

Consumer Perception on the Redness and Off Flavor Upon Stored Red Chili Paste with Hypoiodous Acid Treatment

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Abstract

Red chili has a short shelf life due to rapid increase in respiration rate. Pretreatment with hypoiodous acid (HIO) is currently being developed to prolong shelf life of agricultural commodities. This study aims to identify the effect of treatment with HIO on redness and off flavor of red chili paste during storage that was used as the quality measurement in consumer perception level. The treatments were conducted by soaking red chili in 10 mM HIO for 15 minutes while controlled treatment was done using pure water only. HIO was generated by reaction of 20 mM H₂O₂ and 20 mM KI. Analysis of redness value and aroma was conducted every day for 7 days. The data were obtained by calculating the average and standard deviation, then presented in a graph with error bars. The results showed that the redness value of control and HIO treatment were 42.94 and 43.71 that was starting from 51.55 and 54.10. The results also showed that the control treatment showed off flavor on the third day of storage, while off flavor on HIO treatment showed on the seventh day. In conclusion, HIO treatment might inhibit the decrease in redness and prevent changes on red chili paste's off flavor.

Keywords: hypoiodous acid (HIO), red chili, storage

1. Introduction

During storage, red chili may undergo microbial growth that will decay and lower its qualities due to lipolytic and proteolytic activities, and also contribute to the aroma compounds degeneration and sensory quality decay (Niu *et al.*, 2020). As the basic prerequisites in paste

products, pre-storage handling is required to keep their quality during storage (Hua *et al.*, 2022). However, bacteria and enzymes are also involved in the decrease of red chili's quality during storage, resulting in a negative impact for red chili's sensory qualities. Therefore, further processing of red chili to extend its shelf life is to process it into chili paste. Turning red chili into paste is known as a way to minimally process red chili. Furthermore, this chili processing has been applied in many ways, including fermented chili paste (Hua *et al.*, 2022). But in spite of that, processing red chili into chili paste without further treatment will reduce the quality and also red chili paste's shelf life.

Hypoiodous acid (HIO) is an oxyacid from the combination of hydrogen peroxide (H_2O_2) and potassium iodate (KIO_3) (Gusrianto *et al.*, 2018). Pretreatment technology using HIO pretreatment is considered to be potentially well in maintaining the quality of red chili paste because HIO has antibacterial and antifungal properties. Low price handling process with GRAS compound such as hypothiocyanite or HIO has been applied in fruit to minimize the browning change during pre-serving in apple and salak (Muslim *et al.*, 2020). In our previous study, the application of HIO effectively hindered the browning index of salak and apple during storage (Al-Baarri *et al.*, 2019a; Al-Baarri *et al.*, 2019b). In addition, utilization of other potent substances such as olive leaf extract might also prolong the shelf life (Zam, 2019).

Organoleptic characters such as color and aroma play a big role in customer's consideration when buying horticultural products, especially red chili. The presence of color and aroma in food marketing is very important because consumers generally will recognize the quality of organoleptic characters first. The color and aroma of red chili paste are influenced by the quality of red chilis that were used, where red chilis with poor qualities will result in red chili paste with a less desirable color and aroma. Based on those considerations, this study aims to identify the effect of treatment with HIO on redness and off flavor of red chili paste during storage that was used as the quality measurement in consumer perception level.

2. Material and Methods

2.1. Materials

This experiment used red chili that was purchased from the local market market in Banyumanik Regency (10 minutes from the research station). Other materials were H_2O_2 (Merck, Germany), KI (Merck, Germany). Chopper (Oxone, Indonesia), colorimeter (AMT501, US), Ziplock, latex gloves, spatula, and stainless spoons were used in this experiment.

2.2. Methods

2.2.1. Red Chili Preparation

Red chili preparation referred to Al-Baarri *et al.* (2022) with small modification. Red chili was sorted based on Indonesian National Standard (SNI) 4480:2016 about Chili. Red chili samples used in this study were the second class. Red chili that had been sorted then separated from the stalk and washed on flow water to clean up the red chilies. The red chilies were divided into two treatment categories, which are control and HIO treatment. Each of the samples were 110 g.

2.2.2. HIO Preparation

HIO preparation referred to research by Al-Baarri *et al.* (2018) with modification. H₂O₂ (20 mM) and KI (20 mM) was mixing 1:1 to create a reaction into HIO solution. These compounds were mixed in a container and stirred for 1 minute, Red chili contains peroxide enzyme, which may use to catalyze the formation of HIO solution. The container was covered with plastic wrap. The solution was ready to use after 6 minutes reaction time.

2.2.3. Application of HIO and Chili Paste Preparation

Application of HIO in red chili samples and chili paste preparation referred to previous method by Al-Baarri *et al.* (2019b). The control samples were soaked in water, meanwhile the treatment samples were soaked in HIO solution. Soaking process was carried out for 15 minutes. Each samples chopped finely for around 2 minutes, then packed as much as 10 grams with 10x6 cm sealed-ziplock. Chili paste was stored at room temperature. Parameter analysis was done every 3 days.

2.2.4. Redness Value (a*) Analysis

Redness value analysis referred to Tang *et al.* (2021) study using colorimeter. Redness value could be seen from the a* value in colorimeter display. The higher a* value identified as the amount of redness in samples. Colorimeter was calibrated first by white and black surfaces. Colorimeter sensor was applied onto each of the samples. The information about redness value can be seen from colorimeter display.

2.2.5. Aroma Analysis

Aroma analysis was carried out using method of Villavicencio *et al.* (2021) with modification. Each of the paste samples were smelled by the practitioner. Normal aroma was described as negative (-), while the off-flavor was described as positive (+).

2.2.6. Data Analysis

The data were calculated into the average and standard deviation, The analysis was conducted using Microsoft Excel 2019, then presented in a graph with error bars and scattered line.

3. Result and Discussions

3.1. Redness

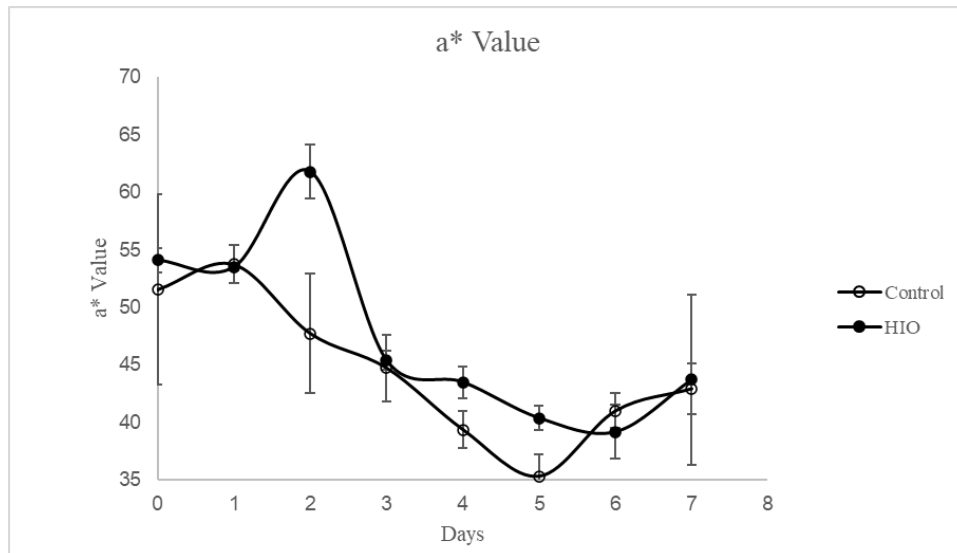


Illustration 1. Red Chili Paste a* Value during 7 Days of Storage.

Based on the results of Illustration 1, the a* (redness) value of red chili paste decreased during seven days of storage. This graph showed that red chili paste soaked only with water experienced a bigger decrease than red chili paste with HIO pretreatment. Chili paste without HIO pretreatment has a value of a* (red color indicator of chili paste) that is not good or decreases faster. This phenomenon can occur due to the length of storage, because storage can affect the antioxidant levels of red chili and will result in a browning reaction. The longer the storage, the antioxidant compounds and pigments will be degraded resulting in a decrease in color (Gusrianto *et al.*, 2018). The HIO pretreatment on chili paste looks more stable because HIO is an acidic compound that can slow down the formation of quinone pigments, as a brown colorant because HIO will function as an oxidizing agent that will react with the polyphenol oxidase (PPO) enzyme (Zhang *et al.*, 2019).

Color changes that occur in chili paste can affect consumers' views of the chili paste produced. Consumer preferences are very important in determining the quality of chili paste where color is an indicator of the freshness of red chilies. Generally, chilies with a fresh red

color are preferred by consumers because they are considered an indicator that the chili has good quality and is fresh chili (Prasetia and Partini, 2019).

3.2. Aroma

Table 1. Red Chili Paste Aroma Changes during 7 Days of Storage.

Aroma								
Day	0	1	2	3	4	5	6	7
Control	-	-	-	+	+	+	+	+
HIO	-	-	-	-	-	-	-	+

Note: Off-flavor was described as positive (+) and normal aroma was described as negative (-)

Based on the results of Table 1, red chili paste only soaked in water showed off-flavor on the third day of storage, while red chili paste with HIO treatment showed off flavor on the seventh day. Off-flavor in control chili paste is caused by microbial activity that decomposes chili nutritional components into acid (Renate, 2019). The more acid that accumulates in the chili paste, the more off-flavor it will be. it also indicates the level of rottenness of the chili paste.

HIO may retain the aroma of chili paste due to its antimicrobial properties. HIO contains iodine derived from potassium iodide. Potassium iodide reacted with hydrogen peroxidase can penetrate bacterial cell walls, inhibit protein synthesis, and denature DNA (Vecchio *et al.*, 2015). Iodine is also presumed to attack the surface proteins and destabilize membrane fatty acids of lipid enveloped viruses (Hove et al., 2020). Consumers will prefer chili with a normal aroma because it indicates the freshness of the product. The normal aroma of chili paste also may stimulate appetite.

4. Conclusion

Based on this study, it can be concluded that red chili paste with HIO treatment showed a slighter decrease in a* value and aroma changes than red chili paste without HIO treatment. Thus, the usage of HIO treatment proved to be quite effective in inhibiting the decrease in redness, preventing off flavor changes, and also mainting the quality of red chili paste.

5. Reference

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