



NOTE

Determination of Phenolic Compound Contents in Traditionally Producted Grape Pekmez Samples

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The aim of this study was to determine the phenolic compound in grape pekmez samples. This study was conducted in Nigde city (Turkey). About 50 samples were collected from Nigde city. Grape pekmez samples were collected from city center, town centers, towns and villages. pH values, hydroxymethylfurfural (HMF) concentration, total phenolic compound concentration and phenolic compound concentration were determined in these samples. pH values: 5.32 ± 0.23 were found to be the average result of the research. As a result of studies for the purpose of quantifying the HMF concentration was 35.64 ± 10.45 mg/kg. Total phenolic compound of samples were determined as 3359.25 ± 72.56 . HPLC analysis of phenolic compounds was carried out in gape pekmez samples. Gallic acid, catechin, caffeic acid, epicatechin, *p*-coumaric acid and ferulic acid were found in pekmez samples with concentrations; 47.94 ± 2.58 , 148.69 ± 11.17 , 20.7 ± 2.08 , 101.25 ± 5.8 , 12.24 ± 1.65 and 18.26 ± 2.58 mg/kg respectively. pH values and HMF concentration was found in accordance with the Turkish Food Codex. Total phenolic content of phenolic compounds with other studies shows similar results.

Keywords: Grape pekmez, Total phenolic compounds, Gallic acid, Catechin, Caffeic acid, Epicatechin, *p*-Coumaric acid, Ferulic acid.

Pekmez is a traditional Turkish food and has been produced for a long time in Turkey. It made by using different fruits such as grape, apple, fig, mulberry and carob. This is nutritionally important, specially for babies, children and sportsmen. Pekmez is a healthful food due to its nutritional content and is used as a main source of energy based on its chemical composition. Pekmez has an important function in the working of the brain, in which glucose is an energy source. Furthermore, pekmez confers approximately 293 kcal/100 g of energy and also has important organic acids and mineral materials [1-3].

Polyphenol quantity and quality in plant foods can vary significantly according to different intrinsic and extrinsic factors such as plant genetics and cultivar, soil composition and growing conditions, maturity state and post harvest conditions, among others [4].

The aim of this study was to determine the phenolic substances in grape pekmez samples. pH values, hydroxymethylfurfural (HMF) concentration, amount of total phenolic substance and phenolic contents (gallic acid, catechin, caffeic acid, epicatechin, *p*-coumaric acid) were determined in these samples.

Samples: Pekmez samples were collected from city center, town centers, towns and villages. 50 samples were collected from Nigde city of Turkey. pH values, HMF concentration,

total phenolic substance concentration, phenolic contents were determined in these samples.

Analytical measurements: The pH were determined according to AOAC standard method [5]. Hydroxymethylfurfural contents of pekmez samples were determined according to method of Zappalà *et al.* [6]. First samples were prepared and homogenized. 10 g of pekmez were dissolved in 20 mL water and transferred to a 50 volumetric flask. 2 mL of the solution and 5 mL of *p*-toluidine solution were put in two different test tubes; to one tube was added 1mL of distilled water (reference solution); to the second, 1 mL of barbutiric acid solution 0.5 % (sample solution). The absorbance of the solutions at 550 nm was determined using a spectrophotometer.

Total phenolic compound analysis: The amount of total phenolics in pekmez samples were determined with the Folin-Ciocalteu reagent using the method of Lister and Wilson [7]. To 50 mL of each sample 2.5 mL 1/10 dilution of Folin-Ciocalteu's reagent and 2 mL of Na₂CO₃ were added and incubated at 45 °C for 15 min. The absorbance of all samples was measured at 765 nm using a UV-visible spectrophotometer. Results were expressed as milligrammes of gallic acid equivalent per gram of dry weight.

Phenolic composition: To determine the composition of the polyphenolic substances, 5 g of the each sample with distilled water diluted to 50 mL. 10 mL of this solution was

6000 rpm for 20 min at centrifugated. The sample was filtered through a 0,45 mm membrane filter. And stored at -18 °C. Prior to analysis was diluted with distilled water again ¼ percent. These samples were injected into HPLC [8].

The pH values and HMF concentration are given in Table-1. pH values were determined as the average 5.32 ± 0.23 . HMF, an indicator of quality determination, occurs as a result of excessive heating in foods containing carbohydrates [9]. The Turkish Standard Institute recommends a maximum HMF concentration of 75 mg/kg for first quality grape pekmez (TS, 1996). In this study, a low HMF content of pekmez was found here (35.64 ± 10.45 mg/kg).

TABLE-1
pH VALUES AND HMF CONCENTRATION
OF PEKMEZ SAMPLES (n = 50)

	Min.	Max.	Mean	SD
pH	4.87	5.91	5.32	0.23
HMF (mg/kg)	21.12	63.61	35.64	10.45

Phenolic content of pekmez samples was measured by HPLC method. Six phenolics were determined. These phenolics were gallic acid, catechin, epicatechin, *p*-coumaric acid, ferulic acid and caffeic acid. HPLC retention times in the colon shown Table-2. Concentrations of phenolic compounds shown Table-3 and Fig. 1. Total phenolic compound concentration of pekmez samples was determined as gallic acid equivalents and total phenolic contents. For this process, gallic acid calibration curve plotted (Fig. 2). The calibration curve R^2 : 0.9998 and the equation of the curve $y = 0.0051x \pm 0.0025$, respectively. Sample concentrations were calculated using the absorbance of the calibration curve. All measurements were made in two replicates. Total phenolic content of pekmez samples was found to be 3359.25 ± 72.56 mg/kg.

Gallic acid, catechin, caffeic acid, epicatechin, *p*-coumaric acid and ferulic acid were found in pekmez samples with concentrations; 47.94 ± 2.58 , 148.69 ± 11.17 , 20.7 ± 2.08 , 101.25 ± 5.8 , 12.24 ± 1.65 and 18.26 ± 2.58 mg/kg respectively.

TABLE-2
RETENTION TIMES IN THE COLON OF
PHENOLIC SUBSTANCES

Phenolic substance	Retention time (min)
Gallic acid	6.40
Catechin	20.1
Epicatechin	27.9
<i>p</i> -Coumaric acid	30.3
Ferulic acid	38.6
Caffeic acid	23.8

TABLE-3
TOTAL PHENOLIC CONTENTS OF PEKMEZ SAMPLES (mg/kg)

Phenolic compound	Concentration (mg/kg)	
	Mean	SD
Gallic acid	47.94	7.58
Catechin	148.69	88.17
Epicatechin	101.25	15.8
<i>p</i> -Coumaric acid	12.24	2.65
Ferulic acid	18.26	8.58
Caffeic acid	20.70	3.08
Total phenolic compound	3359.25	72.56

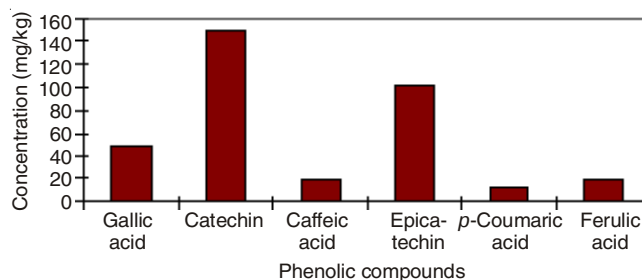


Fig. 1. Concentration of phenolic compounds

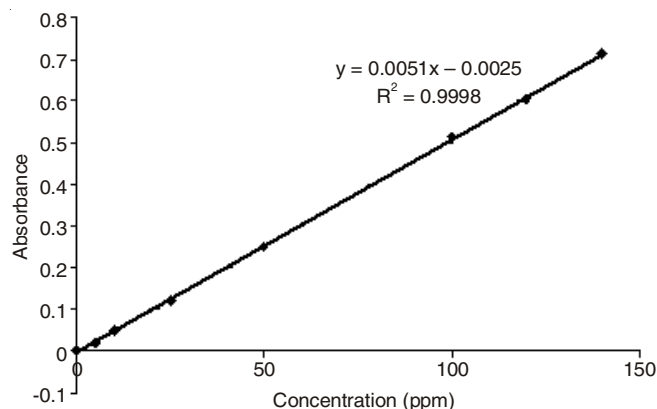


Fig. 2. Calibration curve

pH values and the amount of HMF was found in accordance with the Turkish Food Codex. Pekmez samples were found to be rich in phenolic compounds.

Grapes can be consumed as fresh fruit, but they may also pekmez. Grape pekmez contains a wide range of polyphenolic constituents that have been reported to show anticancer and anti-inflammatory effects *in vitro.*, as well as the ability to block cellular events predisposing atherosclerosis and coronary heart disease [10-12].

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