

Effects of the eco-friendly pretreatment materials on browning and quality of semi-dried persimmons(*Diospyros kaki* Thunb.)

Kyung Mi Jung

Sangju Persimmon Experiment Station
Gyeongbuk Agricultural Technology Administration
Sangju 742-842, Korea
kmgod@korea.kr

Se Jong Kim

Sangju Persimmon Experiment Station
Gyeongbuk Agricultural Technology Administration
Sangju 742-842, Korea
kimsejong@korea.kr

Abstract— This study attempting to examine effects of the environmental-friendly and health-friendly pretreatment materials on browning and quality of semi-dried Persimmons instead of sulfur fumigation because consumers' needs for food safety are increasing.

Semi-dried persimmons treated by non-fumigation showed a severe browning on their surfaces, Browning of grapefruit extract treated group and 5% Sporix treated group was mere. The surface color of grapefruit extract treated group showed a real red color.

Weight reduction rate was more than 50% after air-drying period of 24 days in every process. The rate of 5% Sporix-treated group was 60%, the highest degree. The moisture content of 5% Sporix treated group was 44.9%, the lowest degree while that of grapefruit extract treated group was 55.8%, the high degree.

The soluble solid contents of non-fumigation treated group and grapefruit extract treated group was 38 and 39°Bx, respectively while that of sulfur fumigation treated group and 5% Sporix treated group was 41 and 42°Bx, respectively.

From the general preference standpoint, sulfur fumigation treated group was 3.8, 5% Sporix treated group was 3.9, and grapefruit extract treated group was 4.2. Since taste and color were excellent with 5% Sporix and grapefruit extract treated group, they are recommendable for pretreatment materials when semi-dried persimmons are processed.

It is required to manage environment so that drying site is not excessively humid during drying period when Sporix and grapefruit extract are used as pretreatment materials while making semi-dried persimmons, and it is desirable to use more than ripe persimmons for tasty and high quality semi-dried persimmons.

Keywords- Browning; semi-dried persimmons; pretreatment; Sulfur fumigation; Sporix; Grapefruit seed extract

I. INTRODUCTION

Sulfur fumigation has been conducted to prevent surface browning and fungi while making semi-dried persimmons. Sulfur dioxide remained in food causes asthma patients to have difficulty in breathing or some people to have allergic reaction.

The reason that sulfuring prevents semi-dried persimmon from browning and generation of fungi is that sulfurous acid of a strong reducing power occurs when sulfur burns. It is because such a sulfurous acid is oxidized into sulfuric acid to show a strong bleaching that returns coloring substance.

Particles of sulfur coat plants surface to form a strong acid film that prevents germ invasion, spoilage and vermin damage, which functions as a strong sterilizer.

Chemicals allowable for good preservatives at present have limit in usage and are allowed to be used partially in sterilization of beverages, vegetables, fruits, agricultural equipment, etc. However, the residual feature causes a problem, so a safety-assured substance is approximately required in whole products. Therefore, there have been lots of attempts to find out such a substance in nature. Natural antimicrobials include plant extract, particular protein, enzyme, organic acid, bacteriocin, etc, while natural antioxidants include citron, green tea extract, pyroligneous liquor, etc.

Grapefruit seed extract, a natural antimicrobial and antioxidant, contains enormous amount of natural ascorbic acid, naringin and tocopherol [3] to have an outstanding antibacterial and antioxidant [8].

Sporix, a polyphosphate belonging to acid, has pH 1.8~2.2 and prevents discoloration and growth of microorganism, so improve conservative property [4].

We tried to find effects of the eco-friendly pretreatment materials on browning and quality of semi-dried Persimmons Instead of sulfur fumigation.

II. MATERIALS AND METHOD

'Sangju-Dungsi', a cultivar of astringent persimmons, was harvested around the end of October at Sangju, and made into semi-dried persimmons. It was mechanically peeled and processed with sulfur fumigation, grapefruit extract and Sporix to be air-dried. Sulfur fumigation was made in such a way that persimmons soon after peeling were fumigated for 20 minutes with sulfur of 10 g per 1 at a sealed room.

Grapefruit extract contained the sugar content of 65 ~ 67°Bx and pH 2.6 ~ 3.6%. Sporix, a polyphosphate belonging to acid, was purchased from Seodo BNI Co Ltd, and its molecular formula is $(\text{NaPO}_3)_n$:n = 10 ~ 18. It is

generally used as a food additive and discoloring agent for juice, frozen desert, salted food, Kimchi, etc.

As a soluble solid contents of semi-dried persimmons flesh of 5 g was diluted 20 times with distilled water and mixed to make supernatant. The supernatant was measured by refractometer. Moisture content was measured by constant pressure heat drying method of 105 °C [7]. It was divided into grade 6 from 0 (no browning) ~ 1 (a little browning) ~ 5 (severe browning) for index of browning. Criteria of sensory evaluation included taste, color and preference and 15 evaluators conducted evaluations.

III. RESULTS AND DISCUSSION

Browning index of semi-dried persimmons

Browning index of non-fumigation treatment was 4.0. Its browning started from the 3rd day of drying and began to be more browning as drying period went by. Sulfur fumigation-treated group showed the browning index of 0.0 to have no browning during drying period. Grapefruit extract and 5% Sporix treated group was 0.5 ~ 0.6 to show a mere browning. Anti-browning effect of grape-fruit extract showed an outstanding antibacterial and antioxidant action against all kinds of food, prevented generation of toxic and spoiled substances to extend freshness of food and validity[5][10]. Also, the study revealed that Sporix had an effect to prevent discolorization of soda, to increase safety of tea polyphenol, and to remove or alleviate bitter and astringent taste of green tea.

Weight reduction rate of semi-dried persimmons

Weight reduction rate after 24 days' air-drying in the every process was more than 50%, 5% Sporix-treated group was about 60%, and other-treated group was 57 ~ 58%.

Moisture contents of semi-dried persimmon

The moisture content by Sporix after 24 days' drying was 44.9% shown the lowest degree, that by grapefruit extract was 55.8% shown the highest degree. The reduction of the moisture content was slow during drying day of 7 ~ 14. The reason that the moisture content treated with grapefruit extract was high is that the surfaces of semi-dried persimmons were soaked with viscosity-contained grapefruit extract and created a film that prevents moisture from evaporating[1][2].

Soluble solid contents of semi-dried persimmons

The soluble solid contents of non-fumigation group and grapefruit extract treated group was 38 and 39 °Bx, respectively while that of sulfur fumigation group and 5% Sporix group was 41 and 42 °Bx, respectively. It was reported that soluble sugar was concentrated by evaporation of moisture as drying period went by to increase soluble sugar [11]. This experiment showed the same phase with the said report and there was no big difference in soluble solid contents among treatments[6][9].

Sensory evaluation of semi-dried persimmons

As a result of evaluating taste, the taste of non-fumigation treated group was generally good, that of 5% Sporix-treated group was 3.4, that of grapefruit extract-treated group was 3.9, the highest degree. The surface color of semi-dried persimmons treated with non-fumigation was 1.0, the lowest degree while that of others treated group was generally excellent. Among them, the surface of grapefruit extract treated group showed a great red. From the viewpoint of general preference, sulfur fumigation treated group was 3.8, 5% Sporix treated group was 3.9, and grapefruit extract treated group was 4.2. Since taste and color were excellent with 5% Sporix and grapefruit extract treated group, they are recommendable for pretreatment materials when semi-dried persimmons are processed.

REFERENCES

- [1] W.W. Kang, J.K. Kim, S.R. Oh, J.H. Kim, J.H. Han, J.M. Yang, and J.W. Choi, "Manufacturing process of Sangju traditional dried persimmons Physical quality features", Vol. 33, 2004, pp. 386-391.
- [2] Y.R. Kim and S.H. Cho, "The effect of grapefruit seed extract on antibacterial and microorganism physiology", Agricultural Products, Storage and Distribution Society, Vol. 3, 1996, pp. 187-193.
- [3] Miele, W.H. Efficacy of grapefruit seed extract against Salmonella thphi, Escherichia coli and Staphylococcus aureus. Microbiological food analysis report reviewed and approved by Southern testing and reseach laboratories. Inc. Wilson, NC, U.S.A., 1988.
- [4] Moreira, R and W. Quintero, The grapefruit seed extract "DF-100" in dairy industries sanitization and its uses in cheeses and yogurts manufacturing processes. chemie Brasileira Industria Co., Research, 1987.
- [5] H.W. Park, H.S. Cha, S.H. Kim, H.R. Park, S.A. Lee, and Y.H. Kim. "Quality change of semi-dried persimmons according to grapefruit seed extract treatment and package method", Korea Food Storage & Distribution Society, Vol.13, 2006, pp. 168-173.
- [6] D.S. Son, S.B. Jeong, W.S. Lee, K.G. Lee, and Y.J. Kim, Collection and Cultivation Method Correctives of Appropriate-Quality Astringent Persimmons for Dried Persimmons, Study report of Horticultural Experiment Station, 1990.
- [7] C. J. Alexopoulos and C. W. Mims, Introductory Mycology, 1972, pp.632-634.
- [8] H.C. Lee. Storage effect of grapefruit seed extract-used agricultural products, Master' thesis of Graduate School of Gyeongsang University, 1992, pp.9-10.
- [9] S.H. Cho, I.S. Ju, I.W. Seo, and J.W. Kim, "Storage Effect of Grapefruit Seed Extract treated on Fish Cake", Kor. J. Food. Hygiene, Vol.7, 1991, pp. 99-106.
- [10] S.H. Cho, S.I. Won, J.D. Choi, and I.S. Ju, "Antibacterial and Antioxidant Effect of Grapefruit Seed Extract on Fisheries", Korea Fishery Society, Vol. 23(4), 1990, pp. 289-296.
- [11] S.H. Cho, G.O. Kim, and G.H. Lee, "Study on Freshness Maintenance and Disease Prevention of Fruit and Vegetables by Natural Antimicrobial Treatment - based on Separation of Active Materials from Grapefruit Seed Extract.", Agricultural Products Storage & Distribution Society, Vol. 1(1), 1994, pp. 1-7.



Fig 1. Semi-dried persimmons

Table 1. Browning Index of Semi-dried Persimmons

Days of drying \ Treatment	Days of drying				
	0	5	10	17	24
Sulfur fumigation	0.0	0.0	0.0	0.0	0.0
Grapefruit extract	0.0	0.1	0.2	0.4	0.5
5% Sporix	0.0	0.2	0.3	0.5	0.6
Non-fumigation	0.0	1.0	1.5	3.0	4.0

Browning index: 0 (No browning) - 1 (A little browning) - 5 (Severe browning)

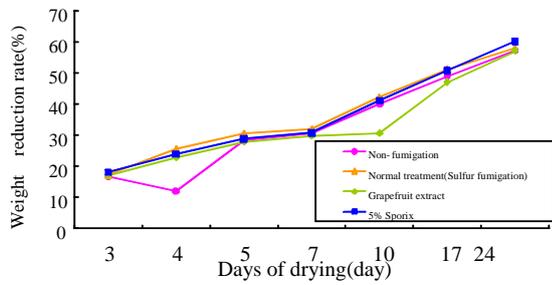


Fig 2. Weight reduction rate of semi-dried persimmons.

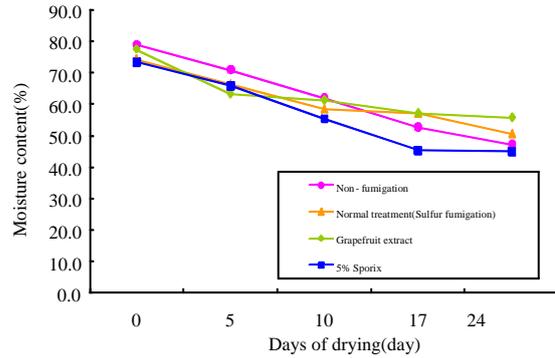


Fig 3. Moisture contents of semi-dried persimmons.

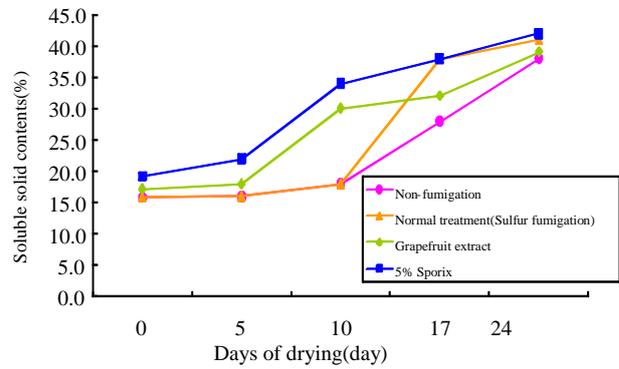


Fig 4. Soluble solid contents of semi-dried persimmons.

Table 2. The sensory evaluation of semi-dried persimmons.

Treatment	Taste	Color	Preference
Non-fumigation	3.0	1.0	1.9
Sulfur fumigation	2.2	4.1	3.8
Grapefruit extract	3.9	4.4	4.2
5% Sporix	3.4	3.6	3.9