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SURAT PERNYATAAN
Nomor : 035/SP.HCP/LPPM/UNIJA/I/2023

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DISCOLORATION IN RAW AND PROCESSED POTATO (Solanum tuberosum) THROUGH SLOW HEATING PROCESS

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Submission date: 16-Jan-2023 03:07PM (UTC+0700)
Submission ID: 1993486975
File name: CESSED_POTATO_Solanum_tuberosum_THROUGH_SLOW_HEATING_PROCESS.pdf (435.69K)
Word count: 1775
Character count: 9239

Journal of Food Technology and Agroindustry Volume 4 No 2 Agustus 2022
P-ISSN: 2656-0623
E-ISSN: 2684-8252

DISCOLORATION IN RAW AND PROCESSED POTATO *(Solanum tuberosum)* THROUGH SLOW HEATING PROCESS

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ABSTRACT

In today's world, it is known that potato become important commodity as it well spread around the continents. Because of not only nutrition content but also potato vastly consumed because of its highly yield per acre. However, there are some factors that contribute to the quality loss of potato itself, one of them is discoloration in raw potato. This experiment aimed to determine discoloration on some sort of potatoes due to to slow heating process at 30°C for 2 hours. The experiment was conducted in the laboratory for sensory and consumer study, University of Goettingen from 04th to 08th of March 2019. There were three varieties of potato used in this experiment, namely Amanda (mealy potato), Queen Anne (mainly waxy potato), and Belana (waxy potato). The result was all samples experienced color changing as the number on each index are changing. Belana variety showed the lowest value of L and experienced the highest gap on before-after L value, which means this variety was the darkest among the other samples. The gap also high as before treatment value was 76.03 and become darker after treatment (63.53). On the contrary, Amanda variety experienced a slight darkening since the gap between before and after treatment was only 2.97 (from 74.34 to 71.37).

***Keywords**: discoloration, potato, processed, raw*

INTRODUCTION

The potato is already an integral part of the global food system. It is the world's number one non-grain food commodity, with production reaching a record 325 million tonnes in 2007 (FAO, 2008). Many improvements have been done in order to increase the productivity of potato. Aeroponics system, for instance, is able to be used in the production of potato in a limited land condition (Tunio et al., 2020). Even in African country such as Kenya is developing strategy, namely Climate-Smart Agriculture, to determine its potential on potato production (Waaswa et al., 2022).

Potato served not only in a form of baked or fried, it also sale in the form of peeled potato. However, this trend is changed as consumers change their preference to unpeeled smaller potato. collaboration among small potato producers, agricultural service prviders, and market agents were proven to put market chain innovation in the changing behaviour on potato preferences in consumer level (Devaux et al., 2009). However, since there are some phenolic compounds in potato (Singh and Saldaña, 2011), consumers are unaware of its existence and its potential of being toxic food.

Apart from toxicity, phenolic compound also contributes to discoloration of potato itself (Mondy and Gosselin, 1988). Discoloration divided into two

P-ISSN: 2656-0623
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types, they are enzymatic and non-enzymatic discoloration. Discoloration in raw potato is important because this enzymatic discoloration is the second largest cause of quality loss in fruits and vegetables, including potato (Ioannou and Ghoul, 2013). The aim of this experiment was to compare discoloration on three different varieties of potato treated at 30°C for 2 hours and their raw form.

Discoloration itself is important to understand how acceptable the final product due to some kind of process. At some cases, discoloration on potato and its product related to undesirable brown color (Manohan and Wai, 2012) and this will lead to decision of consumer whether to buy or leave it behind. In Indonesia, the study of discoloration on potato is very important as potato prone to browning due to enzymatic process (Arum *et al*., 2022). Temperature during the process of cooking potato is one of the factors that influence the discoloration. Similar to the result of (Schippers, 1968) that cooking can increase discoloration and decrease on yellowness of potato.

MATERIALS AND METHODS

The experiment was conducted in the laboratory for sensory and consumer studies of The University of Goettingen from 04th to 8th March 2019. Three different varieties of potatoes were used in this experiment as representative three different categories of potatoes, mealy, waxy and mainly waxy. The experiment started by sorting five medium size of potatoes for each variety, peeled them up and cut into small dices. Potato press equipment was used to mash the potato. The weight of each mashed potato was the same (30 g) and was put into a petri dish before well mixed with 20 ml of distilled water. The surface of the sample smoothened by using the fork. Since this experiment need data on before-after treatment, the color of the samples was measured by using Minolta Color Meter before they were put into a drying chamber at 30°C for two hours. Eventually, after 2 hours the samples were measured again as the same procedure as before. The data appeared, both before and after treatment, was recorded.

RESULTS AND DISCUSSION

The result shows that all samples experienced color changing as the number on each index are changing. Belana variety showed the lowest value of L and experienced the highest gap on before-after L value, which means this variety was the darkest among the other samples. The gap also high as before treatment value was 76.03 and become darker after treatment (63.53). On the contrary, Amanda variety experienced a slight darkening since the gap between before and after treatment was only 2.97 (from 74.34 to 71.37). In terms of a value (green to red), all varieties experienced changes from negative value to positive value after treatment, which means all of them were getting reddish (see figure 1). Based on the observation the gap of b value on Amanda and Queen Anne were not significant while on Belana showed a distinct change.

Table 1. Results of Minolta Color Meter on raw and cooked potato samples

Variety	Color of Raw Potato		
	Color Index	**Before Treatment**	**After Treatment**
Amanda (Mealy)	L	74,34	71,37
	a	-0,76	2,21
	b	25,78	24,74
Queen Anne (mainly waxy)	L	71,03	64,49
	a	-1,3	3,85
	b	27,74	28,34

P-ISSN: 2656-0623
E-ISSN: 2684-8252

	L	76,03	63,53
Belana	a	-3,89	3,23
(waxy)	b	37,09	31,79

Table 1 shows that there was a color changing on potato during the study. This changing is an enzymatic process that commonly occurs on most fruits and vegetables. According to figure 1, the color change on all samples was typically darkening, getting more reddish and from light yellow to dark yellow. As the samples were experienced a similar trend, it is presumably they experienced enzymatic reaction during the treatment. This enzymatic reaction mostly occurs between cortex and skin tissue of potato as it was reported by Friedman (1997), however in this experiment enzymatic process occurred equally since the sample were mixed properly.

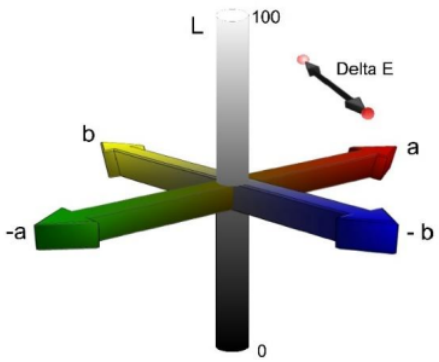

Figure 1. Description of value in Minolta color meter

This enzymatic process is correlated with the presence of chlorogenic acid as the product of the oxidation of polyphenolic compounds. This acid is responsible in deterioration of flavor, color, and nutritional quality of potato after harvesting. However, chlorogenic acid known also as inhibitor for bacterial growth (defense mechanism) (Friedman, 1997). In addition, as reported by Kang in 1983 that chlorogenic acid or dopachrome was converted into black melanin in his study and it completely converted within 5 hours. However, in this experiment the treatment was only 2 hours, which presumably correlated to the result of non-significant difference between before and after value.

As the blackening process is the most frequent but undesirable process on market, scientist is on an attempt to reduce this natural process. One of the measures is using sodium bisulfite as an oxidation-preventive agent. However, the application of this chemical agent is under regulation FDA (1986) (the acceptable daily intake of sulfite is not exceed than 0.7mg/Kg bodyweight) since it has been indicated as the cause of allergic reactions and asthmatic response in certain people (Chen, 2016).

CONCLUSION

1. all samples experienced discoloration at 30°C for 2 hours.
2. all samples were typically darkening, getting more reddish and from light yellow to dark yellow
3. Belana variety experienced the darkest among the other samples. On the contrary, Amanda variety experienced a slight darkening since the gap between before and after treatment was only 2.97.
4. In terms of a value (green to red), all varieties experienced getting reddish

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