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Enhancement Of Beef Sausage Quality Using Grape Seeds As Natural Antioxidants

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Abstract: Effect of different levels (100, 300 and 600 mg/kg) of grape seeds on chemical, physical, and organoleptic properties of fresh, cooked sausages and during frozen storage at –18^{o}C for 6 months were examined. Also, total phenolic content and phenolic compounds were determined using spectrophotometric and HPLC methods, respectively. Results showed that the yield as % and total phenolic content of grape seeds samples were 9.84±0.359 %, and 526.55±9.97 mg/g-1 extract, respectively. On the other hand, grape seeds extract contains different amounts of Gallic acid, t-Coutaric acid, e Caffeic acid, e p-Coumaric acid, (+)-catechin, (-)-epicatechin gallate, (-)-epicatechin and procyanidin B2. The values were 0.850 ± 0.012, 0.006 ± 0.001, 0.004 ± 0.001, 0.011 ± 0.005, 1.130 ± 0.14, 0.013 ± 0.002, 7.450 ± 0.32 and 2.330 ± 0.17 mg/g DM, respectively. With progress of storage period up to 6 months, the moisture and protein content decreased, while fat, ash, fiber, carbohydrates and energy value, increased. Sausage with 600 mg/kg grape seeds recorded the lowest T.B.A value. Also, addition of grape seeds to sausages enhancement of all tested physical properties and organoleptic evaluation by different rates.

Keywords: Grape seeds, Sausages, Frozen storage and Quality.

Introduction

One of the most common problems in food processing is the disposal of the by-products generated. This "waste material" produces ecological problems related to the proliferation of insects and rodents and an economical burden because of transportation to repositories, therefore strategies for the profitable use of these material are needed

(Hussein *et al.*, 2011). In the food processing industry, edible portions of fruits are processed into products such as puree, canned slices, juice and pickles, whereas seeds often will be discarded as waste since it is not currently utilized for commercial purposes, seeds are also promising source of useful compounds because of their favorable technological or nutritional properties **(Ajila *et al.*, 2007)**.

Grape seeds from grape juice and wine processing can be separated, extracted, dried and purified into grape seed extract (GSE) which contain polyphenolic compounds. Nutritional interest in polyphenolic compounds has increased greatly in light of their antioxidant activity **(Scalbert and Williamson, 2000)**. The antioxidant compounds present in grape have been identified as phenolic acids (benzoic and hydroxycinnamic acids), stilbene derivatives, flavan-3-ols (catechin and epicatechin), flavonols (quercetin and myricetin), and anthocyanidins **(Caillet *et al*., 2006).** The antioxidant potential of grape seed is twenty and fifty fold greater than vitamins E and C, respectively arising from increased levels of polyphenols proanthocyanidins and oligomers of flavan-3-ol units, especially catechin and epicatechin present in GSE **Shi *et al*., (2003).** The antioxidant activity of GSE has been reported to improve the oxidative stability in a variety of food systems including cooked beef**,** turkey and pork patties, and cold stored turkey meat **(Mielink *et al*., 2006 and Baydar *et al.*, 2007)**.

Antioxidants are one of the additives which have attracted more attention in last decades. A vast number of plants, food and food wastes have been screened for potential antioxidant activity. Most studies have been focused on the identification of bioactive components, with special emphasis on those of phenolic nature **(Enma Conde *et al.*, 2013)**. An interest in natural antioxidants, especially of vegetal origin, has greatly increased in recent years. Natural antioxidants can protect the human body from free radicals that may lead to the aging process and cause some chronic diseases including cancer, cardiovascular diseases and cataract as well as retard lipid oxidative rancidity in foods **(Lai *et al.*, 2001).** The lipid oxidation is one of the major problems in meat industries. Meat products that are constituted of lipid and polyunsaturated fatty acids (PUFAs) tend to deteriorate due to lipid oxidation, leading to development of unpleasant flavors during processing and storage. The adverse effect of lipid oxidation leads to the development of free radicals which are involved in diseases and a range of disorders including cancer, arthritis, atherosclerosis, Alzheimer's disease, and diabetes. The supplement of synthetic antioxidants is a

method of inhibiting lipid oxidation in meat products. However, synthetic antioxidants such as butylated hydoxyanisole (BHA) and butylated hydroxytolune (BHT) have restricted use in foods as these agents are known to be carcinogenic **(Baydar *et al.*, 2007)**. Natural antioxidants can be used in food systems to prevent the oxidation of fats, oils and lipid-based foods through several reactions upon both heating and long term storage. Incorporation of bioactive compounds, such as phenolics, peptides, proteins and oligosaccharides, into food systems provide a simple way to develop novel functional foods or nutraceuticals that may provide medical or health benefits, including the prevention and treatment of diseases. Alternatively, active packaging systems can be used for adding antioxidants to foodstuffs. Public health authorities consider the prevention and treatment with nutraceuticals as a powerful instrument for maintaining health and for acting against nutritionally induced acute and chronic diseases, thereby promoting optimal health, longevity and quality of life (**Enma Conde *et al.*, 2013)**. Many factors influence the quality and shelf life of meat products such as Bologna-type mortadella. Studies have shown that lipid oxidation is one of the primary causes of quality loss. Lipid oxidation can induce changes in sensorial quality, nutritive value, and product functionality. These changes are perceived as negative by consumers **(Silva, 2003)**.

Sausage is a food that is prepared from comminuted and seasoned meat, and is usually formed into a symmetrical shape. The word sausage is derived from the Latin salsus, which means salted or literally meat preserved by salting. The typical flavors, textures, and shapes of many sausages described today as frankfurters, braunschweiger, pork sausage, and salami were produced **(Kramlich, 1974)**. During storage, quality attributes of the product deteriorate due to lipid oxidation and microbial growth. Lipids oxidation is responsible for reduction in nutritional quality as well as changes in flavor **(Aguirreźabal *et al.*, 2000)**, while microbial contamination can precipitate major public health hazards and economic loss in terms of food poisoning and meat spoilage. Thus, the application of suitable agents and possessing showed that steps both antioxidant and antimicrobial activities may be useful for maintaining meat quality, extending shelf-life and preventing economic loss **(Yin and Cheng, 2003)**.

This work aim to study the effect of different levels of grape seeds powder on chemical, physical, and organoleptic properties of fresh, cooked sausages and during frozen storage at -18^{o}C for 6 months.

Also, determination of total phenolic content and phenolic compounds in these meat products well be the scope in this investigation.

Materials And Methods

Materials

Source of grape seeds:

Grape seeds (*Vitis vinifera* L.), were obtained from the Ganaklez Company, Alexandria Governorate, Egypt.

Solvents used were in an analytical reagent grade and purchased from Merck (Darmstadt, Germany). Folin–Ciocalteau phenol reagent, phenolic standards have from 98–99% purity were purchased from Sigma Chemical Co. (Sigma–Aldrich Company Ltd., UK). BHT was purchased from El – Gomhoria Co., Cairo, Egypt.

Source of meat and natural mutton casings:

Meat and natural mutton casings were obtained from the local market, Menoufiya Governorate.

Methods:

Grape Seed Preparation

The grape seeds were washed with distilled water and cleaned then dried at 60°C for 12 hours or until the moisture content reached the lowest amount of 2.5% to prevent water interfering during extraction. Samples were ground to 850 mesh and kept in a closed container. When used, the grape seeds were soaked in the hexane solution over-night then the mixture was filtered and the hexane was evaporated. The defatted grape seed was extracted as mentioned in the subsequent procedure. Grape seeds were added to the sausages by different levels (100, 300 and 600 mg/kg), while, BHT (100 mg/kg) was added as synthetic antioxidant.

Determination of total phenolic content

Total phenolics in the selected extract samples were determined according to Mazza's method **(Mazza *et al.*, 1999)**, with some modifications as described by **Radovanović & Radovanović, (2010)**. Briefly, 0.25 ml of the diluted sample was mixed with 0.25 mL of 0.1% HCl in 95% ethanol and 4.55 ml of 2% HCl, approximately 15 min before reading the absorbance at 280 nm with a UV/ VIS spectrophotometer (Agilent 8453 spectrophotometer). The absorbance at 280 nm, A , was used to estimate total phenolics (gallic acid was used as standard).

Determination of phenolic compounds

The polyphenol composition of the grape seeds was analysed by using high performance liquid chromatography (HPLC), previously filtered through a 0.45 μm-pore size membrane filter. The apparatus used for the separation and determination of individual polyphenols from the grape seeds was an Agilent Technologies 1200 chromatographic system, equipped with an Agilent photodiode array detector (DAD) 1200 with RFID tracking technology for flow cells, and a UV lamp, an automatic injector, and Chem. Station software. The column was calibrated at 30°C. The separation was performed on an Agilent-Eclipse XDB C-18 4.6 ×150 mm column. The HPLC method was used according to **Radovanović *et al*., (2010)** with some modification (elution gradient and flow rate).

Preparation of natural mutton casings:

Large intestines were removed carefully from the slaughtered animal without punctures to avoid contamination of the carcass as well as to insure not less than minimum possible length. Three essential operations were performed prior to curing: fat and mesentery were removed as completely as possible, the intestinal contents were slipped out under a spray of water to keep the exterior clean, then slimes were removed by crushing intestines manually between two successive rollers. Next, natural casings were salt cured, and were packed in barrels with salt. Prior to use, casings were soaked and washed well with water. The casings were kept wet at all times once the salt was removed prior to filling according to the method described by **El-Deep (1987)**.

Preparation of sausage:

Sausages were prepared using the following formula according to **El-Deeb (1987)** as follows: minced lean meat (beef) 66.0 %, fat tissues15.47 %, salt (sodium chloride) 2.225 %, water (as ice) 15.00 %, species mixture 0.80%, (coriander 34.06%, nutmeg 2.19%, clove 5.41%, mace, 4.27%, curcuma 1.10%, black pepper 18.27%, cubeb 3.84%, ginger 2.19%, canella 11.78%, red pepper 14.70, cardamom 2.19%), sodium alginate 0.50 % and sodium nitrite 0.005 %. Imported frozen beef was thawed at room temperature and minced. The ingredients were mixed and emulsified using laboratory emulsifier (Hobart kneading machine Model C. 100 speed No. 2 (a laboratory cutter) for sausages for 8-10 minutes. Then the emulsion was stuffed by hand into natural mutton casings (specially prepared sheep casings, diameter 80 mm). Different levels of grape seeds (100, 300 and 600 mg/kg) and BHT (100 mg/kg) as synthetic antioxidants were added to the sausages. Sausage in

mutton casings was stored at -18 °C for 6 months. Spoilage was detected by the development of off odours.

Analytical methods:

Moisture, Protein (N x 6.25 kjeldahl method), fat (hexane solvent, Soxhielt apparatus), fiber and ash were determined according to the method recommended by **A. O. A. C. (2010)**.

Carbohydrates and energy value:

Carbohydrate calculated by differences as follows:

% Carbohydrates = 100 - (% moisture + % protein + % fat + % ash + % fiber).

Energy value was estimated by the sum of multiplying protein and carbohydrates by 4.0 and fat by 9.0 according to **FAO (1982)**.

Determination of thiobarbituric acid value (TBA).

TBA value was determined as described by **Pearson (1970)** which could be summarized as follows: Ten grams sample was distilled (distilled water + 4N Hcl) for 10 minutes, 5 ml. of the distillate was added to 5 ml. T. B. A. solution (0.28839g T. B. A. / 100 ml of 90% glacial acetic acid) into a stopper tube, which was then heated in boiling water for 35 minutes. After cooling measurements were carried out colorimetrically at 538 nm., the T.B.A. value was calculated by multiplying the absorbency by the factor (7.8) and the results were presented as grams of malonic / kg sample.

Physical analysis:

Water holding capacity (WHC) and plasticity of the sausages samples:

Water holding capacity of sausage samples was measured as follows: an amount of sample (about 0.3 g) was put under an ashless filter paper (Whatman, No.4) and pressed for 10 min. using1 kg weight. Two zones were usually obtained and measured using a planimeter. The internal zone measured indicated the plasticity, while the water holding capacity was calculated by subtracting the area of the internal zone from that of the outer (total) zone, as described by **Soloviev (1966)**.

Cooking loss:

Sausages were weighted before and after cooking by frying in sunflower oil for 5 min. at 110 °C, then cooking loss calculated as percent of original weight as follows:

$$\text{Cooking loss (\%)} = \frac{\text{Fresh sample weight} - \text{fried sample weight}}{\text{Fresh sample weight}} \times 100$$

Organoleptic evaluation of sausages:

After cooking, sausages were subjected to organoleptic tests by ten judges according to **Watts *et al.*, (1989)**. Jading scale for color, aroma, taste, texture and overall acceptability was as follows: very good 8-9, good 6-7, fair 4-5, poor 2-3and very poor 0-1.

Statistical analysis:

Analysis of variance was conducted for the data in accordance with procedures described by **Steel and Torrie (1980)** at 5 % level of significance was used to compare between means.

Results And Discussion

Total Phenolic Content:

Data given in table (1) show the yield as (%) and total phenolic content of grape seeds samples. Total phenols in the grape seeds and skin were expressed as mg gallic acid equivalent (GAE) per g of dry matter (mg GAE/g dM). It is clear to mentioned that the yield of grape seeds samples was 9.84±0.359 %, while the samples total phenolic content of grape seeds was estimated with folin-ciocalteu colorimetric method reached 526.55±9.97 mg g-1 extract. These results are in agreement with the finding of **Baydar *et al.*, (2006)** they reported that total phenolic content of seed from *Kalecik karasi* extract was found as 549.54 mg (GAE) g-1.

Phenolic compounds:

HPLC method for analyzing phenolics in the samples has some advantages such as easy and time consuming procedure for preparation of the samples, possibilities of quantification of a great amount of diverse phenolics, the precision, accuracy and detection limits obtained for the phenolics quantified by this method enable its application to grape **(Gomez Alonso *et al.*, 2007)**. The amounts and variations of phenolic compounds in the grape seed extracts were determined by HPLC and presented in table (2). It is clear to notice that the grape seeds extract contains different amounts of Gallic acid, t-Coutaric acid, e Caffeic acid, e p-Coumaric acid, (+)-catechin, (-)-epicatechin gallate, (-)-epicatechin and procyanidin B2. The values were0.850 ± 0.012, 0.006 ± 0.001, 0.004 ± 0.001, 0.011 ± 0.005, 1.130 ± 0.14, 0.013 ± 0.002, 7.450 ± 0.32 and 2.330 ± 0.17 mg/g DM, respectively. On the other hand, d Quercetin-glucoside, Rutin, Luteolin-glucoside , Myricetin-glucoside, Kaempferol-glucoside, Quercetin, Delphinidin-3-glucoside[a],Cyanidin-3-glucoside,Petunidin-3-glucoside[b], Peonidin-3-glucoside [b] , Malvidin-3-glucoside, Sum of glucoside derivatives[c] not detected. The obtained data are agreement with those of **Butkhup *et al.*, (2010)** reported the

presence of gallic acid in seeds and skins (0.278 and 0.164 mg/g DW respectively), caffeic acid (0.0048 and 0.0158 mg/g DW respectively), ellagic acid and ferulic acid, but an absence of t-coutaric acid and p-coumaric acid. **Anastasiadi *et al*., (2010)** found that gallic and caffeoyltartaric acids were the only detected phenolic acids in the grape seeds and skins from four native Greek *Vitis vinifera* cultivars

Chemical composition of different types of fresh sausages

Data presented in table (3) show Chemical composition of fresh sausage as influenced by addition of different levels of grape seeds (on wet weight basis). It is clear to notice that control sausage (without grape seeds) recorded the highest moisture, protein and fiber content (%), the values were 61.66%, 14.78% and 0.25%, respectively. Sausage with BHT recorded the highest ash content and lowest carbohydrates contents. The values were 2.04% and 2.60%, respectively. On the other hand, increasing grape seeds levels to the sausages showing the highest moisture, ash and fiber contents. The values were 61.49% and 1.81% and 0.05%, respectively. These results are in agreement with the finding of **(Hai Yu *et al*., 2013).**

Chemical composition of sausages as influenced by addition of different levels of grape seeds during frozen storage at -18 °C for 6 months

The chemical composition of fresh sausages as influenced by addition of different levels of grape seeds during frozen storage at -18 °C for 6 months (on wet weight basis) is shown in table (4). It evident that the highest moisture and protein contents, and lowest energy value were recorded in control sausages. The values were 58.31%, 13.85% and 256.40 kcal/100g, respectively. Increasing grape seeds levels up to 600 mg/kg in sausages recorded the highest fat, ash, fiber and carbohydrates content. The values were 23.64, 2.05, 0.19, and 4.76% .These results are in agreement with that of **(Osama, 2001)**. Finally, data obtained from tables (3-5) indicated that with progress of storage period, the moisture and protein content decreased, while fat, ash, fiber, carbohydrates and energy value, increased.

The changes in thiobarbituric acid value (TBA) of sausages as influenced by addition of different levels of grape seeds during storage period at – 18 °C for 6 months is shown in table (5). It is worthily to notice that at zero time of storage period at -18 °C the values of TBA were 0.32mg / kg for control sausage. With progress of storage period (3 months) the values of all tested sausages increased. The values were 0.85,1.05, 0.5, 0.52 and 0.47 mg / kg, for control sausage, sausage with

BHT, sausage with 100, 300 and 600 mg/kg grape seeds, respectively. At the end of frozen storage (6 months) at– 18 °C the TBA recorded the highest values with all tested sausage samples by different rates. The values were 1.54, 1.30 and 1.35, 1.26 and 0.86 mg / kg for the same mentioned tested sausage respectively. Finally, it could be concluded that the sausage with 600 mg/kg grape seeds recorded the lowest T.B.A. value due to higher antioxidation activity of grape seeds during frozen storage period. This agrees with the report of **Branen, (1975)** which asserted that BHA could reduce lipid oxidation in fatty foods. **Banon *et al*., (2007)** also state that grape-fruit seed extracts have better potential as a shelf life extending antioxidant in cooked meat systems.

Physical properties of sausages as influenced by addition of different levels of grape seeds during frozen storage at -18 °C for 6 months

Data presented in table (6) show the physical properties of sausages as influenced by addition of different levels of grape seeds during frozen storage at -18 °C for 6 months. The obtained results indicated that the value of water holding capacity (WHC) at zero time of storage period was 3.2 cm^2. With advancement of storage period for 3 months, the values of WHC. decreased by different rates. The values were 2.75, 2.74, 2.76, 2.77 and 2.79 cm^2, respectively for control sausage, sausage with BHT, sausage with 100, 300 and 600 mg/kg grape seeds after 3 months of frozen storage, while the lowest W. H.C. values recorded at the end of storage period. The values were 1.50, 1.50, 1.52, 1.54 and 1.56 cm^2, respectively for the same mentioned tested sausages. Such change may be due to moisture loss (dryness) by thawing. In case of plasticity in table (6), a markedly decrease was observed during storage of sausages with grape seeds, and it recorded the maximum decrease at the end of storage period. The plasticity decreased from 4.24 to 2.5, 4.24 to 2.49, 4.24 to 2.52, 4.24 to 2.54 and 4.24 to 2.56cm^2, respectively for control sausage, sausage with BHT, sausage with 100, 300 and 600 mg/kg grape seeds after 6 months of frozen storage period, possibly due to dryness, besides protein denaturation. These results are in agreement with the report of **(El-Kholie, 1994)**. On the other hand, the values of cooking loss and yield of sausage with different levels of grape seeds are shown in table (7). The values were 25.40 % and 74.60 %, respectively for control sausage. With progress of storage period for 3 months a marked increase in cooking loss and decrease in yield was observed. The values were 33.75 and 66.25 %, and 33.70 &66.30, 33.30 & 66.70, 33.00 & 67.00 and 32.86 & 67.14, respectively for control sausage, sausage with BHT, sausage with 100, 300 and 600

mg/kg grape seeds. The highest increase in cooking loss and decrease in yield was recorded at the end of storage period (6 months). The values were 39.80 % & 60.20 %, 39.72 % 60.28, 39.50 & 60.50, 39.22 & 60.78 and 38.90 & 61.10, respectively for the same mentioned tested sausages. Similar results were obtained by **Osama, (2001) and Samiha, Alloush (2002)**. Finally, it could be concluded that addition of grape seeds to sausages enhancement of all tested physical properties by different rates.

Organolyptic properties of sausages as influenced by addition of different levels of grape seeds during frozen storage at -18 °C for 6 months

The organoleptic properties of fried sausage as influenced by addition of different levels of grape seeds during frozen storage at -18 °C for 6 months are shown in table (8). It is mentioning that at zero time of frozen storage at -18 °C all organoleptic properties (color, flavor, taste, texture and overall acceptability) recorded the highest organoleptic score (9) of the judging scale. With progress of storage period for 3 months all tested organoleptic properties of all investigated sausages somewhat decreased. The scores ranged from (8.1 to 8.3) for color, (8.0 to 8.2) for flavor, (8.2 to 8.4) for taste, (8.0 to 8.1) for texture and (8.0 to 8.2) for overall acceptability. While at the end of storage period (6 months) a markedly reduction in all organoleptic properties was observed. The scores ranged from (7.1 to 7.4) for color, (7.3 to 7.5) for flavor, (7.2 to 7.4) for taste, (7.0 to 7.2) for texture and (7.1 to 7.4) for overall acceptability. The obtained data are agreement with those of **Schum, (1971) and Badei *et al.*, (1991)**. Finally, it could be concluded the sausages with grape seeds were somewhat of better quality than that prepared with control sausage considering the organoleptic properties.

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Table (1): Yield and total phenolic contents (TPC) of grape seeds

Properties	Yield %	TPC mg. g^{-1} extract
Grape seeds	9.84±0.359	526.55±9.97

Table (2): Individual phenolic content (mg/g DM) in grape seeds

Phenolic compound	Grape Seeds
Gallic acid	$0.850^{c} \pm 0.012$
t-Coutaric acid	$0.006^{d} \pm 0.001$
e Caffeic acid	$0.004^{d} \pm 0.001$
e p-Coumaric acid	$0.011^{d} \pm 0.005$
d Quercetin-glucoside	ND
Rutin	ND
Luteolin-glucoside	ND
Myricetin-glucoside	ND
Kaempferol-glucoside	ND
Quercetin	ND
(+)-catechin	$1.130^{b} \pm 0.14$
(-)-epicatechin gallate	$0.013^{d} \pm 0.002$
(-)-epicatechin	$7.450^{a} \pm 0.32$
Procyanidin B2	$2.330^{b} \pm 0.17$
Delphinidin-3-glucoside [a]	ND
Cyanidin-3-glucoside	ND
Petunidin-3-glucoside[b]	ND
Peonidin-3-glucoside [b]	ND
Malvidin-3-glucoside	ND
Sum of glucoside derivatives[c]	ND

Values are the means ± standard deviation ($n = 3$). nd, not detected.
Means in the same column bearing different letters are significantly different ($p < 0.05$), as analysed by the Tukey test.
[a]The level of delphinidin-3-glucoside is expressed as cyanidin-3-glucoside equivalent.
[b]The levels of petunidin-3-glucoside and peonidin-3-glucoside are expressed as malvidin-3-glucoside equivalents.

[c]Sum of malvidin, delphinidin, cyanidin, petunidin and peonidin glucoside (acetyl and coumaryl) derivatives (mg ME/g DW).

Table (3): Chemical composition of fresh sausage as influenced by addition of different levels of grape seeds (on wet weight basis)

Constituents	Moisture %	Protein %	Fat %	Ash %	Fiber %	Carbohy-drates %	Energy Value Kcal/100g
Sausage (control)	61.66	14.78	18.91	1.77	0.25	2.63	239.83
Sausage + BHT (100 mg/kg)	61.60	14.44	19.29	2.04	0.03	2.60	241.77
Sausage + grape seeds (100 mg/kg)	61.45	14.33	19.27	1.79	0.03	3.13	243.27
Sausage + grape seeds (300 mg/kg)	61.48	14.36	19.31	1.80	0.04	3.01	243.27
Sausage + grape seeds (600 mg/kg)	61.49	14.33	19.31	1.81	0.05	3.01	243.15

Table (4): Chemical composition of fresh sausage as influenced by addition of different levels of grape seeds during frozen storage at -18 °C for 6 months (on wet weight basis).

Constituents	Moisture %	Protein %	Fat %	Ash %	Fiber %	Carbohy-drates %	Energy value Kcal/100g
Sausage (control)	58.31	13.85	21.56	1.98	0.31	3.99	256.40
Sausage + BHT (100 mg/kg)	57.51	13.21	22.96	2.26	0.12	3.94	275.24
Sausage + grape seeds (100 mg/kg)	57.25	13.33	23.11	1.95	0.14	4.22	278.19
Sausage + grape seeds (300 mg/kg)	56.54	13.04	23.50	1.99	0.18	4.75	282.66
Sausage + grape seeds (600 mg/kg)	56.66	12.70	23.64	2.05	0.19	4.76	282.60

Table (5): Changes in thiobarbituric acid value (TBA) of sausages as influenced by addition of different levels of grape seeds during frozen storage at -18 °C for 6 months (mg /Kg)

Sausage / Blends / Storage period (month)	Sausage (control)	Sausage + BHT (100 mg/kg)	Sausage + grape peels (100 mg/kg)	Sausage + grape peels (300 mg/kg)	Sausage + grape peels (600 mg/kg)
Zero time (0)	0.32	0.32	0.32	0.32	0.32
1	0.52	0.42	0.45	0.40	0.36
2	0.69	0.51	0.54	0.48	0.41
3	0.85	1.05	0.50	0.52	0.47
4	1.25	1.15	1.16	1.06	0.65
5	1.40	1.25	1.31	1.20	0.80
6	1.54	1.30	1.35	1.26	0.86

Table (6): Physical properties of sausages as influenced by addition of different levels of grape seeds during frozen storage at -18 °C for 6 months

Items	Water holding capacity (WHC,cm^2)					Plasticity (cm^2)				
Storage period (month)	Control	BHA 100 mg/kg	GS 100 mg/kg	GS 300 mg/kg	GS 600 mg/kg	Control	BHA 100 mg/kg	GS 100 mg/kg	GS 300 mg/kg	GS 600 mg/kg
Zero time	3.20	3.20	3.20	3.20	3.20	4.24	4.24	4.24	4.24	4.24
1	3.03	3.03	3.04	3.05	3.07	3.80	3.80	3.82	3.83	3.85
2	3.00	3.00	3.05	3.07	3.09	3.69	3.68	3.71	3.72	3.74
3	2.75	2.74	2.76	2.77	2.79	3.24	3.25	3.26	3.27	3.29
4	2.50	2.50	2.52	2.53	2.54	2.91	2.90	2.93	2.94	2.96
5	2.00	2.01	2.02	2.04	2.06	2.75	2.75	2.77	2.79	2.81
6	1.50	1.50	1.52	1.54	1.56	2.50	2.49	2.52	2.54	2.56

GS = Grape seeds

Table (7): Physical properties of sausages as influenced by addition of different levels of grape seeds during frozen storage at -18 °C for 6 months

Items	Cooking loss (%)					Yield				
Storage period (month)	Control	BHA 100 mg/kg	GS 100 mg/kg	GS 300 mg/kg	GS 600 mg/kg	Control	BHA 100 mg/kg	GS 100 mg/kg	GS 300 mg/kg	GS 600 mg/kg
Zero time	25.40	25.40	25.39	25.37	25.35	74.60	74.60	74.61	74.63	74.65
1	28.60	28.55	28.46	28.38	28.16	71.40	71.45	71.54	71.62	71.84
2	30.10	30.00	29.61	29.30	29.02	69.90	70.00	70.39	70.70	70.98
3	33.75	33.70	33.30	33.00	32.86	66.25	66.30	66.70	67.00	67.14
4	37.10	37.00	36.88	36.50	36.00	62.90	63.00	63.12	63.50	64.00
5	38.20	38.10	38.00	37.88	37.60	61.80	61.90	62.00	62.12	62.40
6	39.80	39.72	39.50	39.22	38.90	60.20	60.28	60.50	60.78	61.10

GS = Grape seeds

Table (8): Organoleptic properties of fried sausages as influenced by addition of different levels of grape seeds

Items	Color					Flavor					Taste				
Storage period month	**Cont**	**BHA 100 mg/kg**	**GS 100 mg/kg**	**GS 300 mg/kg**	**GS 600 mg/kg**	**Cont**	**BHA 100 mg/kg**	**GS 100 mg/kg**	**GS 300 mg/kg**	**GS 600 mg/kg**	**Cont**	**BHA 100 mg/kg**	**GS 100 mg/kg**	**GS 300 mg/kg**	**GS 600 mg/kg**
0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0
1	8.7	8.8	8.7	8.8	8.9	8.6	8.7	8.6	8.7	8.7	8.7	8.8	8.7	8.7	8.8
2	8.5	8.6	8.5	8.6	8.6	8.4	8.5	8.4	8.5	8.5	8.5	8.6	8.5	8.6	8.6
3	8.2	8.3	8.1	8.1	8.3	8.0	8.1	8.0	8.1	8.2	8.3	8.4	8.2	8.2	8.2
4	7.9	8.2	8.0	8.0	8.1	7.8	8.0	7.9	7.9	8.0	8.0	8.2	8.0	8.0	8.1
5	7.5	7.8	7.6	7.6	7.7	7.4	7.6	7.5	7.5	7.5	7.6	7.9	7.7	7.7	7.7
6	7.1	7.4	7.3	7.4	7.4	7.3	7.4	7.3	7.4	7.5	7.2	7.4	7.3	7.3	7.4

Continued Table (8):

Items	Texture					Overal acceptability				
Storage period month	Cont.	BHA 100 mg/kg	GS 100 mg/kg	GS 300 mg/kg	GS 600 mg/kg	Cont.	BHA 100 mg/kg	GS 100 mg/kg	GS 300 mg/kg	GS 600 mg/kg
0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0
1	8.5	8.6	8.6	8.7	8.7	8.6	8.8	8.7	8.7	8.8
2	8.2	8.4	8.3	8.4	8.5	8.3	8.5	8.4	8.4	8.5
3	8.0	8.2	8.1	8.1	8.2	8.0	8.2	8.1	8.1	8.2
4	7.8	8.0	7.9	8.0	8.1	7.8	8.0	7.9	8.0	8.1
5	7.5	7.7	7.6	7.6	7.7	7.5	7.8	7.6	7.6	7.7
6	7.0	7.2	7.1	7.1	7.2	7.1	7.4	7.2	7.3	7.4

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تحسين جودة السجق البقري بأستخدام بذور العنب كمضادات أكسدة طبيعية

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الملخص

تم دراسة تأثير مستويات مختلفة (100، 300 و 600 مجم /كجم) من بذور العنب على الخواص الكيميائية والطبيعية والحسية للسجق الطازج والمطبوخ، كذلك أثناء التخزين المجمد على درجة حرارة -18م° لمدة 6 أشهر. أيضا تم تقدير الفينولات الكلية و المركبات الفينولية المختلفة باستخدام طريقة الطيف وجهاز التحليل الكروماتوجرافى عالى الأداء على التوالي. وأظهرت النتائج المتحصل عليها أن المتحصل عليه كنسب مئوية ومجموع الفينولات الكلية من عينات بذور العنب كانت 9.84 ± 0.359٪، و 526.55 ± 9.97 مجم/ جم -[1] مستخلص، على التوالي. من ناحية أخرى، وجد أن مستخلص بذور العنب يحتوي على كميات مختلفة من الفينولات مثل حمض الجاليك، حمض تي كويوتيريك ، وحمض الكافئيك ، حامض الكيوماريك، (+) - كاتشين، (-) - يبيكاتشين جالات و (-) – يبيكاتشين وبيرسياندين بى تو. حيث كانت القيم 0.850 ± 0.012، 0.006 ± 0.001، 0.004 ± 0.001، 0.011 ± 0.005، 1.130 ± 0.14، 0.013 ± 0.002، 7.450 ± 0.32 و 0.17 ± 2.330 ملجم / جم وزن جاف على التوالي. مع تقدم فترة التخزين إلى 6 أشهر، انخفض محتوى الرطوبة والبروتين، في حين أزداد محتوى الدهون والرماد والألياف والكربوهيدرات وقيم الطاقة. عينات السجق البقرى المحتويةعلى 600 ملجم /كجم بذور عنب سجلت أدنى قيمة لحامض الثيوباربيتوريك . أيضا إضافة بذور العنب لعينات السجق حسنت من الخصائص الطبيعية والتقييم الحسي بنسب مختلفة.

الكلمات الأفتتاحية: بذور العنب ـ السجق ـ التخزين بالتجميد ـالجودة.