ISSN: 2338-1345 –Vol. 3 (1) 7- 11

Journal online http://journal.bakrie.ac.id/index.php/APJSAFE

Asia Pacific Journal of Sustainable Agriculture Food and Energy (APJSAFE)

Influence of pre-treatments on Jengkol Bean (*Pithecellobium lobatum, Benth*) toward Sulfuric Content

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Abstract- This research had been carried out at Laboratory of Agricultural Product Technology, Faculty Of Agricultural Technology, Andalas University-Padang from August 2014 – October 2014. Jengkol bean content djengkolic acid. Djengkolic acid is one of the types of amino acids containing sulfur and spread evenly in jengkol bean. Consumption of jengkol bean can give bad smell effect when breathing or urinating, this odor arising from Djengkolic acid which breaking down into sulfur containing-thiol compounds which is volatile. This research is aimed to decrease of sulfur level from jengkol bean by giving some treatments. This research used eksplorative design with 4 treatments and 3 replications. Treatments were consist of boiling jengkol in ash solution, boiling jengkol in whiting solution, boiling jengkol in water and aging jengkol in soil. Result of this research obtained that differences of treatments on jengkol resulting different effect toward water content, ash content, sulfur content and pH. The most drastic decrease of sulfur is to use whiting and followed by the use of kitchen ash, boiling in water and aging in the soil.

Keywords: Jengkol bean, Some treatment and Sulfur

INTRODUCTION

According to Astawan (2009), jengkol bean contained of protein 23.3 g / 100 g of material, vitamin C 80 mg / 100 g of material, carbohydrates 20.7 g / 100 g of material, calcium 140 mg / 100 g of material, phosphorus 166.7 mg / 100 g of material, iron 4.7 g / 100 g of water and 49.5 g / 100 g of material. However, consumption of jengkol bean can give bad smell effect when breathing or urinating, it is due to the djengkolic acid content of about 1-2% contained in jengkol beans.

Djengkolic acid is one of the types of amino acids containing sulfur and spread evenly in jengkol bean. Jengkol bean consumption is signed by a distinctive specific odor of jengkol in urine and breathing. This odor arising from Djengkolic acid which breaking down into sulfur containing-thiol compounds which is volatile (Muchtadi, 1989). Most people do not like this smell.

Some of ways to reduce the odor that do by people such as boiling jengkol with kitchen ash solution, whiting solution, water, or by bury fresh jengkol beans in the soil. However, the influence of the treatments of sulfur content in Djengkolic acid of jengkol bean that produced was still unknown. Therefore, in this study is expected to determine the influence of multiple treatments toward sulfur content in Djengkolic acid of jengkol bean.

Based on the description above, the authors conducted this useful research. This study Influence of pre-treatments on Jengkol Bean (Pithecellobium lobatum, Benth) toward Sulfuric Content.

MATERIALS AND METHODS

Raw materials used in this study is jengkol beans with hard texture characteristics obtained from Kampung Kandang, Pariaman, soil, water, whiting and kitchen ash.

The tools used consists of a basin, plastic, stoves, thermometers, scales, spoons, pans, aluminum cup, oven, desiccator, weigh, porcelain bowls, tweezers, furnace, 125 ml Erlenmeyer flask, filter paper, and a pH meter.

This study used Explorative method which consists of 4 treatments and 3 replications. The treatments were given, namely Treatment A (Boiling in kitchen ash solution), Treatment B (boiling in whiting solution), Treatment C (boiling in water) and treatment D (aging jengkol in the soil).

Pre-treatment

Treatment A = Boiling 100 g jengkol with ratio of water: ash kitchen = 1000ml: 25 g

Treatment B = Boiling 100 g jengkol with ratio ofwater: whiting = 1000 ml: 25 g

Treatment C = Boiling 100 g jengkol with 1000 ml of water

Treatment D = Boiling 100 g jengkol the has been aged for 14 days, boiling is done with 1000 ml of water

Observations

a. Observation of raw jengkol, including moisture content (Soedarmadji et al, 1997), ash (Soedarmadji et al, 1997), the pH value (Soedarmadji et al, 1997), protein content(Soedarmadji et al, 1997) and sulfur content (Sulaiman , 2005).
b. Observations of cooking water in jengkol boiling process including the pH value of cooking water before and after boiling process.
c. Observation of jengkol after treated, including moisture content (Soedarmadji et al, 1997), ash (Soedarmadji et al, 1997), the pH value (Soedarmadji et al, 1997), and sulfur (Sulaeman, 2005).

RESULT AND DISCUSSION

Analysis of fresh raw jengkol include pH, moisture content, ash content, protein content and sulfur in Table 1 below:

Table 1.Chemical Analysis Results Of Raw Jengkol Bean

Analysis	Total
Moisture content	51,43 %
Ash content	0,44 %
Protein content	19 %
Sulfur content	1,512 ppm
pH value	5,90

Jengkol that is used in this study contain a water content of 51.43% this number is lower than water content of jengkol in Indonesia's food composition table, which is 52.7%. Ash content of jengkol used in this study has 0.44% lower than ash content of jengkol Indonesia's food composition table, which is 0.9%. Protein level in jengkol used in this study is 19%, this is 5.4% higher than the number in Indonesia's food composition table. Levels of sulfur contained in the fresh jengkol used in this research is 1.512 ppm and pH of 5,90.

The difference in the results of chemical analysis of raw materials which obtained may be due to the possibility of different jengkol varieties which analyzed and jengkol might come from different environments. According to (Harris et al, 1989), environmental conditions greatly affect the levels of plant nutrients. This diversity is caused by many factors that are interdependent, especially genetic factors, sunlight, rainfall, soil, location, season and fertilization

The results of pH analysis of cooking water before and after boiling jengkol can be seen in Fig 1 below:

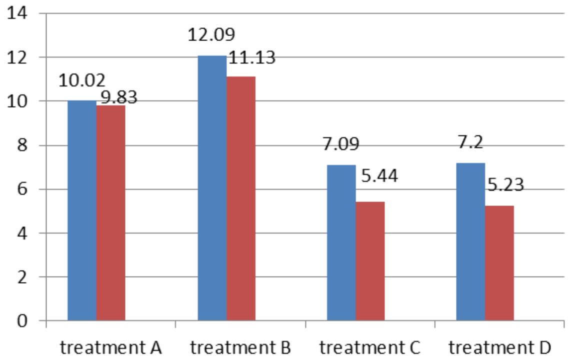

Fig 1. pH value of water cooking before (blue) and after boiling of Jengkol (red)

From Fig. 1 known that pH value of cooking water before boiling is in a state of alkaline and neutral. Because to the addition of alkaline material such kitchen ash and whiting in the solution that will release OH- ions which can increase the pH value of the solution. The lowest pH in cooking water is found in treatment C (boiling in water) and treatment D (boiling ripened jengkol). That is because in the absence of the addition of alkaline material, so that the pH of the cooking water is neutral.

According to Kurniawan et al (2012), ash kitchen is the remnants of the combustion of organic materials containing mineral elements such as potassium, calcium, magnesium, sodium, manganese, iron. According to Haerani (2012), whiting is made of sea shells, shells that have been burned which is then cooled by the addition of water to produce whiting, whiting contains minerals calcium and has chemical formula CaO.

After jengkol boiled, the pH value of the cooking water is decreased. This is presumably because of djengkolic acid dissolved into water.

pH value will affect the solubility of the protein, protein dissolve either at higher pH or alkaline pH. According to Chandra et al (2013), the higher the pH of boiling solvent, the soluble protein content will increase. According to Harris et al (1989), to isolate the protein cysteine required pH 10.8 . At that pH, the solubility of cysteine with an alkaline solution in a state of maximum. pH of the cooking water used is expected to affect the solubility of djengkolic acid.

The results showed the moisture content of jengkol after given some treatments was not significantly different. The results of the analysis of moisture content of jengkol after boiling can be seen in Fig. 2 below:

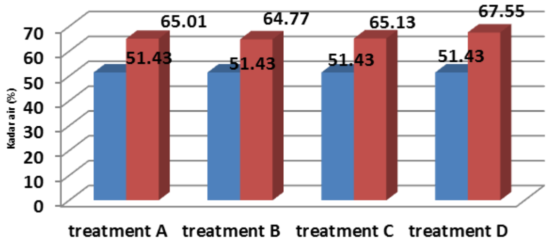

Fig.2. Moisture content analysis of Jengkol (red-fresh Jengkol, blue-pretreatment)

Known from Chart 2, when compared the moisture content of fresh jengkol which is 51.43%, the moisture content of boiled jengkol is increased. This happened because jengkol absorbs water during the process of soaking and boiling so the weight of jengkol increase because the water will easily diffuse into the cell wall of jengkol.
The results showed the ash content of jengkol after treated to a different number. The results of ash content analysis of jengkol after boiling process can be seen in Fig. 3 below:

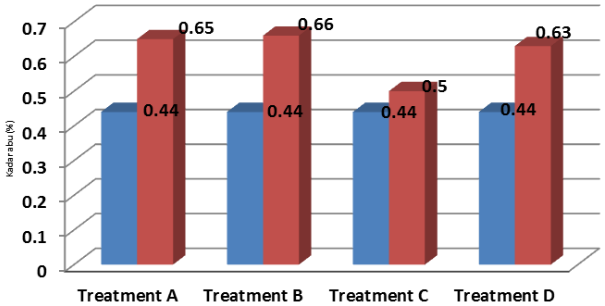

Fig 3. Ash content of Jengkol Bean after boiling process

In Fig. 3 seen that the ash content of raw materials of 0.44% increased after given some treatment, which is 0.63% -0.66%. Increased levels of ash in jengkol that boiled with solution of kitchen ash and whiting due to kitchen ash and whiting contained mineral elements such as Mg, Na and Ca absorbed into jengkol during the boiling process, so that the ash or mineral of jengkol increased. These results are consistent with research by Salama et al (2012) which showed that the ash content of fresh mussels increased after boiling in salt solution which containing mineral elements Mg, Na and Cl that are absorbed into the mussel meat during the boiling.
In treatment D (aging jengkol in soil) an increase in ash content allegedly because ash content of jengkol increased during germination. It is in accordance with the research results of Wachid (2006), ash content of sprouts tend to rise after the germination process. Winarno (1989) in Wachid (2006) stated that during germination was also an increase in vitamins, lysine and tryptophan. Some minerals (calcium and iron) which usually tightly bound are removed so that present in a more freely form.
The results showed a pH value of jengkol after given several treatments show different results. The results of pH analysis of jengkol after boiling process can be seen in Fig.4 below:

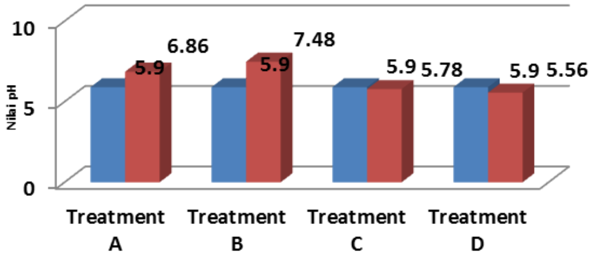

Fig 4. Analysis result of pH value of fresh Jengkol and after treatment

From Fig. 4 known that the pH value of jengkol that had been treated ranged from 5.56 to 7.48. The highest pH value obtained from treatment B (boiling in whiting solution) and the lowest pH value obtained from treatment D (boiling ripened jengkol). In treatment A (boiling in ash kitchen solution) and treatment B (boiling in whiting solution) found an increase in the pH of jengkol. The increase of pH of jengkol after treated presumably because minerals seeped into jengkol during the boiling process, allegedly also because of djengkolic acid leached into the water when the boiling process. Alkaline cooking water seeped into jengkol so that the pH of boiled jengkol increased mainly with the using of kitchen ash and whiting Jengkol contains djengkolic acid which is class of cysteine, an amino acid containing sulfur that can dissolve in water. According to Deman (1997), high content of polar amino acids in protein may increase protein solubility in water. Polar amino acids contained in albumin, asparagine, cysteine, glutamine which is soluble in water. According to Chandra et al, (2013), the higher the boiling solvent pH, the level of soluble protein will increase.

The results showed the levels of sulfur in jengkol after given some treatment has different results. The results of sulfur analysis of jengkol after boiling can be seen in Fig. 5 below:

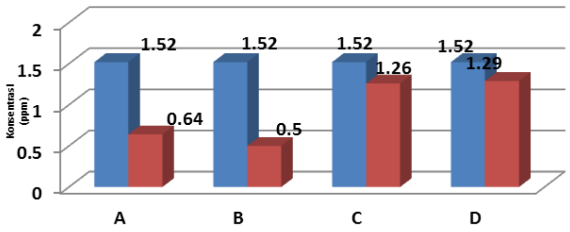

Fig. 5. Analysis result of sulfur content of fresh Jengkol and after treatment

In Fig. 5 it can be seen that the sulfur content of jengkol that have given some treatment ranged from 0.50 ppm ppm-1.29. In jengkol found amino acids containing sulfur (sulfur), which can be soluble in water. According to Deman (1997), polar amino acids contained in albumin, asparagine, cysteine, glutamine which is soluble in water.

Sulfur content of raw jengkol is 1.51 ppm, after done some boiling process the levels of sulfur in jengkol decreased. Decreased levels of sulfur after treated presumably because Djengkolic acid which is soluble in water have been dissolved during the boiling process. Boiling of jengkol with alakaline cooking water causes more sulfur dissolve, it can be seen in jengkol with treatment B (boiling in whiting solution) with a pH of cooking water before boiling is 12.09 resulting the lowest sulfur content, which is 0.5 ppm, with decreasing levels of sulfur in jengkol, and minerals seeped from the kitchen ash and whiting to jengkol caused the pH value of jengkol increased.

The higher pH of cooking water, the soluble protein will increase. In alkaline conditions the majority of amino acids negatively charged. Similar charge will repel each other which causes the minimum of interaction between groups of amino acids that will increase the solubility of the protein (Chandra et al, 2013).

In treatment D (boiling ripened jengkol) the level of sulfur is decrease but it is not significant when compared to the sulfur content of fresh jengkol which is of 1.512 ppm. This is presumably because the aging process, the variety of jengkol which is used in this study takes longer than 14 days to sprout along the 2-6 cm, so that after aging in the soil for 14 days only a little part of Djengkolic acid which decomposes. In accordance with research by Oen et al (1973) in Muchtadi (1989), jengkol varieties derived from Depok more difficult to grow the sprout than the varieties derived from Ciawi. So after jengkol bean left in the ground for 14 days, Djengkolic acid levels in jengkol varieties derived from Depok gained 3.1%, while the Djengkolic acid levels of varieties derived from Ciawi 0%. Decreased Djengkolic acid levels while aging process allegedly because Djengkolic acids are broken down by lyase enzymes into ammonia and H_2S which is volatile. According to Muchtadi (1989), an enzyme that can hydrolyze Djengkolic acid named lyase enzyme. When this enzyme breaking the Djengkolic acid, it will form a volatile thiol compound with a distinctive odor of jengkol.

CONCLUSIONS

Based on the research that has been done can be concluded, giving some treatments may affect the levels of sulfur and pH value on jengkol bean. The most drastic decrease of sulfur is to use whiting and followed by the use of kitchen ash, boiling in water and aging in the soil.

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