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PRODUCTION OF STEAMED BUN WITH ANGKAK (*MONASCUS PURPUREUS*) SUPPLEMENTATION

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ABSTRACT

Angkak (red koji or red fermented rice) is a fermentation product of rice by *Monascus purpureus* which contains antioxidant. Antioxidant can prevent cancer, cardiovascular diseases, and other degenerative diseases which are the cause of the high mortality rate in Indonesia according to data released by WHO in 2002. Angkak flour can be supplemented into steamed buns to produce a product with functional values. In order to produce steamed buns with desirable physical qualities and antioxidant activity, appropriate mixing time, mixing speed, and angkak concentration are needed. This experiment aims to find the best processing parameter to make steamed bun supplemented with three concentration of angkak (per kilogram flour) (0%, 0,25%, and 0,5%). Mixing was done in two different stages, the initial slow speed (stage 1), and then followed with fast speed (stage 2; marked with *). There were four variations of mixing time in minutes, which are 2 and 2*; 2 and 3*; 3 and 2*; 3 and 3*. The analysis of antioxidant activity contained in steamed buns was conducted by DPPH method. Physical analyses were conducted by using *texture analyzer* to measure textural properties of steamed buns, seed displacement to measure the volume, and L*a*b* method to measure color. The results show that the higher concentration of angkak supplemented will result on the higher antioxidant activity, volume expansion, and a* value, but also followed with the lower hardness and b* value. The longer the mixing time will result on the higher volume expansion.

Keywords: *angkak*, *supplementation*, *steamed buns*, *mixing*, *antioxidant*

INTRODUCTION

In general, people eat foods as fulfilling the nutritional needs of the body . However, with the development of science and technology , people began to realize that the food consumed is not only useful as a nutrient the body needs but also acts as a functional food , the processed food containing one or more functional components based on a scientific study has certain physiological functions , proved to be harmful and beneficial to health

Currently , the level of consumption of bakery products in Indonesia , one of which pao has increased . Increased consumption can be seen from the consumption of bread in Indonesia , which rose from U.S. $ 1.2 per person per year in 2009 to U.S. $ 1.5 per person per year in 2010 (Hadi & Monalisa , 2011) . Pao contains nutrients that can meet the needs of the body . In addition to a complete nutritional value , pao has a soft texture that is preferred by many.

MATERIALS AND METHODS Instruments

The tools used in the manufacture pao is the mixer, boiler, stove, analytical scales, paper bread, basin, spoon, and knife. While the tools used in chemical testing covers spectrophotometer (UV-Vis Shimadzu mini 1240), cuvet, measuring glass, pumpkin peck, test tube, test tube racks, glass bottles, analytical balance, pipette volume, pumps pilleus, mikropipet, makropipet , aluminum foil, a funnel, filter paper, and agitators. The tools used in physical testing is chromameter (Minolta CR 400), and a texture analyzer (TA series Lloyd Instruments Plus).

Material

The materials used in the manufacturing process pao is low protein flour (Blue Key ®), instant dry yeast, sugar, baking powder, water, red yeast rice flour, margarine, garlic, and salt. While the materials used in chemical testing (antioxidants) covers aquades, ethanol 96%, Tris-HCl buffer 0.05 (pH 7.4), and DPPH (2,2-diphenyl-1-picrylhydrazyl).

Methods

Tests conducted using a texture analyzer texture with TPA method (Texture Profile Analysis) . Type of probe used was a ball probe with a test speed of 5 mm / s , trigger at 25 N , 50 mm sample depth and sample compressed 50 % . Testing was conducted to analyze the texture hardness and springiness of the sample pao.

Testing is done using chromameter color . Before use , chromameter need to be calibrated in advance by firing chromameter on a white plate . Once calibrated , chromameter used to measure the color of the sample by firing pao chromameter on the sample surface which has been coated with plastic . Unit color that appears is L * , a * , and b * . L * is a color unit for brightness (lightness) . If positive (+ L *) sample light colored (light) , but when it is negative (- L *) dark -colored samples . * If a value is positive (+ a *) color samples tend towards red (reddish) , whereas when it is negative (-a *) color tends toward green sample (Greenish) . If the value of b * is positive (+ b *) color samples tend toward yellow (yellowish) , while if it is negative (- b *) color samples tend toward blue (Bluish) (Lebesi & Constantina , 2009) . Testing is done using chromameter color . Before use , chromameter need to be calibrated in advance by firing chromameter on a white plate . Once calibrated , chromameter used to measure the color of the sample by firing pao chromameter on the sample surface which has been coated with plastic . Unit color that appears is L * , a * , and b * . L * is a color unit for brightness (lightness) . If positive (+ L *) sample light colored (light) , but when it is negative (- L *) dark -colored samples . * If a value is positive (+ a *) color samples tend towards red (reddish) , whereas when it is negative (-a *) color tends toward green sample (Greenish) . If the value of b * is positive (+ b *) color samples tend toward yellow (yellowish) , while if it is negative (- b *) color samples tend toward blue (Bluish) (Lebesi & Constantina , 2009) .

Pao volume measurements performed using seed displacement method . Seeds are used for this method is millet seed . This method is done by way of millet seeds put into a container that has been known up to full volume average . Furthermore , pao put in the container is then filled with millet seeds until fully blended. Millet seeds remaining residual volume was measured using a measuring cup to determine the volume of the pao (Subagio et al . , 2003).

Samples at each end of the process (mixing, steaming) weighed approximately 0.5 grams and extracted in 5 ml of 96 % ethanol for 24 hours . The filtrate obtained was taken as 0.1 ml and 3.9 ml was treated with a solution of DPPH (2,2 - diphenyl - 1 - picrylhydrazyl) for 30 minutes . Absorbance of the solution was measured at t = 0 and t = 30 using a spectrophotometer at a wavelength of 517 nm . Aquadestilata used as control (deionized water) were given 2 ml solution of DPPH (2,2 - diphenyl - 1 - picrylhydrazyl) without settling for 30 min (t = 0) . Repetition carried 6 times for each treatment . From the results of absorbance by spectrophotometer % discolorationnya can be calculated using the formula:

$$\% \quad = 1 - \frac{\quad = 30}{\quad = 0} \quad 100$$

Description: AT30 is the absorbance of the sample at minute 30 and At0 is the control absorbance. (Apriyantono *et al.,* 1989)

RESULTS AND DISCUSSION

Hardness

According to Pomeranz (1991) , the mixing time on dough pao manufacturing process with low protein flour , mixing time required minimum 0.4 minutes and 4.2 hours maximum . From the results of the research found that the mixing time of 4 minutes in the control treatment pao , pao red yeast rice 0.25% , and 0.5% earned pao red yeast rice to lower hardness values compared to the mixing time of 5 minutes and 6 minutes.

On the mixing time of 5 minutes there are two kinds of speed that is a combination of low speed 2 minutes and the speed is low speed 3 minutes and 3 minutes and the speed is 2 minutes. From the observations , obtained that low speed mixing process much longer will increase the hardness at pao seen in table 2 . In the process of steaming the dough has obtained results that the increasing hardness levels when compared with the hardness mixing process. With the addition of the red yeast rice will reduce the hardness pao , red yeast rice can be seen at 0.25% , and 0.5% obtained the result that red yeast rice hardness was 0.5% smaller than the hardness of 0.25% red yeast rice .

Pao with red yeast rice supplementation at the highest concentration , ie .5% , resulting in a 0 level of violence which is significantly lower than the control and pao pao red yeast rice supplementation on the concentration of 0.25% (Table 2) . Case is due to the antioxidant compounds contained in red yeast rice pereduksi act as agent in the manufacture of bread . Pereduksi agents weaken the gluten network of the dough , but pereduksi agents can only be used in low concentrations . Undermine the agency 's ability pereduksi dough gluten network occurs also in research Ananingsih & Zhou (2011) that the addition of green tea extract containing catechin compound causes an increase in the amount of SH bond in bread dough . SH bond increase followed by a decrease in the SS bond in the resulting dough gluten network of the dough to be weak . Weak gluten network resulting style needed to change the shape (deformation) pao smaller , so the smaller the hardness was obtained .

Volume

Wheat flour in making bread has advantages because the protein content . Flour protein content consisting of glutenin and gliadin to form the gluten network when it binds with water . Gluten network formed would produce a viscoelastic dough that has a strong ability to hold CO2 gas bubbles produced by the fermentation of yeast (Bennion & Hughes 1975; Matz 1992) . The results showed that there is an increase in volume pao significantly between the mixing and red yeast rice supplementation steaming 0:25 % by value respectively is 39.84 ± 79.31 ± 0:37 and 3:06 , when compared with the volume on the mixing process and pao steaming red yeast rice supplementation of 0.5 % by value respectively are 47.88 ± 0.84 and 72.78 ± 6.64 .

Antioxidants contained in red yeast rice has properties as a reducing agent in the manufacture of bread . Reducing agents will produce the SH bond in the amount of the excess as the SS bond has been formed in the dough is converted back into the SH bond . As a result , the network becomes weaker gluten and dough becomes less viscoelastic dough so that the ability to withstand the gas bubbles become smaller and the resulting bread volume becomes smaller as well (Wang et al . , 2006, in Ananingsih & Zhou , 2011) .

The result showed that mixing speeds provide a noticeable difference in the volume of development , it can be seen in the volume of both mixing and steaming development wherein the mixing speed with a combination of low speed 2 minutes and 3 minutes medium speed , shows the development of the highest volume or least good . This supported the theory of Charley (1982) , less mixing will result in a less elastic dough , but it is very less bread volume and bread easily collapse (collapse) , this is due to the ability of the less gluten in the dough to hold gas . While excessive mixing will destroy the structure of gluten.

Mixing function homogeneously mix all the ingredients , get the perfect hydration on carbohydrate and protein , forming and soften glutein , and hold on glutein gas . Mixing should take place to achieve optimal development of glutein and water absorption . Excessive mixing will damage the structure glutein , dough will be more heat , and the slower peragiannya (Mudjajanto and Yulianti , 2004) . Mixing process depends on the tools used , the speed of mixing , water absorption of glutein , formulas and fermentation period , and the type of bread you want (Mudjajanto and Yulianti , 2004) .

Color

Brightness parameters of the L state (0 = black , 100 = white) . Chromatic colors red - green color mixture shown by the values of a , (a +) = 0-80 for red and (a-) = 0 - (-80) for green color) . Meanwhile, for the color blue -yellow chromatic mix represented by the b (b +) = 0-70 for the yellow and (b -) = 0 - (-70) for the color blue. (Suyatma , 2009) .

Based on the results of the research can be seen that the higher the red yeast rice supplementation will significantly decrease the level of brightness increasing (L *) and b * values , but the increase of the a * pao . This should show that red yeast rice supplementation increase the intensity of red color from pao . Pigment produced by Monascus purpureus is robrupunktatin (red) , monaskorubrin (red) , monaskin (yellow) , ankaflavin (yellow) , rubropunktamin (purple) , and monaskorubramin (purple) . (Timothy , 2004) .

Results obtained on the table when pao with red yeast rice supplementation mixing process has a value greater L * L * values compared with the current pao steaming process , and pao red yeast rice supplementation when the mixing process has the a * smaller than the value of a * on pao while steaming process , whereas for the b * can be said to be stabilized , because the most dominant pao red yeast rice red color , while the yellow color is not so influenced .

According to Wijaya (2001) , declining color stability for high temperature due to the occurrence of unexpected decomposition of anthocyanin aglycones be chalcon form . This is reinforced by the statement Sutrisno (1987) , that the temperature and time of heating causes decomposition and structural changes to occur lightness .

Antioxidant activity

An increase in the production of red yeast rice supplementation increases antioxidant activity pao pao from . Activity of antioxidants found in red yeast rice usually including flavonoids , polyphenols , carotenoids , alkaloids , and vitamins (Chairote et al . , 2009) .

From the results, the antioxidant activity in the mixing stage and is influenced by a long steaming time mixing , at 0:25 % pao red yeast rice supplementation with 6 minutes mixing time either in the process of mixing and steaming obtained the highest antioxidant activity with consecutive values are 117.39 and 118.65 ± 0:47 ± 1:08 , at 0.5 % pao red yeast rice supplementation with 6 minutes mixing time either in the process of mixing and steaming obtained the highest antioxidant activity with consecutive values are 112.63 and 102.00 ± 1:30 ± 0.93 . This is caused by the length of time mixing will cause the pigment in red yeast rice to be homogeneous with pao dough , so that when the antioxidant activity assay , the amount of antioxidants that read more than the rapid mixing time .

With the rapid mixing time , antioxidants can not react to the fullest with the dough , and causes red spots found on the surface of the pao (red yeast rice grains that have not decomposed) , thus resulting in antioxidants pao there are not homogeneous . It is powered from Timothy (2004) , pigment contained in red yeast rice , can form complexes with other compounds . Monascus purpureus pigment can be reduced , oxidized

, and react with other products , such as amino acids to form a variety of complex products called pigment . So the longer mixing time , then the maximum antioxidants will react in the dough .

Steamed dough has antioxidant activity that was not significantly different in the late stages of dough mixing . This is possible because the bond between the antioxidant compounds contained in red yeast rice with SH groups in dough , so that the antioxidant compounds become more stable against steaming because it has strong ties with SH groups dough .

CONCLUSIONS

Red yeast rice supplementation of 0.5% is able to significantly reduce the pao hardness when compared to red yeast rice supplementation of 0.25%.

Speed optimal mixing obtained in the mixing process with a combination of low speed for 2 minutes and a medium speed for 3 minutes.

Antioxidants in red yeast rice has the properties of reducing agents are able to lower the volume on the development of red yeast rice supplementation pao.

Red yeast rice supplementation would reduce the value of L * and b * values and increase the value of a *.

The value of brightness (L *) on pao red yeast rice after steaming tends to decrease due to the decomposition of anthocyanin aglycone form into kalkon.

Red yeast rice supplementation on the pao will lead to an increase in antioxidant activity significantly.

The longer mixing time will increase the antioxidant activity of red yeast rice pao, because the pigment in red yeast rice will be more homogeneous.

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