OPEN ACCESS Freely available online

Journal of
Agricultural Science and Food Research

Research Article

Characterization of Nutritional and Bioactive Compounds in Ajwa in Comparison to other Five Varieties of Palm Dates

Sana Gulzar Bhatti*, Anum Gulzar Bhatti

Department of Biotechnology, Forman Christian College, Lahore, Pakistan

ABSTRACT

The present study provides concrete information about the nutritive value of six different varieties of Palm dates including; Ajwa, Busra, Rabi, Mazafati, Irani and Shareefa. Proximate analysis was a prime method to calculate each type of nutrient present in all varieties. Evaluation of different antioxidants, and phytochemicals were performed to check the efficacy of different varieties of Palm Dates. It has been experimentally proven that Ajwa is not of prime importance than the rest of the varieties. A result clearly defines the efficacy of all varieties not only of Ajwa and it is scientifically proven the ingestion of other varieties. The total moisture content in date varieties were range from 7-15 %. The total ash content in date varieties were range from 1-3 %. The total Protein content in date varieties were range from 1-3 %. The total fat in date varieties were range from 1-6 %. The total fiber content in date varieties were range from 14-70 %. Moreover, the total Carbohydrates in date varieties were range from 12-34 %. Mazafati, Shareefa and Busra contain more fiber as compare to Ajwa that promotes good digestion. It also helpful for diabetic patients for not instant supply of sugars by delaying digestion due to high fiber content. Palm Dates promotes good health and provide with large number of nutrients, antioxidants, minerals and phytochemicals. Irani contain more phenolic (16.6 g/100 g) as compare to the rest the Palm dates. Total phenolic content ranges from 10-17 g as per 100 g of fruit. Busra shows more tannin (11.75 %) and DPPH inhibition index (54.20 %) so it is better for immune system to protect from cancer and maintain good body heath. Antioxidant activity in palm dates ranges from 1-55 % while tannins content ranges from 0-12 %.

Keywords: Ajwa; Antioxidants; Phytochemicals; Proximate analysis; Date flesh; Dates pit

INTRODUCTION

Palm Date, a food snack, frequently used in Asia, one of the oldest cultivated humanity's plants [1]. In Arab regions, Palm dates used as staple food because of it constitutes an important part of human diet, providing a high proportion of Carbohydrates, Proteins, Dietary fiber, and fat, antioxidants and phenolic [2]. Dietary fiber plays an important role in human health. Low amount of dietary fiber in diet can cause severe health problems such as constipation, cancer and may lower cholesterol contents in human body. Based on published reports Ajwa date flesh and pits are enriched source of total dietary fiber (TDF), soluble dietary fiber (SDF) and insoluble dietary fiber (IDF) [3]. While Dietary minerals are essential chemicals that are required for maintaining skeleton structure, cellular functioning and biochemical reactions within human body. Therefore, a certain amount of these minerals (in milligrams) is essential for the optimum growth and maintenance of human body. In this regards Ajwa date fruit (both flesh and pits) are considered as the richest source of dietary minerals among all other date varieties [1,3]. Dates (phoenix Dactylifera) also play a protective role against many diseases includes; diabetes, obesity, cardiovascular diseases [4]. Palm date flesh and particularly pits contain many bioactive compounds that help in the prevention of many serious diseases like cancer. The Ajwa seed oil is of superior quality in comparison to other date varieties like Barni and can be used as vehicle for transversal enhancer in pharmaceutical industry [5].

Ajwa dates are very effective for the lactating women, because they assist in enriching breast milk with many effective nutrients. Furthermore, several studies have shown that kids of mothers who eat Ajwa dates regularly are less susceptible to diseases and infections [6]. The other advantage of consuming Ajwa dates is that they comprise of high iron content. Iron is a vital component in the red blood cell production and they may also assist to treat and prevent anemia [7].

Correspondence to: Sana Gulzar Bhatti, Department of Biotechnology, Forman Christian College, Lahore, Pakistan, Tel: +03241497394; E-mail: sanagulzarbhatti@gmail.com

Received: December 04, 2018, **Accepted:** December 15, 2018, **Published:** January 05, 2019

Citation: Bhatti SG, Bhatti AG. Characterization of Nutritional and Bioactive Compounds in Ajwa in Comparison to other Five Varieties of Palm Dates. J Agri Sci Food Res. 2019;10:253. doi: 10.35248/2593-9173.19.10.253

Ajwa dates are high in nutritional composition then the rest of the date varieties. Both flesh and pits are rich in bioactive compounds that aid to promote human health and lead to eradicate and treat different diseases [6]. Ajwa flesh and pits are enriched with certain phenolic and flavonoids, which have diverse effects on human health because to their strong antioxidant properties. Ajwa dates have strong antioxidant, anti-inflammatory, anti-mutagenic, a hepato-protective, nephroprotective and anti-cancer activity that promote good immune system of human body [8]. Quantities of such phenolic and antioxidant compounds may vary in different Ajwa fruit parts depending on their genetic makeup, experimental conditions for the analysis and extent of hydration [9,10]. The antidiabetic activity in Ajwa extracts might be due to saponins, phenol, steroids and flavonoids, which play a major role in stopping diabetes because phytochemicals have ability to control the functions of pancreatic tissues by enhancing the production of insulin and may reduce the absorption of glucose in the intestinal wall [11]. Ajwa date strongly contributes towards anti-inflammatory and antioxidant properties. The Ajwa date contains a significant amount of anthocyanidins and mostly is present in kimri stage [12-14]. The Ajwa date also contain few important organic acids such as; succinic acid, oxalic acid, malic acid, citric acid, isobutyric acid and formic acid. These acids may improve the functionality of Ajwa dates [15]. Antioxidant and antimutagenic activity in date fruit is quite potent and implicates the presence of compounds with potent free-radical-scavenging activity [16]. Dates also contain small amounts of vitamins C, B_1 thiamine, B_2 riboflavin and nicotinic acid [17]. Date flesh was found rich in mineral content, like; sodium, Potassium, Zinc and Calcium [1]. On other hand, The Ajwa date plays a significant effect in the treatment of bacterial diseases. It has been reported that the methanol and acetone extracts of the Ajwa dates pits reasonably inhibited the growth of Gram positive as well as Gram negative bacteria [18]. Ajwa dates inhibit the activity of Escherichia coli and Klebsiella pneumonia. It also inhibits the reducing effect of methylprednisolone [18]. Methanolic extract of Ajwa dates are also effective against enteric diseases, since it suppresses the activity of Enterococcus fecalis [18]. It has been also reported that the methanolic extract of Ajwa date is effective against Escherichia coli, Bacillus cereus, Staphylococcus aureus and Serratia marcescens [19].

The data analysis from the past few decades suggests that ajwa date fruit has a potential to become an essential food ingredient for the developing new bioactive functional food products targeted at various physiological functions of the human body. It will provide an opportunity for the food companies to develop radically innovative functional food products. This will further enable the food companies to compete in the global health and wellness market by introducing these bioactive functional food products. The aim of study is to compare the six varieties and check their nutritional composition, antioxidant, phenolic and Tannin content. Palm dates like Mazafati, Busra, Irani, Rabi, and Shareefa is not characterized before so it is important to compare those and report them in comparison to Ajwa normally known as of prime importance.

Objectives

1. To evaluate nutritive value for each variety of Date.
2. Evaluation of different Antioxidants of each type of Date.
3. Evaluation of different Phytochemicals of each type of Date.
4. Comparison of Six Varieties of Palm Date.

MATERIAL AND METHODS

Whole research work has conducted in the Pakistan Council of Scientific and Industrial Research Complex.

Sample Collection

Different varieties of Dates were purchased from local market. Name of varieties were Ajwa, Busra, Rabi, Mazafati, Irani and Shareefa.

Proximate analysis

Proximate analysis is a technique use for determination of a group of closely related components together. It conventionally includes determinations of the amount of water, protein, fat (ether extract), ash and fiber being estimated by subtracting the sum of these five percentages from 100. Proximate analysis of six Date varieties (Ajwa, Mazafati, Irani, Rabi, Busra and Shareefa) was carried out by AVOC [20].

Determination of Tannins

Tannins (commonly referred to as tannic acid) are water-soluble polyphenols that are present in many plant foods. Tannins are responsible for decreases in feed intake, growth rate, feed efficiency, net metabolizable energy, and protein digestibility. Tannins content was determined by the AVOC [21]. About 1 gram of sample taken and with 100 ml of distilled water and air condensed for 30 minutes and after complete cooling it was filtered and volume rose up to 100 ml with distilled water. Standard solution of different ratios of tannins along with folin reagent and solution of sodium carbonates were prepared for standard curve. 0.1 ml of sample was dissolved in 0.5 ml folin reagent along with 1 ml of sodium carbonate solution. Then it was again filtered and observed via UV visible spectrophotometer. Readings were taken with respect to blank and standard curve was plotted. In addition, concentration in milligrams was calculated and formulated.

Determination of phenolic

Phenolic often referred to as phenols or polyphenols, causes red color of red wine. It is an organic compound released by different plants and animals as a part of their defense mechanisms with a central cyclic benzene ring and a varying number of hydroxyl groups as substituents. Total Phenolic cintent (TPC) was determined by Ciocalteu assay using gallic acid as standard. 0.1 ml of extract of sample was dissolved in 1.5 ml of three time diluted folin reagent and 3.7 ml of 20% solution of Sodium Carbonate [21,22]. After the devolvement of color, volume was making up to 25 ml and then it was filtered. Moreover, samples were observed via UV Visible Spectrophotometer. Reading was taken with respect to blank and standard curve was plotted.

DPPH free Radical scavenging activity

A method used to determine the antioxidant capacity is to utilize the stable 2, 2-diphenyl-1-picrylhydrazyl (DPPH) radical which use to decolorize when it combines with the hydrogen from a free radical scavenging antioxidant. Antioxidant screening was done by DPPH method [24]. 0.004 g of DPPH (2, 2-Diphenyl-1-picrylhydrazyl) was dissolved in 100 ml of Ethanol and shake well till solubility and then this solution was added to different concentrations of samples as 0.1, 0.3, 0.5 ml sample with 3 ml of

Table 1: Nutritional composition of six Palm Date varieties.

Proximate Analysis	Ajwa	Mazafati	Irani	Rabi	Busra	Shareefa
Moisture% age	9.45%	9.90%	7.35%	7.17%	14.30%	10.40%
Ash% age	1.71%	1.38%	2.09%	1.92%	1.78%	1.61%
Protein% age	1.85%	2.86%	2.07%	Not detected	Not detected	Not detected
Fat% age	2.47%	2.95%	5.43%	3.17%	1.67%	2.57%
Fiber% age	51.40%	55.70%	67%	14.20%	69.90%	60.10%
Carbohydrate% age	33.12%	27.21%	16.06%	73.54%	12.35%	25.32%

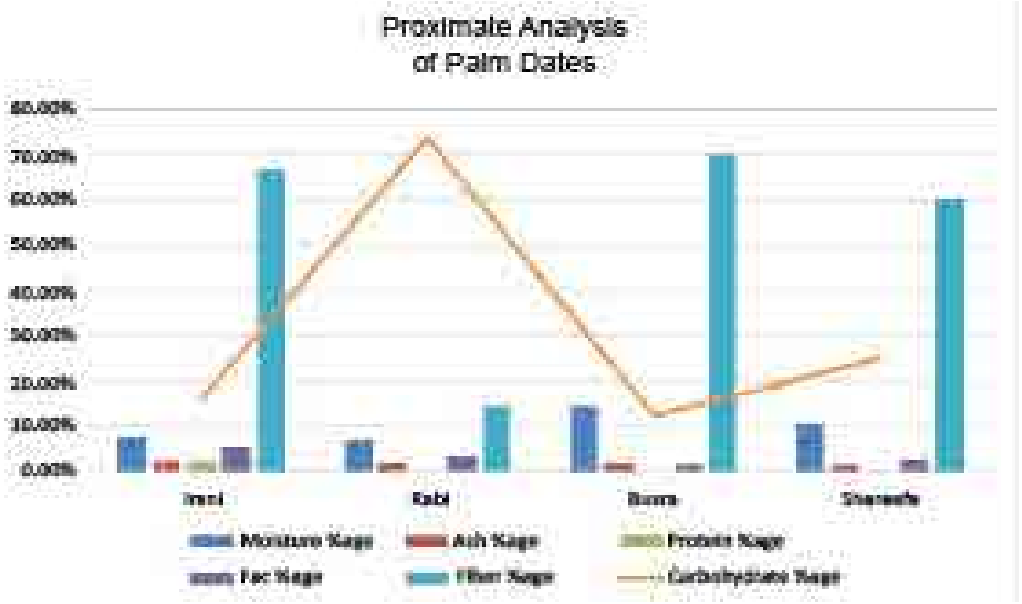

Figure 1: Graphical representation of Nutritional composition of six Palm Date varieties.

Table 2: Proportion of milligrams and % age Tannins in Palm Dates.

Variety of Palm Date	mg / 1 gram	mg/100 g	% age of tannins
Ajwa	5	500	0.005
Mazafati	5	500	0.005
Irani	0.25	25	0.0025
Rabi	0.25	25	0.0025
Busra	117	1.17	0.1175
Shareefa	5	500	0.005

solution and color discharging was observed. This solution was observed under UV visible spectrophotometer with reference to blank and the calculation were made accordingly.

RESULTS AND DISCUSSIONS

Proximate Analysis

Proximate analysis of samples was carried out by determining moisture, ash, protein, fat, fiber and carbohydrate content. The samples were analyzed by the procedure of AVOC [20]. All the determinations were carried out in triplicate (Figure 1). The following results were obtained. The above table 1 is showing the average composition of different varieties of palm dates. Proximate analysis of the Palm date varieties were like Ajwa has 9.45% Moisture, 1.71% Ash, 1.85% Protein, 2.47 % Fat, 51.4% Fiber and 33.12% Carbohydrates. While, Mazafati has 9.9% Moisture, 1.38% Ash, 2.86% Protein, 2.95% Fat, 55.7% Fiber and 27.21% Carbohydrates. Irani has 7.35% Moisture, 2.09% Ash, 2.07% Protein, 5.43% Fat, 67% Fiber and 16.06% Carbohydrates. Rabi has 7.17% Moisture, 1.92% Ash, 3.17 % Fat, 14.2% Fiber and 73.54% Carbohydrates. Busra contain 14.3 % Moisture, 1.78 % Ash, 1.67 % Fat, 69.9% Fiber and 12.35% Carbohydrates. Shareefa has 10.4% Moisture, 1.61% Ash, 2.57% Fat, 60.1% Fiber and 25.32% Carbohydrates. Indeed, protein was not detected in Rabi, Busra and Shareefa. The total moisture content in date varieties were range from 7-15%. The total ash content in date varieties were range from 1-3%. The total Protein content in date varieties were range from 1-3%. The total fat in date varieties were range from 1-6%. The total fiber content in date varieties were range from 14-70%. Moreover, the total Carbohydrates in date varieties were range from 12-34%. Fiber is one of the most important factors that aids to health of digestive system and Busra leads in fiber content.

Determination of Tannins

Standard curve for the standard solution of tannins was plotted. Curve shows that the increase concentration of tannins increases the absorption of wavelength in UV visible spectrophotometer (Table 2). Tannins are molecules useful for the human health because of their antioxidant properties. They have the capacity to protect the tissues from the action of free radicals due to the cellular aging processes. Tannins range in Ajwa, Mazafati and Shareefa was about 0.50%, while Irani and Rabi contain 0.25 % of Tannins. On other hand Busra has the maximum range of tannins that was 11.75 %. Tannins have anti-cancer properties, being able, under certain conditions, to inhibit the growth of cancer cells. So this study proves that Busra is more efficient in this arena (Figure 2).

Figure 2: Graphical Representation of Tannins in Palm Dates.

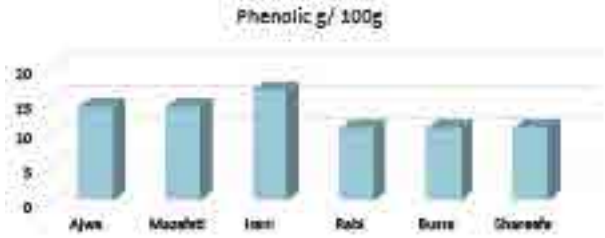

Figure 3: Graphical Representation of Phenolic in Palm Dates.

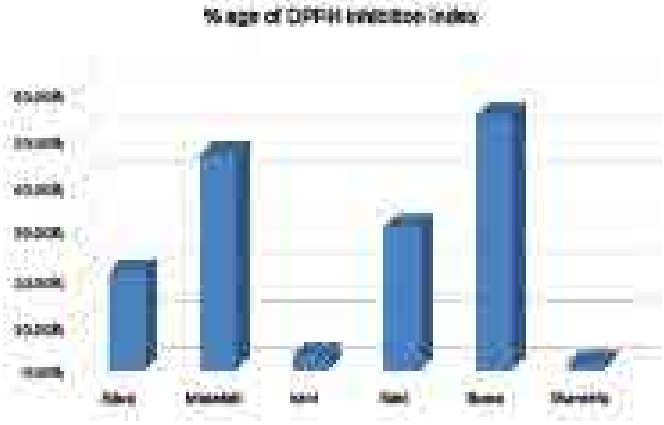

Figure 4: Graphical representation of % age of DPPH inhibition index of palm dates.

Table 3: Proportion of milligrams of Phenolic in Palm Dates.

Varieties	mg / 25 ml	mg /1 g	g / 100 g
Ajwa	0.141	141	14.1
Mazafati	141	141	14.1
Irani	0.1066	16600	16.6
Rabi	0.108	10800	10.8
Busra	0.108	10800	10.8
Shareefa	0.109	10900	10.9

Determination of Phenolic

For the determination of phenolic standard curve of Gallic acid was made to evaluate the concentration of Palm date varieties in the quantitate form. Standard curve used to standardize the values of samples. Phenolic content was calculated by plotting graph.

The reading were taken via UV visible Spectrophotometer and evaluated by plotting on graph of gallic acid and following concentrations were obtained. Calculation was made to estimate the milligram and grams value of palm date varieties as per gram and 100 grams (Table 3).

Table 4: % age of DPPH inhibition index of palm dates.

Variety of Palm Date	% age of DPPH inhibition Index
Ajwa	20.79%
Mazafati	45.90%
Irani	2.76%
Rabi	30.40%
Busra	54.20%
Shareefa	1.14%

DPPH free Radical scavenging activity

Antioxidant screening was done by DPPH method [24]. DPPH inhibition index was calculated for each type of Palm date. Free radicals are produced in the body as byproducts of normal metabolism and whenever it exposes to radiation and some environmental pollutants. As they are highly reactive, that they can damage cellular components and are implicated in a variety of diseases. Free radicals normally neutralized by efficient systems in the human body that include the antioxidant enzymes (superoxide dismutase, catalase, and glutathione peroxidase) and the nutrient-derived antioxidant small molecules (vitamin E, vitamin C, carotenes, flavonoids, glutathione, uric acid, and taurine). Antioxidants are known to neutralize the harmful effect of free radicals and other reactive chemical species that are constantly generated by human body and are thought to promote better health. Antioxidant acts as a radical scavenger, hydrogen donor, electron donor, peroxide decomposer synergist, and metal chelating agents. Antioxidants are effective as they are willing to give up their own electrons to free radicals (Table 4).

CONCLUSION

The current study concludes that Ajwa do not have more nutritive value than the rest of the date varieties and the quantity of antioxidants, phytochemicals are not in high proportion as compared to other varieties of date including; Busra, Rabi, Mazafati, Irani and Shareefa. Busra is the one that proves with more bioactive compounds that benefits human health.

ACKNOWLEDGEMENTS

We are thankful to Pakistan council of Scientific and Industrial Research complex (PCSIR) for their courtesy of providing laboratory facility to operate research methodology. Miss Saima Nazir, Miss Ammara Yasmeen, Mrs. Shumila Usman, Miss Mafia, Miss Shamma Firdous, Anum Gulzar Bhatti and respective Lab attendents, assisted research work.

REFERENCES

1. Khalid S, Ahmad A, Masud T, Asad MJ, Sandhu M. Nutritional Assessment of Ajwa Dates flesh and pits in comparison to local varieties. J Animal Plant Sci. 2016;26:1072-1080.
2. Al-Farsi MA.,Alssalvar C, Al-Abid M, Al-Shoaily M, Al Army. Compositional and functional characteristic of dates syrups and their by-products Food Chem. 2007; 104: 943-947.
3. Assirey EAR. Nutritional composition of fruit of 10 date palm (*Phoenix dactylifera* L.) cultivars grown in Saudi Arabia. J Taibah Univ Sci. 2015; 9:75-79.

4. Vayalil PK. Date fruits (*Phoenix DactyliferaLinn*): An emerging medicinal food. Crit Rev Food Sci Nutr. 2011;52:249-271.

5. Galeb HA, Salimon J, Eid EE, Nacer M, Saari N. The impact single and double hydrogen bonds on crystallization and melting of regimes of Ajwa and Barni lipids. Food Res Int. 2012; 48: 657-666.

6. Al-Farsi MA, Lee CY. Nutritional and functional properties of dates; a review. Crit Rev Food Sci Nutr. 2008;48:877-887.

7. Hasan NS, Amom ZH, Nor AI, Mokhtarrudin N, Esa NM. Nutritional composition and *in vitro* evaluation of the antioxidant properties of various dates extracts (*Phoenix dactylifera L.*) from Libya. Asian J Clin Nutr. 2010;2:208-214.

8. Sumaira K, Nauman K, Rao SK, Haroon A, Asif A. A review on chemistry and pharmacology of Ajwa date fruit and pit. Trends Food Sci Tech. 2017;63:60-69.

9. Al-Laith AA. Degradation kinetics of the antioxidant activity in date palm (*Phoenix dactylifera L.*) fruit as affected by maturity stages. Arab Gulf J Sci Res. 2009;27:16-25.

10. Al-Turki S, Shahba MA, Stushnoff C. Diversity of antioxidant properties and phenolic content of date palm (*Phoenix dactylifera* L.) fruits as affected by cultivar and location. J Food Agri Environ. 2010; 8: 253-260.

11. Hussain MT, Qadir MI, Ali M, Ahmad B, Khan YH. Ajwa date (*Phoenix dactylifera*): An emerging plant in pharmacological research. Pak J Pharm Sci. 2014;27:607-616.

12. Eid NM, Al-Awadi B, Vauzour D, Oruna-Concha MJ, Spencer JP. Effect of cultivar type and ripening on the polyphenol content of date palm fruit. J Agri Food Chem. 2013;61:2453-2460.

13. Eid N, Enani S, Walton G, Corona G, Costabile A. The impact of date palm fruits and their component polyphenols on gut microbial ecology bacterial metabolites and colon cancer cell proliferation. J Nutri Sci. 2014;3: 46.

14. Eid N, Osmanova H, Natchez C, Walton G, Costabile A. Impact of palm date consumption on microbiota growth and large intestinal health: A randomised controlled cross-over human intervention study. Br J Nutri. 2015;114:1226-1236.

15. Hamad I, Abd-Elgawad H, Al-Jaouni S, Zinta G, Asard H. Metabolic analysis of various date palm fruit (*Phoenix dactylifera L.*) cultivars from Saudi Arabia to assess their nutritional quality. Mol. 2015; 20:13620-13641.

16. Vayalil PK . Antioxidant and antimutagenic properties of aqueous extract of date fruit (*Phoenix dactylifera L. Arecaceae*). J Agric Food Chem. 2002; 50:610-617.

17. Samarawira I. Date palm. potentialsource for refined sugar. Econ. Bot. 1983; 37:181-186.

18. Aamir J, Kumari A, Khan MN, Medam SK. Evaluation of the combinational antimicrobial effect of Annona Squamosa and Phoenix Dactylifera seeds methanolic extract on standard microbial strains. Int Res J Biol Sci. 2013;2:68-73.

19. Samad M, Hashim SH, Simarani K, Yaacob JS. Antibacterial properties and effects of fruit chilling and extract storage on antioxidant activity. total phenolic and anthocyanin content of four Date Palm (*Phoenix dactylifera*) Cultivars. Mol. 2016;21:419.

20. Georage. Association of official Analytical Chemist (AVOC): Official method of analysis Washington. 2012.

21. Singleton V, Rossi JA. Colorimetry of total phenolics with phosphomolybdic-phosphotungstic acid reagents. Am J Enol Viti. 1965;16:144-158.

22. Singleton Vl, Orthofer R. Lamuela-Raventos RM. Analysis of total phenols and other oxidation substrates and antioxidants by means of folin-ciocalteu reagent. Method Enzymol. 1999;299:152-178.

23. AVOC. Official method of analysis of AOAC International. Washington. 1970.

24. Zhang XC, Xu BJ. Phytochemical profiles and antioxidant capacities of white and red ginseng as affected by marinating media (vinegar. yellow wine. and Chinese liquor). J Food Process Preserv. 2017; 142: 1331.