Total Sugar Content, Protein, Adhesiveness, and Hardness of Fermented

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Total Sugar Content, Protein, Adhesiveness, and Hardness of Fermented Jackfruit Seeds Flour by *Kluyveromyces marxianus* and *Saccharomyces cerevisiae*

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Abstract

This research aims to produce dough from fermented jackfruit seed using *Kluyveromyces marxianus* and *Saccharomyces cerevisiae*. Concentration of inoculum at 0, 4, 8 and 12% (v/v) was used to measure total sugar, protein content, adhesiveness and hardness in the dough. To produce dough, fermentation process for 1 hour at room temperature (27°C±1) was used. Total sugar was measured using refractometer and protein content was analyzed using Bradford method. Adhesiveness and hardness was analyzed using texture analyzer. Result shows no significant differences (P>0.05) on sugar content in obtained doughs using *K. marxianus* and *S. cerevisiae* resulting a value of 8.442±0.69 and 8.485±0.76°Brix, respectiv Protein content of the fermented dough was 3.51±1,16 and 4.4±2.09% for *K. marxianus* and *S. cerevisiae*, respectively, resulting the significant differences among treatments. The adhesiveness and hardness of fermented dough with *K. marxianus* was significantly higher than that of *S. cerevisiae*. This result may provide beneficial information to food industry that uses jackfruit seed as ingredient.

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Introduction

Jackfruit (*Artocarpus heterophyllus* Lam.) consists of about 10-15% seed of the total weight of fru This seed contains a rich of carbohydrate and protein (Kumar et al., 1988). Seeds are normally discarded or steamed and eaten as a snack or used in some local dishes for example: "Gudeg"; one of Javanese dishes. In addition, the flour from this seed may provide potential a ication in bakery product since this seed is a rich source of protein, starch, and dietary fiber (Chowdhury et al., 2012) and potentially developed through fermentation process (Al-Baarri et al., 2013; Yamaoka et a 014). Therefore, this research was done to analyze total sugar, protein content, adhesiveness and hardness of dough made of jackfruit seed flour using fermentation process by inoculation of *K. marxianus* and *S. cerevisiae*. This research may provide beneficial information to food industry to open the ways for utilizing jackfruit seed as ingredient.

Materials and Methods

Materials

Jackfruit seeds was obtained from local market, *S. evisiae* (FNCC 3022) and *K. marxianus* (FNCC 3026) were obtained from Integrated Research and Testing Laboratory (LPPT) Gadjah Mada University, Yogyakarta, Indonesia. The chemicals used in this research were analytical reagent grade.

Method

The study was conducted from August–October, 2016. The peeled and sliced jackfruit seeds (±3cm of thickness) was dried at 50°C for 6 h (Jading et al, 2011). Miller was used to convert the dried seed into flour. Hand-held refractometer was used to determine total sugar (Ihsan and Wahyudi, 2010), Bradford method was used to analyze protein content (Purwanto, 2014). Adhesiveness and hardness were analyzed using CT3 Texture Analyzer (Brookfield, 2014).

Fermentation of jackfruit seed flour was conducted using the following description. Fifty percent concentration of flour in the water was inoculated with 0, 4, 8, and 12% of *S. cerevisiae* and *K. marxianus*. Incubation was done for 1 hour at room temperature (27±1°C) in anaerobic condi ns.

The obtained data were statistically analyzed using one-way A VA and Duncan's Multiple Range Test using SPSS 16.0. The level significance was set at α = 0.05.

Results and Discussion

Total sugar content in the dough that was composed from *K. marxianus* and *S. cerevisiae* was 8.442±0.69% and 8.485±0.76%, respectively (Figure 1a)

resulting in no significantly differences on b[illegible] value. Sugar content found in this research was 54% lower than that of reported by Fairus et al., (2010). This may be explained by the differences on the water activity in seeds. Furthermore, the enzyme was also plays important role in sugar degradation (Lubis, 2012)

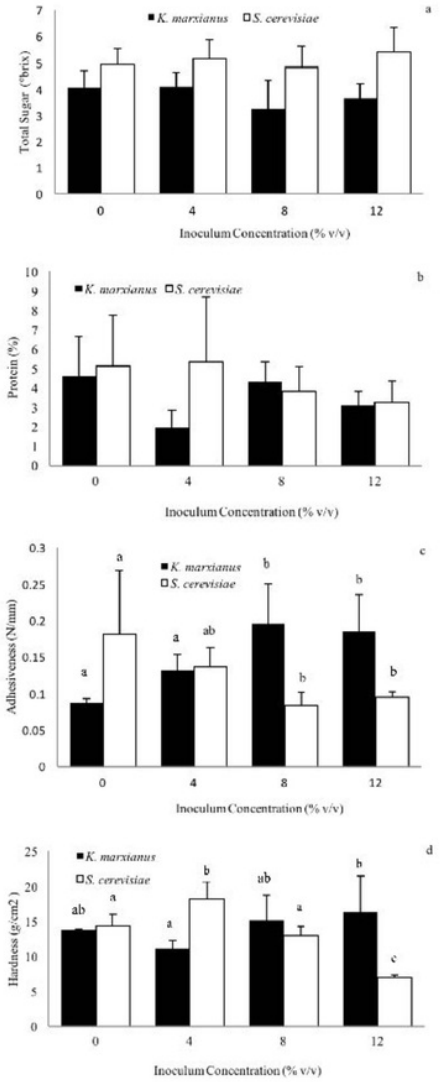

Figure 1. Sugar content (a), total protein (b), adhesiveness (c), and hardness (d) of dough made of jackfruit seed using fermentation process by 0, 4, 8 and 12% of *K. marxianus* and *S. cerevisiae* for 1 hour at room temperature in anaerobic conditions. The superscript shows significantly difference using Duncan's Multiple Range Test.

It was understood that *K. marxianus* break the inulin into oligo-fructose (Yuliana et al., 2014). In addition, *S. cerevisiae* environmental dependently converted complex sugar into glucose and fructose (Awwalurrizki and Putra, 2009; Hasanah and Putra, 2010).

Protein content of dough made of *K. marxianus* showed significant differences while *S. cerevisiae* showed no significant differences among concentrations of inoculum (Figure 1b). The highest protein content was in the fermented dough with 8% concentration of *S. cerevisiae* i.e. 5.37±3.22%. This value could be categorized as low since originally protein content in seed was low (Mukprasirt and Sajjanantakul, 2004). The reduction of protein content could be explained by proteolytic activity (Foukis et al., 2012) by protease enzyme, endopeptidases, and exopeptidases (Lopez et al., 2011). In order to increase the protein content, longer time of fermentation is needed (Kuswardani and Wijajaseputra, 1998), however, auto-biodegradation may reduce the protein content.

Adhesiveness of dough can be seen on Figure 1c. Fermented dough showed lowest value; i.e. 0.08±0.01 N/mm and highest value; i.e. 0.18±0.08 N/mm at 8% inoculation. Yusriyah and Agustini (2014) reported that the adhesiveness was inoculum concentration and fermentation rate dependent. This research shows the linear correlation between inoculum concentration and adhesiveness resulting the in line result with Rotcha et al. (2015). The low in adhesiveness of dough inoculated with *S. cerevisiae* may be assumed no strong relation between sugar and water in *S. cerevisiae* (Kumura et al., 2004)

Hardness of fermented dough by *K. marxianus* and *S. cerevisiae* can be seen on Figure 1d. The highest hardness was shown at 4% *S. cerevisiae* inoculation, i.e. 18.27±2.41 g/cm^2. The value of hardness showed linear correlation with concentration of inoculum. This may be assumed by the content of gluten (Warechowska et al., 2016). Furthermore, the inoculum concentration affected the alcohol production resulting the change in hardness dough (Unika, 2015; Rocha et al., 2015).

Conclusion

K. marxianus and *S. cerevisiae* specifically affected protein content, adhesiveness, and hardness while the both of inoculum showed negligible differences on sugar content.

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