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Using the Heat Moisture Treatment Technique (HMT) to Improve Lima Bean Quality

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ABSTRACT

Hipocotyl Bruguiera gymnorrhiza High carbohydrate, but in Indonesia has not been exploited and developed, this is an alternative hypocotyl development for manufacturing starch as food ingredients industry. In addition to looking for new sources of starch for the modern food industry, also need to know the functional properties of starch. s. The purpose of this study was to determine the effect of sodium bisulfite solution concentration and temperature of heating and the interaction against best quality starch. In this study, the concentration of sodium bisulfite and heating temperature as a variable is changed, while the fixed variables are time and temperature of drying. The study was conducted using a completely randomized factorial design with three replications with 2 factors that NaHSO3 concentration of 0.10%, 0.20%, 0.25% and 0.40% and heating temperature 40 °C, 50 °C and 6 °C. Verse data processing using SPSS 16.0. These results indicate that treatment factors temperature and concentration on the extraction of starch hipocotyl Bruguiera gymnorrhiza significant effect (P < 0.01) of the amylose content, starch content, viscosity, solubility and reduced sugar. Interaction heating temperature and concentration also had a significant effect on amylose content, starch content, viscosity, solubility and reduced sugar. Treatment with a heating temperature of 60 °C and the concentration of 0.25% for 5 minutes is the best treatment result was 19,58 % amylose content, starch content of 65.00%, 520.33 cP viscosity, solubility and reducing sugar 91.99% 0.27%.

Keywords- Bruguiera gymnorrhiza, extraction, sodium bisulfite, amylase.

I. INTRODUCTION

Utilization hipocotyl *Bruguiera gymnorrhiza* for processed food has been limited to flour naturally without modern treatment methods. To increase the economic value hipokotil *Bruguiera gymnorrhiza* needed a better processing methods (Wanma, 2007). Hipokotil *Bruguiera gymnorrhiza* have a high carbohydrate content (Fortuna, 2005; Sadana, 2007; Purnobasuky, 2012) and a high starch content (Pentury, 2009). Starch is an important nutrient in the daily diet, and the development needs of the world starch by the modern food industry is already attracting businesses to identify new sources of polysaccharides (Ancona et al., 2004). Greatest starch content found in green fruits and ripe yet, reaching 70% on dry weight basis. Based on the facts above, Hipokotyle Bruguiera gymnorrhiza starch can be used as an alternative source other than grasses (corn, wheat, and rice).

Bruguiera gymnorrhiza often found in almost all regions of Indonesia. However, beneficiaries are limited to ecological function. Endurance hipocotyl storage Bruguiera gymnorrhiza certainly be brief, and should be a product that is durable in terms of nutritional value, variety and durability of storage utilization. Therefore, it is necessary to develop the production of starch manufacture *Bruguiera gymnorrhiza* and studies about the nutritional value and functional properties such as amylose content, solubility, viscosity reduction and sugar as a reference in producing a meal. In addition, by making the starch *Bruguiera gymnorrhiza* starch can be stored longer and avoid decay.

The benefits of this research are expected to: be known concentration of the solution and the proper warm temperature, so as to optimize the quality of starch produced hipocotyl *Bruguiera gymnorrhiza*. And develop potential use *Bruguiera gymnorrhiza* starch as raw material for the food industry. And the purpose of this study was to determine the effect of sodium bisulfite solution concentration, heating temperature and their interaction on the quality of starch-on-starch extraction *Bruguiera gymnorrhiza* order to obtain the best quality starch.

II. MATERIALS AND METHODS

2.1. Materials

Material for the starch mangrove hipocotyl *Bruguiera gymnorrhiza* obtained from Bay District Kotania Piru West

Seram regency Maluku province. While the chemicals used are sodium bisulfite ($NaHSO_3$) (pa). The raw material for analysis is protelium ether solvent H_2SO_4, HCl 25%, H_3BO_3, phenolphtalein indicator, the indicator methyl blue, alcohol 10%, 45% NaOH, nelson reagents, reagent arsenomolybdat, sodium tetraborate, 38% formaldehyde, methanol, ethanol 80%, Folin reagent, Na_2CO_3, Lowry reagents and distilled water (pa). The equipment used in the extraction of starch is a tool *Bruguiera gymnorrhiza* flouring and 100 mesh sieve, dryer cabinet, Analytical Scales, blenders and equipment glass for analysis.

2.2. Methods

This research was conducted at the Laboratory of Fishery Product Technology Faculty of Fisheries and Marine Sciences UB Malang, method used in this study is an experimental method, first hipocotyl *Bruguiera gymnorrhiza* peeled, cleaned and cut into small pieces the size of < 0.5 cm and then do the removal tannin with water immersion for 72 hours, with a change of water every 6 hours. After that the extraction of starch in the wet with heat treatment pieces hipocotyl *Bruguiera gymnorrhiza* temperature of 40 ºC, 50 ºC and 60 ºC (the temperature is not maintained) in a solution of sodium bisulfite at a concentration of 0:10 g/l; 0:20 g/l, 0.25 g/l and 0.40 g/l (1:2) for 5 minutes then add distilled water (1:2) for extraction (AACC method ekstrkasi modification., 1983) used Waliszewski (2003). Test parameters, namely, starch content, amylose content, solubility, viscosity and reducing sugar. Then the best treatment is determined using the weighted index of effectiveness (De Garmo et al., 1984).

2.3. Analysis Procedure

Analytical procedures characterize the physicochemical properties of starch mangrove cover analysis Starch, amylose, solubility, viscosity and reducing sugar. Analytical procedures starch hydrolysis using the Direct Method; AOAC, 1999 and amylose analysis procedure using the modified method Juliano, (1971). Spectrophotometry. Sugar reduction using reducing sugar analysis by the Somogyi-Nelson method (AOAC, 1990). Solubility and viscosity using gravimetric techniques using Rotational Viscometer, which is to get the value of the viscosity by measuring the twisting force a cylindrical rotor (spindle) were dipped into the sample. And to test the effectiveness of determining the best treatment is determined by the effectiveness of the weighted index method (DeGarmo et al., 1984). This method is based on the following procedure: Variables are sorted by priority and contribution to results. Giving weight to the value of each variable (BV) based on contribution to the relative numbers 0-1. The weight is different depending on the interests of each of the variables that the results obtained as a result of treatment. Weight of normal (BN) was determined from each variable by dividing the weight of the variable (BV) with the sum of all weights of variables. Grouping variables were analyzed from two groups: a) Group A, consisting of variables average the bigger the better (the desired product treated), b) Group B is the group's growing increasingly ugly average (not desired). Then set the value of effectiveness (Ne) of each variable, using the formula:

$$\frac{\text{Treatment value – worst value}}{\text{Best value – worst value}}$$

For variable with mean the bigger the better, the lowest value as the value of the highest value as the worst and the best value. And contrary to the variable with the mean value of the smaller the better, then the highest value as the value of the ugliest and the lowest value as the best value. Calculating the value of the (Nh) of each variable were obtained from the multiplication of normal weight (BN) with effectiveness (Ne). Then add up the value of the results of all the variables, and selected the best combination of treatments that has a value (Nh) the highest.

III. RESULTS AND DISCUSSION

3.1. Amylose Content

Levels of amylose test results ranged from 7.92% in the treatment of heating temperature 40 ºC for 5 minutes with 0.20% NaHSO3 concentration. While the highest amylose content of 21.36% for the treatment of heating temperature 60 ºC for 5 min with a solution of $NaHSO_3$ concentration of 0.40%. This is consistent with research Soebagio et al. (2007) where the influence of high temperatures with limited water content of the physical modification of starch initially increased amylose levels and then drop back optimum, this was due to the termination of glucoside bonds in amylose chains during heating takes place, the constitute the majority of amorphous regions.

The results of analysis of variance showed that the heating temperature and the concentration of $NaHSO_3$ solution was highly significant ($P < 0.01$) the levels of amylose starch *Bruguiera gymnorhiza* (L.) Lamk were extracted, there is also a highly significant interaction ($P < 0.01$) between temperature heating concentration the amylose .

Starch content is one of the quality criteria for wheat, both as food and non-food. hipocotyl *Bruguiera gymnorrhiza* grade starch in very high amounts in wheat hipocotyl *Bruguiera gymnorrhiza* 63.04%, while the starch content of starch in the form of extracts according to the results of testing the treatment ranging from 64.31% in the heating temperature 60 ºC for 5 minute with a solution of $NaHSO_3$ concentration of 0.40%. And the highest starch content of 66.58% in the treatment of heating temperature of 40 ºC for 5 minutes with 0.25% $NaHSO_3$ concentration. This shows that

the differences are not too large, the higher the heating temperature drops more levels comparable to the higher starch concentration and starch content increases in the concentration of 0.25% for all the heating temperature treatment. This shows that the concentration of $NaHSO_3$ 0.25% at 40º C heating temperature is an optimum point. This is consistent with research Yusraini (2007).

The results of analysis of variance showed that the heating temperature and the concentration of $NaHSO_3$ solution was highly significant ($P < 0.01$) to the starch content of starch extracts of *Bruguiera gymnorhiza* (L.) Lamk, there is also a highly significant interaction ($P < 0.01$) between temperature heating concentration the starch.

3.3. Viscosity

Mean viscosity values in this study ranged between 215.66 cP - 1414 cP. Viscosity values increase with increasing heating temperature and the increase is proportional to the concentration levels of amylose. The higher levels of amylose, the value will be higher and the viscosity decreases with decreasing amylose as heating temperature is too high. This is consistent with research Whitt (2002) who reported that amylopectin has a stronger effect on viscosity due to the branched structure and more open compared to amylose, amylopectin which can thicken pasta starch as the temperature rises. Also according to Chen (2003), measuring the tendency to experience retrogradasi starch can be done by two methods: by measuring freezethaw stability and viscosity ratio measurements setback pasta. Syneresis occurs at the time of repeated freeze-thaw cycles showed an increase in intermolecular hydrogen bonding between amylose to mylose, amylopectin with amylose and amylopectin with amylopectin. Meanwhile, the setback paste viscosity showed a tendency retrogradasi happened because amylose molecules more easily exposed to water and prone to recrystallization than amylopectin The results of analysis of variance showed that the heating temperature and the concentration of $NaHSO_3$ solution was highly significant ($P < 0.01$) to the value of the viscosity of the starch extracts of *Bruguiera gymnorhiza*, there is also a highly significant interaction ($P < 0.01$) between temperature heating concentration the starch .

IV. CONCLUSION

From the research it can be concluded that the greater the concentration of sodium bisulfite solution, the amylose content, reducing sugar content, solubility and viscosity of the starch getting up. That the longer the heating time will result in a decrease of starch, amylose levels increase, reducing sugar, solubility and viscosity. Interaction of treatment occurs in operating conditions to produce the optimum heating temperature is 60 ºC, for 5 min at a concentration of sodium bisulfite 0.60 g/l. The resulting starch can be recommended as a base for food and pharmaceutical industry.

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