

Research Article

Multilevel Extraction for Reducing Tannin of Mangrove Fruit (*Bruguiera gumnorrhiza Lamk*) as a Raw Material in Mangrove Flour

Subandriyo[†], Nanik Indah Setianingsih, Muryati

Center of Industrial Pollution Prevention Technology, BBTPPI Jl. Ki Mangunsarkoro No. 6, Semarang, Indonesia

[†]Corresponding author (bandriyo_kalangan@yahoo.com)Article history: Received on November 5, 2014, Accepted on January 20, 2015. This articles is available online at www.j-aft.com.©2015 Indonesian Food Technologists (www.ift.or.id). All rights reserved.

Abstract

One of the kind of mangrove fruits can be used spesifically as source of food rich of carbohydrate is from *Bruguiera gumnorrhiza* (tancang) spesies. This kind of mangrove fruit can be explored as an alternative food and can be treated to be flour rich of carbohydrate. Therefore this kind of mangrove can be developed as source of food based on local resources, considering Indonesia is an island nation so that this kind of mangrove can be cultivated along the coast line. Extraction reducing tannin conducted by fixed variable that is comparison between solvent volume and mangrove fruit chips 3:1, while the changed variable are solvent temperature 50,60,70,80°C and time of immersion 15, 30, 45, 60 minute. The optimal result extraction tannin of mangrove fruit obtained at 80°C temperature with time of immersion 60 minutes. The resulting mangrove fruit meets the national standard of consumption flour with content of HCN 0,26 ppm and tannin 4,56 ppm.

Keywords : mangrove fruit, multilevel extraction, tannin, mangrove flour.

Introduction

Indonesia is one of the nations having the largest of mangrove forests is the world reaches to 8.60 million ha. The mangrove ecosystem has economic benefits as are timber and non-timber. The product of mangrove forests commonly used is timber for firewood whereas the mangrove fruits have not been used widely especially as source of food. *Bruguiera gumnorrhiza* commonly named lindur or tancang is one of the mangrove fruits that can be used as source of new food. This kind of mangrove fruit content of high carbohydrate. The results of research have been done showed that tancang conten of energy 371 calorie/100gr higer than rice (360 calorie/100gr) and corn (307 calorie/100gr) (Fortuna, 2005). In order can be used widely at once for increasing its economic value tancang must be converted in to flour. Flour from tancang fruit content of carbohydrate 80,3763%, fibre 0,7575%, water 12,1761%, fat 3,0917%, dan protein 1,427% (Anonymous, 2009).

Use of mangrove fruit as a raw material of food is interesting and potential to be developed, furthermore this kind of mangrove fruit can be converted in to flour as a raw material of alot of food product such as crispy, stick, cracker, cake and others.

The problem of using mangrove fruit as food is tannin content that cause bitter taste. The bitter taste of mangrove fruit affects consumer valuation of the resulting food product. Besides that tannin is carcinogenic in case consumed in excess amount and continue so must be reduced before processed. The Acceptable Daily Intake for tannin is 560 mg/kg of weight/day (Anonymous 1973).

One way for reducing of mangrove fruit (tancang) tannin is by multilevel extraction. Use of mangrove fruit as material of food industry especially of mangrove areas in Central Java with the overall objective to achieve public welfare is expected to be mangrove conservation strategy through the use of mangrove fruit as raw material in making of flour.

Materials and Methods

Mangrove fruits (*Bruguiera gumnorrhiza*) were obtained from Kartika Jaya Village, Patebon Sub-district, Kendal District. Mangrove fruit, were chopped into chip forms with a thickness of 1-2 mm.

Experiments of Extraction Tannin

Our experiments for tannin extraction were done with water solvent in an extractor. The fixed variable is the comparison between solvent volume and mangrove fruit 5:1 w/w, while the changed variable are solvent temperatures 50, 60, 70, 80 °C and time of immersion 15, 30, 45, 60 minute. The results of tannin reduction of mangrove fruits were obtained by analizing tannin content of filtrate from extraction process.

Making of Mangrove Flour

Mangrove flour is made from the best result after reduction treatment of tannin. Mangrove fruit of the result of the extraction process are dried in oven of 70°C, 48 hours then milled and sieved in 80 mesh. The resulting mangrove flour stored in plastic packaging.

Analysis of Mangrove Flour

Analysis of mangrove flour based on Indonesian National Standard parameters for wheat flour, tapioca and mocaf. The analyzed parameters consists of percentage of water, percentage of ash, percentage of fat, percentage of protein, percentage of crude fibre, percentage of carbohydrate, content of HCN, content of tannin, sieve 70 mesh, sieve 80 mesh and sieve 100 mesh.

Result and Discussion

Figure 1 and 2 cannot be evaluated because tannin content in one treatment go up and down irregularly. Figure 3 show that extraction of 70°C with time of immersion 60 minute is optimal point of tannin extraction process. Firstly this treatment can extract 17.25 ppm amount of tannin and in second 60 minute can extract 15.22 ppm, in third 60 minute tannin extracted 12.08 ppm, in fourth and fifth 60 minute tannin extracted are 10.44 and 7.08 ppm. While three other extraction treatment produce fewer tannin reduction.

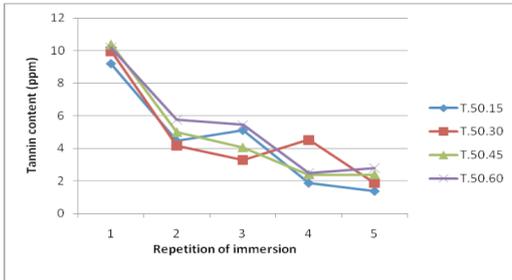


Figure 1. Content of tannin of filtrate from extraction process with solvent temperature 50°C, time of immersion 15, 30, 45 and 60 minute.

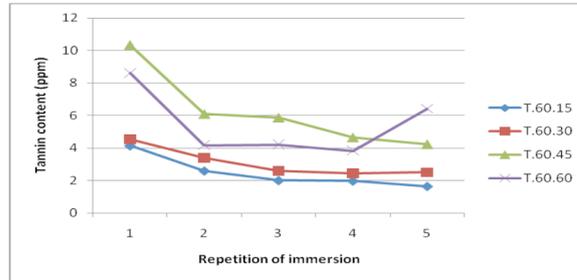


Figure 2. Content of tannin of filtrate from extraction process with solvent temperature 60°C, time of immersion 15, 30, 45 and 60 minute.

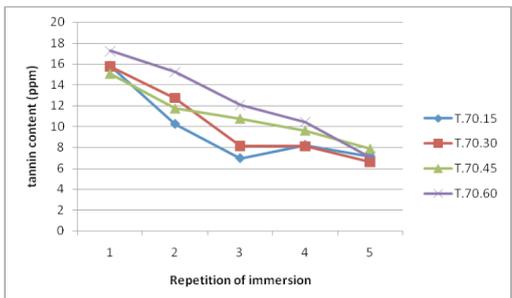


Figure 3. Content of tannin of filtrate from extraction process with solvent temperature 70°C, time of immersion 15, 30, 45 and 60 minute.

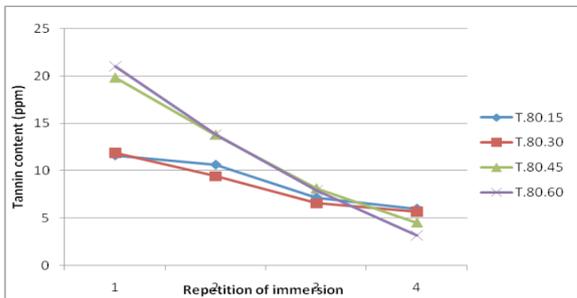


Figure 4. Content of tannin of filtrate from extraction process with solvent temperature 80°C, time of immersion 15, 30, 45 and 60 minute.

Table 1. The result of tannin analysis of filtrate from extraction process

50°C		60°C		70°C		80°C	
Treatment	Tannin (ppm)						
T.50.15.1	9.19	T.60.15.1	4.14	T.70.15.1	15.84	T.80.15.1	11.61
T.50.15.2	4.45	T.60.15.2	2.6	T.70.15.2	10.24	T.80.15.2	10.63
T.50.15.3	5.1	T.60.15.3	2.01	T.70.15.3	6.95	T.80.15.3	7.17
T.50.15.4	1.87	T.60.15.4	1.98	T.70.15.4	8.22	T.80.15.4	5.99
T.50.15.5	1.37	T.60.15.5	1.65	T.70.15.5	7.16	T.80.15.5	-
T.50.30.1	9.97	T.60.30.1	4.53	T.70.30.1	15.76	T.80.30.1	11.87
T.50.30.2	4.17	T.60.30.2	3.4	T.70.30.2	12.73	T.80.30.2	9.41
T.50.30.3	3.29	T.60.30.3	2.61	T.70.30.3	8.15	T.80.30.3	6.57
T.50.30.4	4.52	T.60.30.4	2.44	T.70.30.4	8.13	T.80.30.4	5.68
T.50.30.5	1.88	T.60.30.5	2.5	T.70.30.5	6.62	T.80.30.5	-
T.50.45.1	10.39	T.60.45.1	10.34	T.70.45.1	15.08	T.80.45.1	19.85
T.50.45.2	4.99	T.60.45.2	6.09	T.70.45.2	11.74	T.80.45.2	13.81
T.50.45.3	4.05	T.60.45.3	5.87	T.70.45.3	10.77	T.80.45.3	8.14
T.50.45.4	2.38	T.60.45.4	4.65	T.70.45.4	9.62	T.80.45.4	4.54
T.50.45.5	2.39	T.60.45.5	4.23	T.70.45.5	7.87	T.80.45.5	-
T.50.60.1	10.19	T.60.60.1	8.62	T.70.60.1	17.25	T.80.60.1	21.01
T.50.60.2	5.78	T.60.60.2	4.19	T.70.60.2	15.22	T.80.60.2	13.81
T.50.60.3	5.45	T.60.60.3	4.22	T.70.60.3	12.08	T.80.60.3	7.89
T.50.60.4	2.49	T.60.60.4	3.83	T.70.60.4	10.44	T.80.60.4	3.15
T.50.60.5	2.81	T.60.60.5	6.41	T.70.60.5	7.08	T.80.60.5	-

Note:

T : Tancang
 50, 60, 70, 80 : Temperature
 15, 30, 45, 60 : Time
 1, 2, 3, 4, 5 : Level

Figure 4 show that extraction of 80°C with time of immersion 60 minute is optimal point of tannin extraction process. Firstly this treatment can extract 21.01 ppm amount of tannin and in second 60 minute can extract 13.81 ppm, in third 60 minute tannin extracted 7.89 ppm and in fourth 60 minute tannin extracted are 3.15 ppm. While three other extraction treatment produce fewer tannin reduction. Tannin extraction of 80°C only performed in four times and produce the highest tannin reduction.

Table 2 show that the result of content of water analysis of mangrove flour is 9.34% that means meet the quality requirement of three comparators The Indonesian National Standard (INS ofwheat flour, INS of tapioka, INS of mocaf). The result of ash content analysis of mangrove flour is 3.10% does not comply fulfill the quality requirement of three comparators Indonesian National Standard. The result of fat content analysis of mangrove flour is 5%, this result cannot be compared because the three comparators INS doesn't require content of fat. The result of protein content analysis of mangrove flour is 3.71%, less than protein quality requirement of wheat flour. The result of crude fibre analysis of mangrove flour is 6.63% higher than crude fibre quality requirement of tapioca and mocaf. The result of carbohydrate analysis of mangrove flour is 72.22% show that this flour can produce high calories, so that can be used as an alternative new source of food based on local resources.

Table 2. Analysis Result of Mangrove Flour

Parameter	Unit	Mangrove flour	Wheat flour (SNI)	Tapioca starch (SNI)	Mocaf flour (SNI)
Water content	%	9,34	max. 14.5	max. 12	max. 13
Ash content	%	3,10	max. 0.70	max. 1,5	max. 1,5
Fat content	%	5,00	-	-	-
Protein content	%	3,71	min. 7,0	-	-
Crude fibre	%	6,63	-	max. 4	max. 2,0
Carbohydrate	%	72,22	-	-	-
HCN	ppm	0,26	-	max. 40	max. 10
Tannin	ppm	4,56	-	-	-
Sieve 70 mesh	%	77,47	min. 95	-	-
Sieve 80 mesh	%			min. 90	100
Sieve 100 mesh	%				min. 90

HCN is dangerous compound to be eaten because in 0.5-3.5 mg/kg of weight causes death, which in the body can interfere cytochrome oxidase enzyme that stimulate respiratory reaction of aerobic organism. The result of HCN analysis of mangrove flour is 0.26 ppm meet the quality requirements of Indonesian National Standard of tapioka and mocaf. The result of tannin analysis of mangrove is 4.56 ppm, it is safe for tannin content of food because the acceptable daily intake for tannin is 560mg/kg of weight/day. For the result of sieve 80 mesh analysis of mangrove flour doesn't meet the quality requirement of three comparators INS.

Conclusion

The optimal result of tannin reduction extraction is of 80°C temperature with time of immersion 60 minute. The resulted mangrove flour meet the criteria of safe flour to be consumed.

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