A Study of Preservative Effects of Sesame Oil (*Sesamum indicum* L.) On Mashed Potatoes

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Abstract

*Sesame (*Sesamum indicum *L.) seed and oil have long been used widely as healthy foods to supply energy and prevent aging. Some of the main active anti-oxidative constituents in sesame seeds are γ-tocopherol and phenols. The purpose of this study was to investigate the biopreservative efficiencies of different levels of sesame seed oil on mashed potatoes .Different levels sesame seed oil were added individually or in combinations to mashed potatoes, which was acidified to pH 4.5, before storage at 25°C. Addition of 100ppm, 200 ppm, and 400ppm sesame oils, we discovered that 400ppm sesame seed oil increased the shelf life of mashed potatoes to 49 days, while it was 15 days for the control mashed potatoes without preservatives incubated at room temperature and observed for over two weeks. The results showed that sesame seed oil was more efficient in preserving stored potatoes paste than sodium benzoate .The sesame oil was of good preservatives as microbial growths were observed after 7 weeks of incubative preservation. The result of this study showed that sesame seed oil was clearly superior within the trial duration. Organisms found associated with the spoilage of the stored potatoes paste included fungi such as Aspergillums flavus, A. fumigates, A. Niger and Fusariumspp and bacteria such as Bacillus coagulant.*

Keywords
Biopreservatives*, Sesamum indicum* L., antimicrobial, sesame oil, mashed potatoes, fungi, bacteria, spoilage, organism.

Introduction

For many centuries, ancient communities throughout Europe and Asia used the oil of ground sesame seeds for therapeutic purposes [1] Recently published research studies support the promising health benefits of sesame oil which include; antioxidants to neutralize cell damaging free radicals as well as vitamin E to promote healthy skin [2]. Sesame seeds are used in various food items as a flavoring ingredient. They are also known for their nutritional values, as well as therapeutic properties [3] .There is a number of health benefits of sesame seeds, which can be enjoyed by making them a part of your daily diet. They possess a plethora of nutrients that are extremely beneficial for overall human health [4].Sesame oil comes from sesame seeds – no surprise there. But the composition of the oil depends on what kind of sesame seeds. There are black seeds, yellow seeds, and brown seeds. But in general, sesame oil consists of about 80% oleic and linoleic acids. A lot of other vegetable oils are also rich in these two unsaturated fatty acids but sesame oil is unique because it contains approximately equal proportions of the two [5].Compared to other vegetable oils sesame oil is relatively high in compounds such as sterols, triterpenes, tocopherols, and sesame lignans. Lignans which are complex molecules made of polyphenols. At least one of these lignans, called sesamol, is a powerful antioxidant [6]. However, even though sesamol is found in sesame seeds only trace amounts are found in sesame oil. The

concentration of sesamol also depends on how the seeds have roasted whether or not they were bleached, processed, deodorized, etc. [7].Sesame seed (Sesamum indicum L.) is an oilseed with a chemical composition of about 50-52% oil, 17-19% protein and 16-18% carbohydrate [8]. The hull contains large quantities of oxalic acid, crude fiber, calcium and other minerals. When the seed is properly defueled, the oxalic acid content is reduced from about 3 % to less than 0.25 % of the seed weight [9]. Sesame seed contains antioxidants which inhibit the development of rancidity in the oil. In the food industry, where synthetic antioxidants are used extensively, there is an increasing demand for more of these natural products [10).The nutritional benefits derived from sesame seeds are based on the variety being utilized, so using it as preservatives is the target of our study.

Materials and Methods

The experiment was conducted in the laboratories of basic science, at applied science university during June–October 2015 .Fresh Jordanian potatoes were boiled and mashed .Fresh Sesame Oil were obtained from local Jordan Sesame Oil Manufacturers .Different levels of sesame oil were used as preservatives as per following treatments:-

T_1= 0.10 g mashed potatoes with 0 ppm sesame oil
T_2= 0.10 g mashed potatoes with 100 ppm sesame oil
T_3= 0.10 g mashed potatoes with 200 ppm sesame oil
T_4= 0.10 g mashed potatoes with 400ppm sesame oil
T_5= 0.10 g mashed potatoes with 400ppm sodium benzoate.

Estimation of moisture and carbohydrate

The percent of moisture in the sample was estimated by the standard procedure as recommended by (Tarioul, 2007) [11] .Physicochemical analyses (pH, quality characteristics) of samples were examined by using ISI methods [12] .Sensory evaluation of samples. Samples were examined by the method described by Govindarajan et al., [13] for their quality Parameters like color, aroma, taste, texture and overall acceptability. For statistical analysis of sensory data, a 1-9 point hedonic scale was used to assess the degree of acceptability of samples. The highest score is 9 ‘like extremely 'and ‘dislike extremely’ is the lowest score of 1. The data were analyzed for ANOVA in completely randomized design (CRD) under computerized statistical methods of M-stat and least significant difference (LSD) was used to compare the means. The results were evaluated by Analysis of variance and Duncan's New Multiple Range Test procedures of the Statistical Analysis System [14].

Microbial test MIC of samples

Aspergillums flavus, A. fumigates, A. Niger and Fusarium spp and bacteria such as Bacillus coagulant, were cultured in 0.08-1.0% (weight/volume) diluted in broth. Four types of polymicrobial cultures were prepared by culturing the isolates with each other in broth (control) and broth containing various concentrations of sesame oil Microbial growth was as observed on solid plate media after 24 h incubation.

Results and Discussion

Table1 revealed that the moisture content of sample packed in polyethylene bags slightly decreased in T_1, T_2, T_3, T_4 and T_5 for the first two months of storage and it was 11.20%, 11.30%, 11.25%, 11.15% and 11.27% respectively. After the next two months, it was slightly increased in all treatments. This may be due to variation in atmospheric relative humidity that ranged from 42 to 65% during first two months and 55-85% during next two months of storage period. The initial carbohydrate content in T_1, T_2, T_3, T_4 and T_5 was

observed 35.20, 35.15, 35.27, 35.22 and 35.29 % respectively, after the next two months, it was observed 35.17, 35.16, 35.19, 35.15 and 35.10% respectively. There was very little changed in carbohydrate content during four months of storage at room temperature. Initially the pH was found 4.5, 4.5, 4.6, 4.7 and 4.7 in T_1, T_2, T_3, T_4 and T_5 respectively. The pH of the sample was gradually increased in all treatments during storage periods. From the Table 2, it was observed that all the treatments were free from insect and microbial infestation up to two months of storage. After four months of storage T1 (aspergillums) and T_5 (bacteria) were infested by micro organism. The other treatments were free from insect and microbial infestation up to four months of storage (Table 2).

Table 1. Physical and Chemical Parameter of Sesame oil -Potatoes Samples during Storage.

Treatments	Moisture (%)			Carbohydrate (%)			pH		
	0m	2m	4m	0m	2m	4m	0m	2m	4m
T_1	11.30	11.20	11.37	35.2	35.17	35.16	4.5	4.7	4.9
T_2	11.35	11.30	11.40	35.15	35.16	35.15	4.5	4.8	4.9
T_3	11.32	11.25	11.39	35.27	35.19	23.18	4.6	4.9	5.0
T_4	11.27	11.15	11.35	35.22	35.15	23.14	4.7	4.9	5.2
T_5	11.35	11.27	11.39	35.29	35.10	23.10	4.7	4.9	5.0

Note: m=Month

Table 2. Microbial Infestation of Stored Potatoes.

	Storage period (month)		
Treatments	0m	2m	4m
T_1	-	+a	+a and +b
T_2	-	-	-
T_3	-	-	-
T_4	-	-	-
T_5	-	-	+a and +b

Note: a = aspergillums, b = bacteria
(+ Prese nt, a nd –absence)

Quality characteristics and sensory evaluation of potatoes samples

Sesame oil samples were evaluated for quality parameters such as visual colour, texture and odor by panel Presented in Table 3. Mixed samples with 400ppm sodium benzoate was performed yellowish colour with crispy and dissolving texture and good appetizing and rest of them developed off flavour. The effect of sesame oil on sensory test parameter for stored potatoes revealed that it had a positive effect (Table 3). From the visual observation of potatoes, it was found that addition of sesame oil improving the colour of the samples.

Data present in Table 4 revealed that the T3 (8.25) had the higher score for overall acceptability considering colour, flavour, texture and taste followed by T4 (7.32) and T2 (7.23).

Table 3. Quality characteristics of potatoes samples

Treatments	Colour	Texture	Odor
T_1	Light brown	Hard and brittle	off flavour
T_2	Straw yellow	Hard and brittle	Appetizing
T_3	Yellowish	Crisp and dissolving	Appetizing
T_4	Deep brown	Hard and brittle	Slight off flavour
T_5	Deep brown	Brittle and dissolving	Slight off flavour

Table 4. Sensory evaluation of potatoes samples after four months of storage

Treatments	Colour	Flavour	Texture	Taste	overall acceptability
T_1	5.63_c	6.77_c	7.22_a	7.22_b	6.81_c
T_2	6.68_b	7.25_b	7.20_a	7.12_c	7.02_b
T_3	7.69_a	8.35_a	7.58_a	8.59_a	8.25_a
T_4	7.29_a	7.35_b	7.33_a	7.26_b	7.32_b
T_5	6.02_a	6.33_b	7.20_a	7.22_b	6.83_b

a=Profile Attribute Analysis [15]
b=Texture Profile Method[16]
c =Revised Math Attitude Scale[17]

Conclusion

Civilization has brought a lot of changes with respect to how food items can be stored or preserved, since sesame oil is a natural antibacterial agent So it's probably more accurate to say that sesame oil has the potential to be antibacterial but I couldn't find any other information confirming the efficiency of the oil itself. In conclusion, sesame oil prevents the growth of the microorganisms in single and mixed microbial cultures, it may be stated that the addition of sodium benzoate (400ppm) with equally mixed sesame oil sample, was not effective as sesame oil of acceptable quality for 4 months of storage at room temperature. No micro organism was grown in stored sesame-potatoes samples. It was fully safety to consumer. As multifunctional bioactivity ingredients, sesame oil can be used as antiioxidative, antibacterial agent and coating.

Acknowledgements

The author acknowledges Applied Science Private University, Amman, Jordan, for the fully financial support granted of this research article. Sincere thanks to all my colleagues at basic science department, for creating inspiring conditions for work.

References

1. Fukuda Y, Nagata M, Osawa T, Namiki M. Chemical aspects of the antioxidative activity of roasted sesame seed oil and the effect of using the oil for frying. Agri. Biol. Chem. 1986;50:857–862.

2. Lyon CK. Sesame: current knowledge of composition and use. J. Am. Oil. Chem. Soc. 1972;49:245–249.

3. Mohamed HMA, Awatif II. The use of sesame oil unsaponifiable matter as natural antioxidant. Food Chem. 1998;62:269–276.

4. Aruoma OI. Free radicals, oxidative stress and antioxidants in human health and disease. J. Am. Oil. Chem. Soc. 1988;75:199–212.

5. Jinyoung L, Yoosung L, Eunok C. Effects of sesamol, sesamin, and sesamolin extracted from roasted sesame oil on the thermal oxidation of methyl linoleate. Food Sci. Technol. 2008;41:1871–1875.

6. Labuza TD. Kinetics of lipid oxidation in foods. Crit. Rev. Food Technol. 1971;7:355–395.

7. Ito N, Fukushima S, Tsuda H. Carcinogenicity and modification of the carcinogenic response by BHA, BHT and other antioxidants. CRC Crit. Rev. Toxicol. 1985;5:109–150

8. T. Y. Tunde-Akintunde, B. O. Akintunde Some Physical Properties of Sesame Seed Biosystems Engineering - BIOSYST ENG , vol. 88, no. 1, pp. 127-129, 2004

9. Akinoso, R, Aboaba, S A & Olayanju, T.M.A. (2010) Effects of Moisture Content and Heat Treatment on Peroxide Value and Oxidative Stability of Un-Refined Sesame Oil. AJFAND 10 (10): 4268- 42850

10- Kim HW. Studies on the antioxidant compounds of sesame oil with roasting temperature. Food Sci. 2000;32:246–251.

11. T.Islami Standardization of Bread Preparation from Soy Flour. Int. J. Sustain. Crop Prod. 2(6):15-20 . 2007

12 .Barnett,H.L. and Hunter, B.B. (1972). Illustrated genera of imperfect fungi . 3rd edition, Burgess Publishing Co. , 273 pp.

13. Govindarajan R, Vijayakumar M, Pushpangadan P (2005). Antioxidantapproach to disease menagement and the role of 'Rasayana' herbs of Ayurveda. ***J. Ethnopharmacol***. 99:165–178

14. Richard A. Lawrence A pocket calculator program for Duncan's New Multiple Range Test and analysis of variance Computers in Biology and Medicine Volume 14, Issue 3, 1984, Pages 357–362

[15].L. Averette et al. Descriptive flavor analysis of bacon Journal: Food Quality and Preference -vol. 21, no. 1, pp. 44-55, 2010.

[16] A. Drewnowski .Individual differences in sensory preferences for fat in model sweet dairy products Acta Psychologica 84, 103-110, 1993.

[17]Stone et al. Factors influencing mathematical competencies. Community Junior College Research Quarterly Volume 5, Issue 1, 1980