noodle, then cause the increase of the swelling process increased (Kruger *et al.*, 1996). The result of cooking yield analyzes

Table 4. Tensile Strength Analyze to Instant Dry Noodle

Treatment	Testing Tensile Strength (kgf/cm^2)
MIK	2.56 ± 0.62^a
MIA	1.06 ± 0.18^a

- The whole result are *Mean ± Standard Deviation*
- The different superscript sign show significant differences (≤0.05) based on Duncan multiple range test.

Key :
MIK : Control instant dry noodle
MIA : 20 % CPO and 80% water noodle composition

Table 5. The result of Cooking Yield and Cooking Loss as Physical Analyze to Instant Dry Noodle

Treatment	Testing *Cooking yield* (%)	*Cooking loss* (%)
MIK	193.49 ± 3.27^a	3.56 ± 0.09^a
MIA	211.73 ± 6.07^b	3.76 ± 0.07^b
MIB	230.39 ± 5.37^c	4.19 ± 0.17^c
MIC	243.59 ± 5.90^d	4.42 ± 0.13^d

- The whole result are *Mean ± Standard Deviation*
- The different superscript sign show significant differences (≤0.05) based on Duncan multiple range test.

Key :
MIK : Control instant dry noodle
MIA : 20 % CPO and 80% water noodle composition
MIB : 30 % CPO and 70% water noodle composition
MIC : 40 % CPO and 60% water noodle composition

(Table 5), CPO increased the water absorbtion capability of instant dry noodle. This was due to phospholipids content in CPO. The phosphate chain contained of electron and proton content from hydroxyl chain that can pull waters around, so the high level of CPO content increased cooking yield (Almatsier, 2002).

Cooking loss was an important factor that influence the cooking quality and defined as solid mass from the raw instant dry noodle that lost in the water during cooking process (Kruger *et al.*, 1996). As the statement of Dick & Youngs (1998) at Manthey & Schorno (1997) the maximum accepted of cooking loss is 8% and Table 5 shows that cooking loss of instant dry noodle were between 3.56 – 4.42. So, the addition of CPO was significantly increase

the instant dry noodle cooking loss. It happened because of the low water content from CPO influenced the deformation of gluten.

Sensory Analyzes

Sensory analyzes were done and the results are showed at Table 6.

The color of instant dry noodle was influenced by the existence of carotenoids as natural pigment (deMan, 1997). Table 6 show the level of panelist for color requirement with the parameter between like and dislike. The most accepted color from MIA (20% of CPO concentration) and followed by MIC (40% CPO concentration).

Taste is the sensory experience related by stimulus reaction below the tongue and around of mouth area (Taub & Singh, 1998). The addition of CPO influenced the taste of instant dry noodle and it is showed on Table 6 about the level of panelist taste requirement with the parameter between like and dislike. The most accepted taste was MIA (20% CPO concentration) and the second was MIK as the control.

Table 6. The Sensory Ranking Rate test of hedonic level to Instant Dry Noodle

Parameter	Testing	4	3	2	1	Mean
Color	MIK	3	2	3	42	1.32^{a}
	MIA	21	14	14	1	3.10^{b}
	MIB	8	14	24	4	2.52^{c}
	MIC	18	20	9	3	3.06^{b}
Taste	MIK	18	6	9	17	2.50^{a}
	MIA	19	16	9	6	2.96^{a}
	MIB	5	13	17	15	2.16^{ab}
	MIC	8	15	15	12	2.38^{ab}
Flavor	MIK	12	4	9	25	2.06^{a}
	MIA	17	12	13	8	2.76^{b}
	MIB	9	20	12	9	2.58^{b}
	MIC	12	14	16	8	2.60^{b}
Texture	MIK	14	17	5	14	2.62^{ab}
	MIA	22	11	14	3	3.04^{a}
	MIB	4	13	19	14	2.14^{c}
	MIC	14	22	4	10	2.20^{bc}

- The whole result are *Mean ± Standard Deviation*
- The different superscript sign show significant differences (≤0.05) based on Mann Whitney multiple range test.

Key :
MIK : Control instant dry noodle
MIA : 20 % CPO and 80% water noodle composition
MIB : 30 % CPO and 70% water noodle composition
MIC : 40 % CPO and 60% water noodle composition

Parameter : *(Color, Taste, Flavor, Texture)*
1 = dislike very much
2 = dislike
3 = like
4 = like very much

The requirement of instant dry noodle flavor panelist being to the parameter dislike and like. The best flavor requirement was MIA (20% CPO concentration) and the most unaccepted by panelist was MIK as the control sample. However, the difference between MIK and MIA did not show significant difference.

Texture is important sensory parameter in quality of food, sometimes it is more important than flavor, taste, and color (deMan, 1997). Table 6 shows the acceptance of panelist was between like and dislike. The highest score of acceptance shows on MIA (20% CPO concentration), it was due to lipid content of CPO made the instant dry noodle soft, not elastic, and low tensile strength. The former study found that the addition of lipid to noodle will increase firmness and decrease cohesiveness and also tensile strength (Kruger *et al*. 1996).

CONCLUSIONS

- Fortification of Crude Palm Oil (CPO) to instant dry noodle has influenced physical characteristics, i.e. decreasing tensile strength and increasing cooking yield and cooking loss. Chemical characteristic, i.e. decreasing water and carbohydrate content, increasing ash, lipid, protein, vitamin A content and also antioxidant activity and also characteristic of instant dry noodle product significantly.
- Instant dry noodle which added by 20% concentration of CPO is the most accepted product by panelist.

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