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Factor Affecting The Storage of Krathon Sauce

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ABSTRACT

The study on factors affecting the storage of krathon sauce was conducted 2x2x3 Factorial in CRD was used. Three factors studied were container (clear glass- and light brown glass bottles), temperature (4 ^{o}C and room temperature) and storage times (7 d, 5 and 9 m after storage). It was found that krathon sauce stored in brown glass bottles at 4 ^{o}C for 5 m had the highest percentage of protein (20.31%w/w) and gave the best antioxidant (IC_{50}= 3.297). Storage time, temperature, and container had no effect on amount of minerals. It can be concluded that krathon sauce kept in dark-colored containers under lower temperature and shorter storage time could maintain the nutrients in the sauce.

Keywords: Krathon, Krathon sauce, Nutrition, Storage time, Antioxidant activity

INTRODUCTION

Krathon belongs to genus *Millettia*, family Leguminosae-Papilinoideae (Smitinan, 2001; Muchajeep, 1998) found in Chattrakan, Nakhonthai and Noenmaprang districts of Phitsanulok province. Krathon sauce is widely used as food seasoning. After fermentation of its leave, krathon juice is simmered and seasoned with salt. The final product gives sauce-like odor and taste (Mopoung *et al*., 2007). Krathon sauce contains protein, carbohydrate, fat, fiber, ash and moisture 25.80, 2.28, 2.24, 1.56, 6.54 and 61.67 % w/w, respectively and K, Na, Ca, Fe, P, and Zn 5.34, 6.75, 7.86, 0.33, 3.94, and 0.07 mg/g, respectively (Mopoung *et al*., 2002; Mopoung *et al*., 2007). Form an analysis of chemical constituents, Millettia erytrocalyx (Palazzino *et al*., 2003; Sritularak, *et al*., 1998; Sritularak *et al*., 2002) Krathon sauce (Boonphong *et al*., 2006) was also found to contain a group of flavanoid substances namely flavone, flavonol, and flavonol glycoside. These three substances are antioxidants. Krathon sauce is produced once a year for local consumption. Normally, it can be stored only one year since amount of nutrient minerals and antioxidant will be altered after that. The objective of this study was then to investigate if those two factors affected storage time. These may be caused by type of container (Rattanapanon and Rattanapanon, 1994) and temperature under storage condition.

METHODOLOGY

The experimental designed was 2x2x3 Factorial in CRD. Three main factors were type of container (clear glass- and light brown glass-bottles, temperatures (4 ^{o}C and room temperature) and storage times (7 d, 5 and 9 m after storage).

Finished krathon sauce was poured into clear glass- and light brown glass-bottles. All krathon sauce bottles were stored in incubators temperature of 4°C and room temperature (night and day temperatures varied depended on the time of experiment). After one week storage, krathon sauce was analyzed for amount of nutrients, minerals (Helich, 1990) and IC_{50} (antioxidant) potential (Brand-Willams *et al.*,1995; Molyheux, 2004).

Data collected were analyzed for statistical variance (ANOVA).

RESULTS AND DISCUSSION

Storage time had effect on percent of protein, fat, ash, moisture and carbohydrate (Table 1). Longer storage gave lower amount of Mg and IC_{50} (Table 2). Type of containers affected percents of moisture (Table 3) and IC_{50} (Table 4). Light brown glass bottle gave better result compared to the clear one (Table 3 and 4). While only protein (Table 5) and amount of Mg (Table 6) were influened by storage temperature.

Amount of protein and fat were reduced from the initial phase of storage because these organic substances could be changed according to the conditions of storage, especially the change in chemical structures which can lose its natural condition. Similarly, the occurrence of lipid oxidation could also cause protein and fat to reduce from the initial phase. The storage at room temperature in clear glass container could accelerate the loss of protein and fat (Figure 1 - 4). At higher temperature, clear glass container could increase IC_{50} value (Figure 5 and 6) (Rattanapanon and Rattanapanon, 1994). These IC_{50} values were related to amount of antioxidant in the substances. Substance with low IC_{50} value had high antioxidant potential. It was reported from the analysis of chemical constituent that krathon sauce contained a group of flavonoid substances namely flavone, flavonol, and flavonol glycoside (Boonphong *et al.*, 2006). These were constituents of biomolecular substances that had antioxidant potential. Their changes occurred according to the conditions of storage, particularly the change of chemical structure (Rattanapanon and Rattanapanon, 1994).

Table 1 Effect of storage times on amount of nutrients

Time after Storage	%Protein	%Carbohydrate	%Fat	%Fiber	%Ash	%Moisture
One week	19.42^{a}	6.10	1.53^{a}	1.37	5.99^{a}	65.59^{a}
5 month	19.23^{b}	8.71	1.31^{b}	1.40	5.56^{b}	63.80^{b}
9 month	17.65^{c}	11.95	1.30^{c}	1.34	5.43^{c}	62.33^{c}

Mean values followed by different letter are not significantly different at 5% level (Duncan's multiple range test)

Table 2 Effect of storage times on amount of minerals and antioxidant

Time after Storage	Fe(mg/g)	Mg(mg/g)	Zn(mg/g)	IC_{50}
One week	0.064	1.1695[a]	0.0172	3.52[c]
5 month	0.065	1.1607[b]	0.0136	3.56[b]
9 month	0.063	1.0870[c]	0.0296	3.99[a]

Mean values followed by different letter are not significantly different at 5% level (Duncan's multiple range test)

Table 3 Effect of type of containers on amount of nutrients

Containers	%Protein	%Carbohydrate	%Fat	%Fiber	%Ash	%Moisture
clear glass bottle	17.96[b]	10.93	1.37	1.35	5.62	62.77[b]
light brown glass bottle	20.00[a]	6.76	1.37	1.43	5.50	64.94[a]

Mean values followed by different letter are not significantly different at 5% level (Duncan's multiple range test)

Table 4 Effect of type of containers on amount of minerals and antioxidant

Containers	Fe(mg/g)	Mg(mg/g)	Zn(mg/g)	IC_{50}
clear glass bottle	0.065	1.303	0.0250	3.83[a]
light brown glass bottle	0.065	1.325	0.0153	3.56[b]

Mean values followed by different letter are not significantly different at 5% level (Duncan's multiple range test)

Table 5 Effect of storage temperatures on amount of nutrients

Storage temperature	%Protein	%Carbohydrate	%Fat	%Fiber	%Ash	%Moisture
Room temperature	18.73 [b]	9.02	1.42	1.47	5.63	63.72
4 °C	19.23[a]	8.67	1.31	1.31	5.49	63.99

Mean values followed by different letter are not significantly different at 5% level (Duncan's multiple range test)

Table 6 Effect of storage temperatures on amount of minerals and antioxidant

Storage temperature	Fe(mg/g)	Mg(mg/g)	Zn(mg/g)	IC_{50}
Room temperature	0.064	1.341[a]	0.0250	3.74
4 °C	0.064	1.288[b]	0.0152	3.64

Mean values followed by different letter are not significantly different at 5% level of probability (Duncan' s multiple rang test)

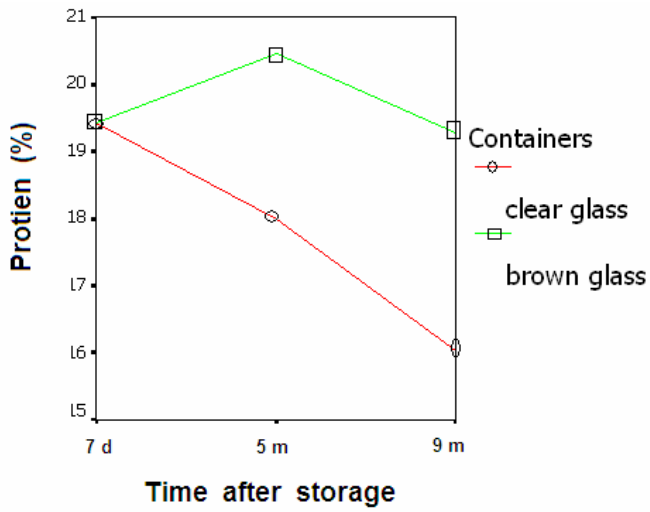

Figure 1 Amount of protein in each phase of storage when using 2 types of container

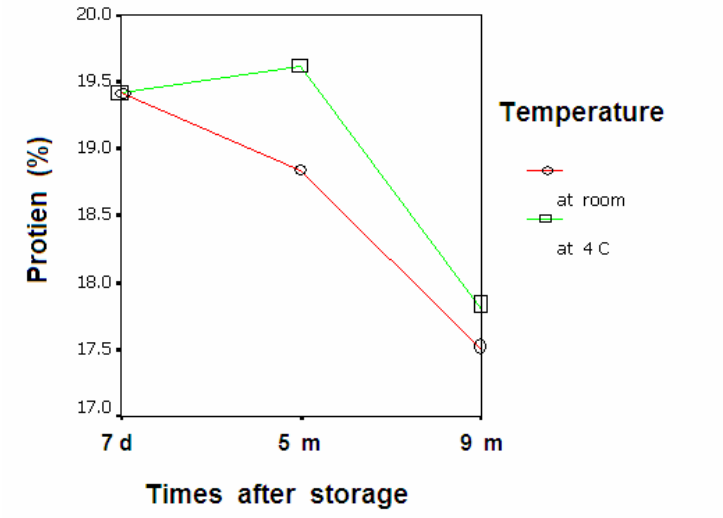

Figure 2 Amount of protein in each phase of storage under 2 storage temperatures

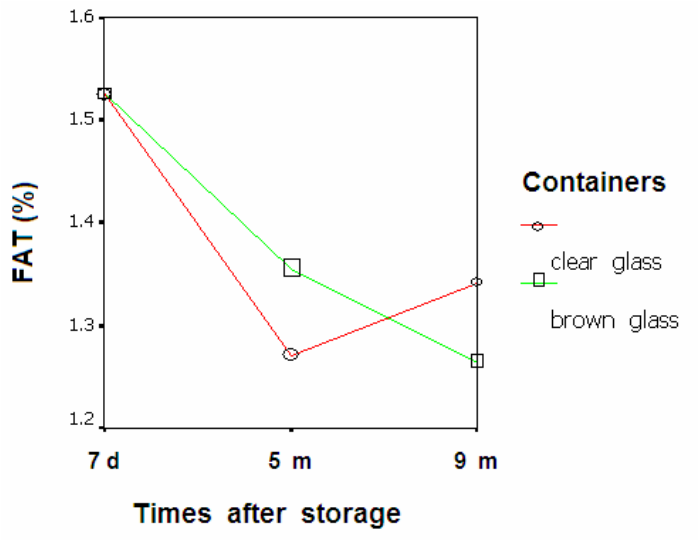

Figure 3 Amount of fat in each phase of storage when using 2 types of container

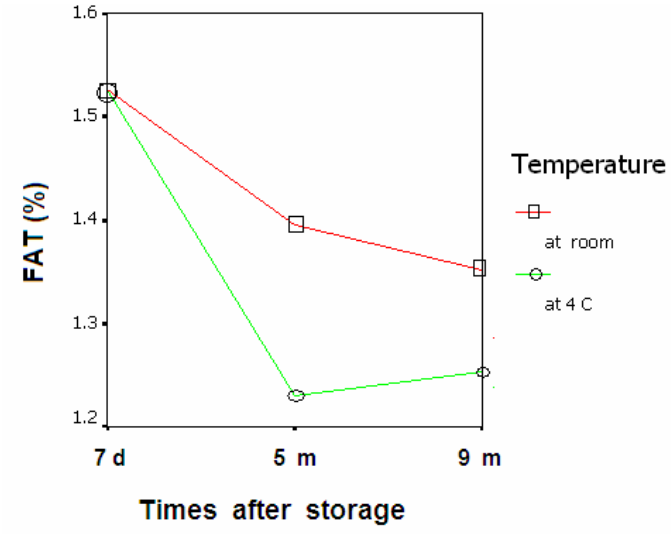

Figure 4 Amount of fat in each phase of storage under 2 storage temperatures

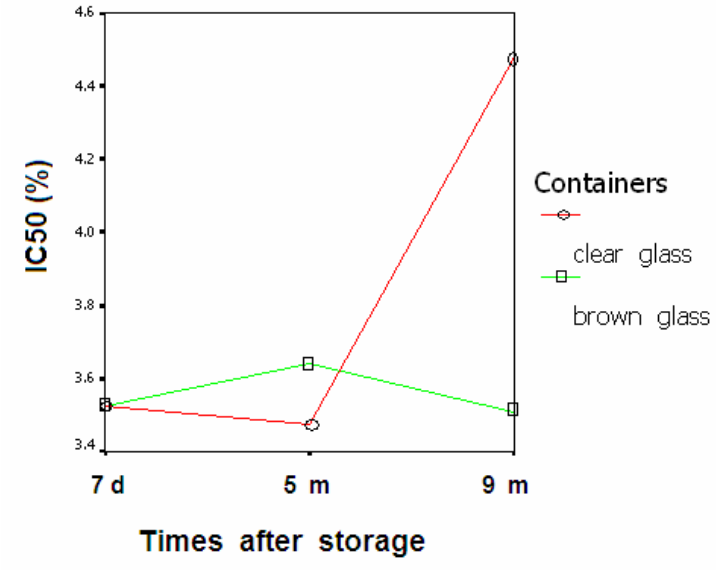

Figure 5 IC_{50} value in each phase of when using 2 types of container

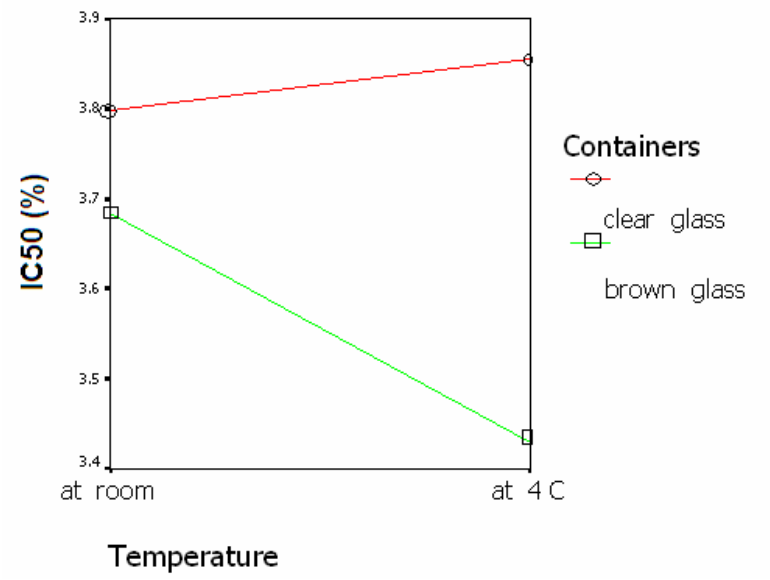

Figure 6 IC_{50} value in each storage temperature when using 2 types of container

CONCLUSION

Nutrients, minerals, and antioxidant are biomolecular constituents which were affected by storage times, storage temperatures, and types of container. Krathon sauce was stored best at lower temperature, in shorter storage time and in darker glass bottle. These conditions help maintaining the quality of Krathon sauce.

Krathon sauce contained a rather high amount of protein, similar to soybean sauce(Mopoung, *et al*., 2007). Krathon sauce is a kind of seasoning produced from local wisdom. Results of this study should be publicized to make others know about its benefit and factors affecting the storage of krathon sauce which could eventually lead to Food safty production process.

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