

The Use of Some Fruits as Natural Antioxidant Sources in Meat and Meat Products: A Review

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Abstract

Lipid oxidation in meat products causes to decrease the shelf life of the product. In addition, oxidation results with negative change of quality parameters such as colour, odour and aroma. Antioxidants are frequently used to prevent such spoilage, to extend the shelf life of meat products and to maintain their sensory qualities.

Fruits are also known to be one of the main elements of a healthy diet. Moreover, fruits are also considered as one of the most important natural antioxidant sources. The use of this source in meat and meat products is important both for the protection of shelf life and the quality and production natural meat products.

In this review, different antioxidative fruit extracts used in meat products consumed in the world were investigated. In addition, the effects of these antioxidants on meat products have been studied under varying conditions through in-depth literature studies.

Keywords: Natural antioxidants, meat products, fruit

1. Introduction

Meat and meat products constitute one of the important food groups with their nutritive items. However, the shelf life of the product is decreased and quality parameters such as colour, odour and aroma are changed by lipid oxidation in meat products [1]. Antioxidants are used to prevent such spoilage, to extend the shelf life of meat products and to maintain their sensory qualities. The debate over the toxic effects of synthetic antioxidants is still continuing [2], and in addition to this, consumers demand for natural and healthy products. So the number of products and research of natural antioxidants are increasing. Due to high phenolic content of plant and spice extracts, they exhibit antioxidative effects, also increase the interest in such extracts [3]. Phenolic compounds found in many fruits and vegetables are natural antioxidants and they have anticarcinogenic effects [4].

Moreover, positive effects of these compounds on the gastrointestinal tract have also been reported [5].

Positive results have been obtained in studies on meat products produced by utilizing the antioxidative effect of different fruits. The use of some fruits which have positive effects on metabolism (immune system, cardiovascular system etc.) instead of synthetic antioxidants has positive effects on health in two different directions. Some studies have reported that fruits such as plum, grape, cranberry, bearberry, pomegranate, citrus fruits, carob fruit and tropical fruits have antioxidative effects on meat products. In these studies, meat groups with different characteristics such as sausage, turkey meat, beef and poultry meat were used and positive results were obtained in all these different products. Moreover, the packaging systems using fruit-based natural antioxidants were obtained give positive results. Studies on natural

antioxidants are increasing with interest and demand for natural additives and natural food products. When the antioxidative effects and natural structures of fruit-based antioxidants are considering, their importance is increasing.

2. Some fruits as natural antioxidants

The effects of natural antioxidants on many different meat products and storage conditions have been studied. In these studies, using of different fruits such as plum, pomegranate, blueberries, citrus fruits as antioxidants in meat have been reported. Integrated methods including combination of different fruits and package systems have been examined with a number of studies analyzing antioxidative effect of fruits.

Plum seen as a natural antioxidant has been used in different meat products such as pork [6], irradiated turkey meat [7] and beef [8,9]. Dry plum powder was reported to be more effective than antioxidants such as BHA / BHT in preventing oxidative rancidity of pork sausages [6]. Puree or fruit of plum gave positive results as an antioxidant in these studies.

Positive results in turkey meat have also been obtained in studies used powder and puree of cranberry with antioxidant effect of cranberry [10,11]. The antioxidant effect is caused by the high amount of flavonol contained in the extract. Especially antioxidant effect has been obtained benzoic and phenolic acids extracted from cranberry [4]. As a result, the oxidative stability of meat products obtained from pigs fed with cranberry increased [12]. As an advantage, colour, tasting and flavour of meat was not influenced by cranberry [10]. Positive results have been obtained with using cranberry in meat products because of cranberry have natural structure, high antioxidant activity and non-aromatic property.

Pomegranate which has a very high antioxidant capacity in fruits [13] has been used in meat and meat products. Pomegranate performed antioxidant activity in chicken meat stored at 4 °C [14]. Positive results were obtained in raw goat meat stored same temperature [15].

The use of citrus fruits in meat products for antioxidant activity has been reported in many studies. The oxidative stability of the meatball by making with lemon and orange juice has been increased in [16,17] studies. Natural antioxidant activity in citrus using citrus juice has been demonstrated by Viuda-Martos et al. (2010) in sausage. Maintaining oxidative stability and preserving physical and chemical properties of the meat product have been achieved using citrus fruits in this study. Lipid oxidation in sliced turkey meat stored at 4 °C was delayed in a study investigated the use of combination citrus fruits extract and packaging [19].

High antioxidant activity has been demonstrated with tropical fruits [2], *Melissa officinalis* [20] and black currant extract [21] on meat and meat products. Protein and oil oxidation have been prevented and colour stability in the storage process have been maintained by black currant extract in the same study. Especially studies are concentrated on black currant seed because of it has high antioxidative activity. For example, positive results related to antioxidative effect have been reported the extract obtained from grape seed extract on cooked beef during storage in the refrigerator [22]. In another study, high antioxidative effect has been demonstrated by together grape seed and bearberry on raw and cooked pork [23]. Also oxidative stability effect has been showed by grape seed and vacuum package together associated with a high antioxidative effect in the storage process, the advantages of combined methods are seen as a result of this situation [24]. In addition, the antioxidative effect of the grape seed extract on chicken meat was examined and similar results were obtained with other meat products [25].

In addition to these antioxidative effects, carob fruit was also considered as an important natural antioxidant by preventing lipid oxidation in pork [26], and spices which have flavonoids and phenolic acids are also considered important natural antioxidant sources [3]. Natural antioxidant sources and areas of using are shown in Table 1.

Table 1. Natural antioxidant sources and areas of using

Antioxidative Fruit	Methods	Type of meat	References
Plum	Dried plum	Sausage	<i>Nunez de Gonzalez et al., 2008a</i>
Plum	Plum concentrates and powder	Precooked roast beef	<i>Nunez de Gonzalez et al., 2008b</i>
Plum	Plum extract	Irradiated turkey breast	<i>Lee and Ahn, 2005</i>
Plum	Plum puree	Low fat beef patties	<i>Yildız-Turp and Serdaroğlu, 2010</i>
Cranberry	Cranberry press cake	Turkey meat	<i>Raghavan and Richards, 2006</i>
Cranberry	Solvent and microwave extracts of cranberry press cake	Turkey meat	<i>Raghavan and Richards, 2007</i>
Cranberry	Pork products made from pigs fed with cranberry juice powder	Pork	<i>Larrain et al., 2008</i>
Pomegranate	Pomegranate fruit juice	Chicken meat (4 °C)	<i>Vaithyanathan et al., 2011</i>
Pomegranate	Salt, kinnow and pomegranate fruit by-product powders	Raw ground goat meat (at refrigerator)	<i>Devatkal and Naveena, 2010</i>
Citrus Fruits	Lemon albedo and orange dietary fiber powder	Cooked and dry-cured sausages	<i>Fernandez-Lopez et al. 2004</i>
Citrus Fruits	Rosemary, orange and lemon extract	Beef meatballs	<i>Fernandez-Lopez et al., 2005</i>
Citrus Fruits	Citrus fibre and spice essential oils	Sausage	<i>Viuda-Martos et al., 2009, 2010</i>
Citrus Fruits	Citrus extract	Cooked turkey meat	<i>Contini et al., 2012</i>
<i>Melissa officinalis</i>	<i>Melissa officinalis</i> extract	Bologna type – sausage	<i>Berasategi et al., 2011</i>
Black currant	Black currant extract	Pork patties during chilled storage	<i>Jia et al., 2012</i>
Grape seed	Grape seed extract	Cooked beef	<i>Ahn et al., 2002</i>
Grape seed and bearberry	Grape seed and bearberry extracts	Raw and cooked pork	<i>Carpenter et al., 2007</i>
Grape seed	Grape seed extract	Cooked, cold stored turkey meat	<i>Mielnik et al., 2006</i>
Grape seed	Grape seed extract	Salted, chicken thigh meat during refrigerated storage	<i>Brannan, 2008</i>
Carob fruit	Carob fruit extracts	Cooked pork meat during chilled and frozen storage	<i>Bastida et al., 2009</i>

4. Conclusion

We tried to investigate the antioxidative effects of different fruit extracts used in different meat products consumed in the world and stored varying storage conditions with in-depth literature study in our study.

The attention of consumers is taken to products formulated with natural ingredients [15]. Interest and demand for natural additives and natural food products are increasing day by day due to changing consumer demands.

In this context, efforts for developing natural antioxidants and their importance are also increasing. In addition, the taste and flavour of meat products are not affected by the using of this type of antioxidants, and the effectiveness of these healthy natural antioxidants can be increased with integrated methods. The increasing of study on the antioxidative effects of different fruits and their using in meat products are important for creating an alternative to synthetic antioxidants.

Antioxidative activity of these fruits and technological or sensory problems on meat products should be investigated and the use of natural antioxidants should be improved in future study.

Compliance with Ethics Requirements. Authors declare that they respect the journal's ethics requirements. Authors declare that they have no conflict of interest and all procedures involving human / or animal subjects (if exist) respect the specific regulation and standards.

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