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PRE-EVALUATION OF TURMERIC'S (*Curcuma Longa*) ANTIOXI-DANT ACTIVITY AS A DEGRADATION INHIBITOR OF FISH PRODUCT IN A MODEL SYSTEM I
(EVALUASI PENDAHULUAN SIFAT AKTIVITAS ANTI OXIDANT KUNYIT (*Curcuma Longa*) SEBAGAI PENGHAMBAT PENURUNAN MUTU PRODUK PERIKANAN DALAM SUATU MODEL SYSTEM I

Oleh:

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ABSTRACT

So far, ground turmeric is produced by boiling the turmeric rhizome to destroy the enzyme activities. Turmeric was proved to have an anti-oxidant activity which destroyed by heating. Thus, for anti-oxidant purposes, the ground turmeric is less effective than the fresh one.

If the anti-oxidant actvity of fresh turmeric is found, the right doses in applying turmeric can be determined.

RINGKASAN

Tepung kunyit selama ini diproduksi setelah terlebih dahulu kunyit segarnya mengalami perebusan, dengan maksud untuk menginaktifkan enzim dan menstabilkan zat warna kuningnya. Dalam suatu model sistem, analisa dengan 617 Rancimat menunjukkan bahwa aktivitas antioksidan dari kunyit menurun drastis pada suhu 90°C.

1. Introduction:

Actually, fish deterioration can be avoided by applying low ambient temperature in fish handling and processing. How-ever, in tropical condition, using of ice is a quite expensive way if compare to end-fish product price.

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The popularity of sodium chloride is wellknown in fish salting processing. It can solve a part of the problems such as rapid deterioration. Due to its pro-oxidant activity, the salting products have a high risk of rancidity. The fish oil rancidity will lead a reduction of quality of the product and form some toxic materials.

Although food industries have used effective synthetic anti- oxidants. recently consumers of food prefer natural anti- oxidants on the basis of the assumption that natural compounds are safe. So, turmeric (an important spices among rice-eating peoples in most Asiatic countries) its seem to be one of natural anti-oxidants which is cheap. available everywhere in Indonesia, and suitable to tradition of Indonesian people.

Curcumin was identified as the antioxidant in turmeric. The rhizome of turmeric has been found to contain curcumin (diferuloylmethane), demethoxycurcumin [(p-hydroxycinnamoyl)-feruloylmethane, and bisdemethoxycurcumin (p,p'-dihydroxydicinnamoylmethane) (Diaz and Peinado, 1992; Krishnamurthy et al. 1976; and Jitoe et al. 1992). Jitoe et al. (1992) found that the antioxidant activity of turmeric was stronger than other tropical gingers, and this was in agreement with the work of Toda et al. (1985, cited by Jitoe et al., 1992) who reported that the anti-oxidant activity of the 3 curcuminoid were 20, 9, and 8 times, respectively, stronger than that of -tocopherol. Thus, the applying turmeric as a cheap anti-oxidant in fish processing should be investigated in order to find a fixed doses and form of turmeric (i.e. fresh rizhomes or powder form after being processed).

2. Experimental Methods

Apparatus. 617 Rancimat

Material and reagent

Turmeric powder from Midland Herbs & Spices and L-Noel & Son Ltd., fresh rizhome turmeric from West Java, Menhaden Oil from BDH, Metasilicic acid (silicic acid) from Sigma

Treatment of Sample

This treatment was based on the work of Chulu (1988). Menhaden oil was mixed with 20 % w/w of metasilicic acid (silicic acid) and continuously mixed by a magnetic stirrer under nitrogen for 16 hours. This process was continued until the oil sample gave a PV of less than 2 mEq/kg after which the oil was quickly filtered through a Whatman filter paper no. 541 in a Buchner funnel under vacuum. The oil was then kept at -50°C under nitrogen until required for use.

Analytical procedure

Four g of fish (menhaden) oil was weighed into each of the six reaction-vessel cylinders and then the reaction-vessel heads fitted using the SGJ clips after inserting glass anti-foaming and anti-splash rings. The connection were then made to the measuring vessels at the rear and also to the connecting tubes at the front with the appropriate spherical-joint transition pieces. The 617 rancimat was then run at 20 L air flow per hour and temperature between 50 - 120°C until the all curved line reached the other edge of the chart paper.

3. Results and Discussion

At a temperature of 50°C and an air flow of 20 litres per hour, the induction time for menhaden oil control was 8.75 hours, menhaden oil + 5 % NaCl (then filtered) was 7.5 hours, menhaden oil + 5 % TP (turmeric powder, then filtered) was more than 23 hours (changes were then observed only after the temperature was raised to 80°C), and for menhaden oil + 12 % TP directly applied the induction time was more than 25 hours (changes were only observed after 23 hours at 50°C, two further hours at 80oC and then raising the temperature to 100°C). When the rancimat experiment was repeated at 70°C it was found that the more turmeric present in the sample then the greater the antioxidant effect (rancidity protection factor, see Table 1).

Table 1. The changes of Induction Time (IT) and Rancidity Protection Factor (RPF) of Menhaden Oil at Difference Concentration of Turmeric Powder (TP)

SAMPLE	IT (minutes)		R P F	
Menhaden Oil Control	80	183	1	1
Menhaden Oil + 1 % TP	222	201	1.23	1.10
Menhaden Oil + 3 % TP	435	300	2.42	1.64
Menhaden Oil + 5 % TP	510	413	2.83	2.26
Menhaden Oil + 7 % TP	622	515	3.46	2.81
Menhaden Oil + 9 % TP	715	617	4.21	3.37

Note: each set of values is a single rancimat determination at 70°C.

The data in Table 1 supported the result of aprevious experiment (Suwandi, 1993) which indicated that turmeric reduced rancidity development in salted-dried dogfish as detected by sensory assessment. Further results also showed that the present of 5 % NaCl did not affect the increase of induction time caused by turmeric, although NaCl in menhaden oil caused reduction in induction time of 75 minutes at 50oC heating (see Table 2).

Table 2. The Changes of Induction Time (TP) of Menhaden Oil at Difference Concentration of Turmeric Powder (TP) and Turmeric Rhizome (TR)

SAMPLE	INDUCTION TIME (minutes)			
	80°C	90°C	100°C	120°C
Menhaden Oil Control	113	72	15	0
Menhaden Oil + 5 % NaCl			15	0
Menhaden Oil + 5 % NaCl + 5 % TP			24	0
Menhaden Oil + 3 % TR	104			
Menhaden Oil + 5 % TP		78	17	15
Menhaden Oil + 5 % TR	147	60		
Menhaden Oil + 7 % TR	218			
Menhaden Oil + 9 % TR	158			
Menhaden Oil + 10 % TP		110		
Menhaden Oil + 10 % TR		42		
Menhaden Oil + 11 % TR	171			
Menhaden Oil + 15 % TR		78		

Note: The percentage turmeric are in w/w. Each set of values are a single rancimat determination. The turm eric rhizome was frozen at -25°C for 7 months before being chopped and used.

This result supported the statement by Tarr (1962) that NaCl is a pro-oxidant substance. However, at higher temperatures a reduction in induction time due to the presence of salt was not detectable. It is evident that when salt was used along with turmeric the induction times are longer than when only turmeric was added(i.e. from 17 to 24 minutes and from 15 to 21 minutes at 100°C and 120°C respectively).

In Table 2 can be seen that heating at 90°C destroyed the antioxidant function of turmeric as indicated by the previous result (Suwandi, 1993). It is possible that the antioxidant properties of turmeric powder are less than those at fresh rhizomes. Turmeric powder is produced by grinding sun-dried turmeric rhizomes after being boiled for 3-4 hours (Purseglove et al., 1981). Heating is applied to destroy the vitality of the fresh rhizomes and to obviate the raw odour, to reduce the drying time, to gelatinise the starch and give a more uniformly coloured product. According to Jitoe et al.(1992), the antioxidant effect of turmeric is due to curcuminoids, i.e. the phenolic character of diferuloyl methane (Shankaracharya and Natarajan, 1973).

4. Conclusion and Sugesstion for Further Work

Turmeric was shown to have antioxidant activity in a model system using the 617 Rancimat. Investigation of the mode of action of turmeric in retardation of lipid via use of a model system is needed.

References

Chulu, C.L. 1988. Storage Stability of Edible Zambian Refined Sunflower Oil. M.Phil Thesis. School of Food and Fisheries, Humberside College of Higher Education, Grimsby-England.

Diaz, A.N. and M.C.R. Peinado. 1992. Fluorometric determi nation of Curcumin yogurt and musfard J Agric. Food. Chem., 42, 56-59

Masuda; I.G.P. Tengah; D.N. Suprapta; I.W. Gara; and N. Nakatani. 1992. Antioxidant activity of tropical ginger extracts and analysis of the contained curcuminoids. J. Agric. Food Chem., 40: 1337-1340

Krishnamurty, N.; A.G. Mathew; E.S. Nambudiri; S. Shivashankar; Y.S. Lewis; and C.P. Natarajan. 1976. Oil and oleoresin of Turmeric. Trop. Sci. Vol. 18: 37- 45

Purseglove, J.W., .G. Brown, C.L. Green, and S.R.J. Robbins. 1981. Spices. Vol. 2. Longman, London.

Shankaracharya, N.B. and C.P. Natarajan, 1973. Turmeric-chemistry, technology and uses. Indian Spices. Vol. 10. Part 3: 7-11

Suwandi, R. 1993. Quality Changes in Salted-dried Dogfish (Squalus acanthias L) during Processing and Storage. M.Phil. Thesis. School of Food, Fisheries, and Environmental Studies - University of Humberside.

Tarr, H.L.A. 1962. Changes in nutritive value through handling and processing procedures. In: Fish as Food, Vol. II. Edited by G. Borgstrom. Academic Press, New York. 235-266.

Jitoe, A.; T. Masuda, I.G.P. Tengah; D.N. Suprapto; I.W. Gara; and N. Nakatam. 1992. Antioxidant activity of Tropical ginger extracts and analysis of the contained curcuminoids. J. Agric. food Chem. 40, 1337-1340.