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The Effect of Cranberry and Grape Seed Addition on Quality Characteristics of Cookies

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Abstract

The aim of this paper was to study the influence of cranberries and grape seed addition on the quality of cookies. The recipe and technology for making cookies was optimized with addition of cranberries and grape seeds flour. Three samples of cookies, PM, P1 (15% cranberries, 3% grape seed flour) and P2 (25% cranberries, 3% grape seed flour) were subjected to sensory analysis in order to establish consumer's preference. Sensory evaluation using hedonic scale indicated that the sample with 25% cranberries content had the highest score. Both grape seed powder and the finished products have been subjected to physic-chemical analysis, studying moisture content, total protein, ash, total polyphenols and antioxidant activity. Additions bring an important content of polyphenols and increase antioxidant capacity, beneficial to consumers.

Keywords: cranberry, grape seeds, cookies

1. Introduction

Nowadays, there is a growing demand for a new generation of healthier food products, without sugar addition, which, at the same time, are required to have excellent sensory quality [2].

Rich in simple carbohydrates, the cranberry fruits (Vaccinum vitis idaea) are a rich source of polyphenols (including flavonols, proanthocyanidins and quercetin), giving them an antioxidant effect 20 times higher than vitamin C. Cranberries fight infection, pathogenic bacteria, E. coli and exacerbate the immune system. Fiber from cranberry composition favors the intestinal transit [6].

Dehydrated cranberries have been shown to have an undeniable action against a number of bacterial pathogens, cancer, cardiovascular diseases and inflammations. These effects are determined by the wealth of biologically active substances, especially polyphenols, vitamins (ascorbic acid, riboflavin, tocopherols), β-carotene and minerals [7].

Wine wastes, consisting mainly of skins, seeds and stems represent 20% of the processed grapes weight and are considered valuable coproducts due to their important phenolic compounds content [10]. The seeds constitute a considerable ratio of the pomace, with an amount between 38-52% on a dry matter basis [12].

The results of certain studies have indicated that the polyphenols present in grape seeds in significant concentrations could be classified into two groups: flavonoids and non-flavonoids [11]. There are a number of studies reporting that grape seed polyphenols help to reduce the risk of cancer and heart disease by inhibiting the oxidation of low-density lipoprotein (LDL) [8]. The most abundant phenolics isolated from grape seeds and skins are flavan-3-ols (catechin and epicatechin) and their oligomers and polymers (proanthocyanidins). The outer seed coat contains the majority of both the monomeric and polymeric flavan-3-ols (2 to 5 times more than the endosperm) [13].

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Grape seed flour can substitute wheat flour and reduce carbohydrate levels by up to 10%[15]. The grapefruit composition contains vitamins A, D, C, E, P and the vitamin B complex, minerals and fibers, enzymes, amino acids, antioxidants, citric acid and polyphenols [3].

Cookies hold an important place in snacks due to their taste, crispness, and eating convenience [5].

2. Materials and Methods

2.1 Materials

Obtaining grape flour: Grape seed flour was obtained from grapes of the Muscat Ottonel variety. The flour was obtained after a succession of operations: preservation of the seeds by freezing, thawing, washing, drying at 60oC for 24 hours and grinding (fig. 1).

Fig.1 Grape seeds powder

Cranberries were dehydrated in the desiccator at 40 ° C to 55% SU. Dried cranberries contain the same nutrients as fresh cranberries. Cranberries with minimal processing contain the highest amount of antioxidants.

Obtaining cookies The experimental studies were carried out in laboratories of the Department of Food Products Engineering, Faculty of the Food Science and Technology, University of Agricultural Sciencesand Veterinary Medicine Cluj-Napoca. The raw materials used in these experiments were: whole flour, dried cranberries (15% and 25%), grape seeds flour(3% for all samples), grape oil 7%, ammonium bicarbonate (0.5%) and sodium bicarbonate (0.5%),

The technological steps and parameters are: kneading (10 min), resting time (4°C, 20 min), dividing and shaping, baking (180°C, 12 min).

2.2 Physical evaluation of cookies

Cookies diameter was measured by placing 5 cookies edge-to-edge to get the average diameter in millimeters.

Cookie thickness was measured by stacking 5 cookies on top of each other and gets the average thickness. *Diameter:* The diameter was measured in mm by Vernier caliper.

Thickness: The thickness was measured in mm by screw gauge. *Spread ratio:* The spread ratio was determined by using this formula

Spread.ratio=diameter(mm)/thickness(mm)

2.3 Sensory analysis of cookies

Sensory evaluation was conducted in the Food Science Laboratory. A total of 83 untrained panelists (53 women and 30 men) aged 18–50 participated in a consumer acceptance study. Each panelist evaluated all samples of cookies in one session. One sample was the target of this study, which is The P1 sample (15% cranberries, 3 % grape seeds flour) was the target of this study and the P2 sample (25 % cranberries, 3% grape seeds flour) was used as control. Cookies were evaluated for overall acceptability (texture, color, taste and flavor) and the sensory evaluation was carried out on the 9 point Hedonic scale.

2.4. Chemical characteristics of cookies

Moisture content, total protein, ash, reducing carbohydrates, alkalinity and fat content were determined by AACC(2000) methods .

2.5 Evaluation of the antioxidant activity of extracts and quantification of total phenolics

The determination of the total phenolics content was performed using the Folin-Ciocalteu reagent, according to Muresan *et al.* (2012) and Kodama *et al.* (2010) with some modifications. A 0.25 mL of the methanolic extract obtained above were mixed with 0.12 mL of the Folin-Ciocalteu

reagent and 1.8 mL of distillated water. After 5 minutes at room temperature, 0.34 mL of a sodium carbonate (Na_2CO_3) solution 7.5% was added and the mixture was placed at room temperature for 2 hours. The absorbance was measured at 750 nm on a Shimadzu UV-1700 PharmaSpec spectrophotometer.

A calibration curve was performed using different concentrations of standard gallic acid solutions (r^2 = 0.9997) and the concentration of TPC was expressed as mg GAE/g dried material.

Table 1. The physic-chemical characteristics of the grape seeds powder (GS)

Sample	Moisture [%]	Ash[%]	Fat [%]	Total protein [%]	Total Polyphenols [mgGAE /g d.s.]	Antioxidant activity [%]
GS	5.75±0.15	3.06±0.02	6.31±0.10	10.93±0.25	91.72±0.21	29.52±0.34

All analyses were made in triplicate and mean value was recorded; Values with different superscript in same column are significantly different

Table 2. Physical properties of cookies

Sample Cookies	Diameter [mm]	Thickness [mm]	Spread ratio	Weight g
PM WF:GS	40.35^{a}	10.50^{c}	3.84^{c}	8.40^{a}
P1 WF:GS:C	40.30^{a}	11.00^{a}	3.66^{b}	9.30^{b}
P2 WF:GS:C	40.20^{a}	11.50^{b}	3.49^{a}	9.80^{c}

PM = wheat flour +3% grape seeds powder; P1= wheat flour +15% cranberry + 3% grape seeds powder; P2 = wheat flour +25% cranberry+ 3% grape seeds powder; *All analyses were made in triplicate and mean value was recorded; Values with different superscript in same column are significantly different*

Table 3. Sensory scores of prepared cookies using different addition (WF:GS:C)

Sample Cookies	Colour	Texture	Taste	Flavour	Overall acceptability
PM WF:GS	7.5^{a}	8.5^{b}	8.0^{a}	7.5^{a}	7.8^{a}
P1 WF:GS:C	8.0^{b}	8.0^{a}	8.5^{b}	8.5^{b}	8.5^{b}
P2 WF:GS:C	8.5^{b}	8.0^{a}	8.9^{b}	8.8^{b}	8.8^{b}

PM = wheat flour +3% grape seeds powder ; P1= wheat flour +15% cranberry + 3% grape seeds powder; P2 = wheat flour +25% cranberry+ 3% grape seeds powder; *Values with different superscript in same column are significantly different*

Table 4. Chemical characteristics for cookies

Sample Cookies	Moisture [%]	Fat [%]	Reducing carbohydrates content [%]	Ash [%]	Total protein [%]	Alcalinity, degree/100g
PM WF:GS	10.00±0.17^{a}	8.99±0.15^{c}	3.8±0.15^{a}	1.63±0.02^{a}	5.18±0.10^{b}	2.75±0.10^{a}
P1 WF:GS:C	11.00± 0.15^{b}	7.69±0.15^{b}	4.9 ±0.07^{b}	1.70±0.02^{ab}	5.03±0.12^{b}	2.10 ±0.15^{a}
P2 WF:GS:C	13.80±0.18^{c}	5.99±0.15^{a}	5.6±0.13^{c}	1.82±0.02^{b}	3.67 ±0.13^{a}	1.52±0.10^{a}

PM = wheat flour + 3% grape seeds powder; P1= wheat flour +15% cranberry + 3% grape seeds powder; P2 = wheat flour +25% cranberry+ 3% grape seeds powder; *All analyses were made in triplicate and mean value was recorded; Values with different superscript in same column are significantly different*

Table 5. Chemical characteristics for cookies

Sample Cookies	Total Polyphenols [mgGAE / g d.s.]	Antioxidant activity [%]
PM WF:GS	24.63±0.26 [a]	12.09±0.15 [a]
P1 WF:GS:C	74.34±0.23 [a]	21.52±0.23 [a]
P2 WF:GS:C	87.75±0.29 [a]	28.79±0.21 [a]

PM = wheat flour + 3% grape seeds powder; P1= wheat flour +15% cranberry + 3% grape seeds powder; P2 = wheat flour +25% cranberry+ 3% grape seeds powder; *All analyses were made in triplicate and mean value was recorded; Values with different superscript in same column are significantly different*

Determination of 2, 2 - diphenylpicrylhydrazil radical scavenging capacity (DPPH)

Scavenging activities of the extracts on the

stable free radical DPPH were assayed using the method adapted after Anesini *et al*. 2008. A volume of 0.1 mL of an methanolic extracts were mixed with 0.9 mL distilled water and 3.9 mL methanolic DPPH solution. After 30 minutes incubation in darkness, the absorbance of each sample was measured at 515nm against a blank of methanol.

The percentage of DPPH was calculated by measuring the absorbance of the sample and applying the following equation:

% of inhibition = [1 - (*A*s/*A*0)] × 100, where *A*s is the absorbance of sample, and *A*0 is the absorbance of the DPPH solution.

2.6. Statistical analysis

Statistical analyses were performed by using Minitab statistical software version 16 (Minitab Inc., State College, PA, USA) and by using two-way analyses of variance (ANOVA) and LSD multiple comparison test.

3.R**esults and Discussion**

3.1. Analysis of grape seed powder

The results presented in Table 1 show that grape seed powder contains significant amounts of mineral substances (3.6g%), fat (6.31g%) and proteins (10.93g%) but also antioxidant activity and high polyphenol content, fact found also by other authors [3,8,12].

Grape seed extract is known as a powerful antioxidant that protects the body from premature aging, disease and decay [13].

3.2. Physical analysis of cookies

The result of the physical analysis of the functional cookies produced is shown in (Table 2), which shows that the cranberry and grape seeds powder in different percentages has a significant effect on thickness, spread ratio and weight of cookies.

From the results, it was noted that the weight cookies have grown significantly as the proportion of cranberry the contents are up the samples PM, V1, V2 that could be explained by the increment addition on cranberry. The reduction of gluten in cookies dough by substituting with cranberry resulted in.

The physical characteristics of cookies undergo changes due to the decrease in protein content, influencing the hydration capacity.

The cookie diameter decreased as the amount of cranberry increased, having significant difference ($p \geq 0.05$) between PM, V1, V2. The thickness increased significantly between samples.

3.3 Sensory evaluation for cookies

Sensory analysis was carried out by using untrained panelists (83) to measure sensory characteristics texture, color, taste, flavor and overall acceptability of cookies.

Sensory evaluation of cookies, presented in Table 3, revealed that there are significant differences between PM, V1 and V2 samples regarding sensory attributes like texture, color, taste, flavor and overall acceptability only for cookies.

There was significant difference ($p \geq 0.05$) in color, texture, taste, flavor between retarding the formation of gluten matrices, which contributed to the substantial decrease in texture, fact that was also reported for other additions. [5]

Preferred by consumers is the V2 sample (wheat flour + 25% cranberry + 3% grape seed powder), for which the addition of cranberries imparts a savory sweet taste.

3.4. Chemical analysis of cookies

Cookies are a popular food, consumed widely, characterized by long shelf-life and it can be used as vehicle for bioactive compounds fortification [2].

There was a significant difference ($p \geq 0.05$) in moisture, ash, protein, fat, alkalinity and reduced carbohydrates content between PM, V1, V2 samples (Table 4). The addition of cranberries brings a mineral intake (from 1.63 g% for the control sample to 1.82 g% for the 25% cranberries sample), simple carbohydrates (from 3.8g% for the control sample to 5.6g% for the 25% cranberries sample) in contrast to the fat and protein content, fact also reported by other authors.[6,7].

In terms of antioxidant activity and total polyphenol content (Table 5), the optained values for the addition samples had significantly higher values than the control sample. Similar results were also reported in other studies [2].

4. Conclusion

The addition of cranberries and grape seeds powder ensures sufficient carbohydrate content for consumers. Grape seed meal can substitute wheat flour to reduce carbohydrate levels. This type of food, cookies, has an antioxidant capacity and significant polyphenol content. The skins and seeds are a rich source of high-quality polyphenols.

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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