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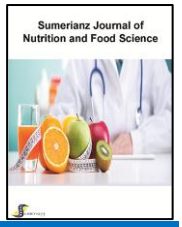

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Apparent Viscosity Colour Attributes and Antioxidant Activity of Cake Batter Prepared with Cranberry (*Vaccinium Macrocarpon*) Powder by Maceration Method

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Abstract

The influence of cranberry powder prepared by maceration method on some physichochemical properties of cake batter has been investigated. For this study, 11 concentrations and 1 artificial antioxidant (TBHQ) replacer with wheat flour. The apparent viscosity of cake batter significantly ($p \leq 0.05$) increased by increasing level of Cranbbery powder concentration and this increasing was duplicated at 50% replacement. In addition, lightnessand and yellowness of cacke batter formulation with cranberry powder decreased with increasing level of concentration and lightness getting darker than testifier sample and also redness value increasing too. Moreover, antioxisant capacity of samples with cranberry powder was higher than control sample based on widely range of phytochemical compound in cranberry structure. Finally, this present work showed that the usage of artificial antioxidant TBHQ supplementation with crarnberry powder significantly increased the antioxidant strength of cake batter compared to non-TBHQ specimens. Finally, statisticts pointed that sample contains 100 ppm TBHQ and 50% cranberry replacement as the best treatment.

Keywords: Cake batter; Cranberry powder; Apparent viscosity; Color attributes.

1. Introduction

In many research papers, most of researchers try and consider to usage and application of natural, organic and functional ingredients and raw materials based on planet and herbal to increasing from nutritional value till high quality technologies to improve the final products (Hosseinvand and Sorkhinejad, 2019). Cranberry has 2 varites, Large Cranberry (*Vaccinium macrocarpon*) and the Small Cranberry (*Vaccinium oxycoccos*). The quality and quantity content of all the natural and mineral compunds like Flavonoides (proanthocyaninidins and flavonols) depend on many factors like cultivation technologies, rippenes, harvesting time and region with weather. Cranberry with different varites has prominent and great functional for human body. This fruit also has widely range of phytochemical compound such as arabinoxyloglucan olygosacharides, anthocyanins such as C3Ga, C3Ar, P3Ga, P3Ar (Auker *et al.*, 2019; Cesonienė and Daubaras, 2015). Moreover, cranberry fruit has clinical treatment to oral health benefit and urinary trac infection (Alexander and John, 2019). Researchers state that cake batter formulation with unripe banana flour had highest specific gravity and lowest lightness value than testifier (Hosseinvand and Sorkhinejad, 2018). In addition, researchers state that L* and b* values decreased with increasing level of cranberry concentration and had high amount moisture at pound cake prepared with cranberry powder (Lee *et al.*, 2015). No study has been reported so far about the influence of cranberrw powder extraction based on maceration method and added to cake batter formulation. The present work was performed with the aim of determining the effects of cranberry powder to some physichochemical properties of cake batter.

2. Material and Method

2.1. Material to Prepare Cake Batter

All ingredients used to prepared the cake batter, Such as wheat flour (28% wet Gluten and 0.67% ash) Sunflowr oil, Baking powder, Sugar were purchased from chain store. Data at table 1, show formulation of cake batter with different concentration level of cranberry powder.

Table-1. Cake batter formulaton with different levels of cranberry powder with TBHQ (W/W %)

	Wheat flour	Cranberry powder	Baking powder	Milk	sugar	Sunflower oil	Egg	TBHQ
T0	50	0	1	10	14	10	15	0
T1	40	10	100ppm	100ppm	100ppm	100ppm	100ppm	100ppm
T2	30	20	100ppm	100ppm	100ppm	100ppm	100ppm	100ppm
T3	20	30	100ppm	100ppm	100ppm	100ppm	100ppm	100ppm
T4	10	40	100ppm	100ppm	100ppm	100ppm	100ppm	100ppm
T5	0	50	100ppm	100ppm	100ppm	100ppm	100ppm	100ppm
T6	10	0	100ppm	100ppm	100ppm	100ppm	100ppm	100ppm
T7	20	10	100ppm	100ppm	100ppm	100ppm	100ppm	100ppm
T8	30	20	100ppm	100ppm	100ppm	100ppm	100ppm	100ppm
T9	40	30	100ppm	100ppm	100ppm	100ppm	100ppm	100ppm
T10	50	40	100ppm	100ppm	100ppm	100ppm	100ppm	100ppm
T11	0	50	100ppm	100ppm	100ppm	100ppm	100ppm	100ppm

2.2. Cranberyy Extract by Maceration Method

The extract of cranberry was prepared by Maceration method. In the solvent extraction method with water / ethanol solvent Mixed to 1: 5 ratio and shaker was stirred for 24 hours followed by paper Filter No. 1 (used to remove the solid part and finally to remove the solvent from the rotary evaporator) used. The extract was kept in the refrigerator at 4 °C until the test (Handa *et al.*, 2008)

2.3. Color Attributes

Cake batters samples were measured for colour attributes in the L*, a*, b* values system using a Minolta Colorimeter CR- 300 (Konica Minolta Business Technologies, Inc., Langenhagen Hannover, Germany). Moreover, In this coordinate system L* value is a* measure of lightness ranging from black to white, a* value ranges from – (greenness) to + (redness) and b* ranges from – (blueness) to + (yellowness).

2.4. Antiooxidant Measurement

Antioxidant activity of cake batter samples was evaluated according to Gharibzahedi *et al.* (2013) with some revisions. Samples were mixed with methanolic DPPH solution and then the mixture kept for 30 min at room temperature. A DPPH solution with no added extract was considered as the control. The antioxidant activity as inhibition percentage of DPPH was measured at 517 nm according to the following equation:

1%: (A blank- A sample/ A blank) × 100 Eq. 1

2.5. Apparent Viscosity

Apparent viscosity of cake batter samples were measured directly using Brookfield Digital rheometer, Model rvdv+pro, USA. Sheare rate was between 1.9-76 ms^{-1} and the S07 spindle at 25°C was used for rheological measurement. In addition, all of data loading by Rheocalc V 32 software.

2.6. Statistic Data

Analysis of variance (ANOVA) was applied to determine whether there was significant difference between different formulations ($p \leq 0.05$). When significant difference was found, Duncan's multiple comparison test was used for comparison. Each value in the table is the Mean ± SD of three replicates and two determinations were conducted for each replicate.

3. Result and Disscusion

Proximate analysis of Cranberry powder show in Table 2.

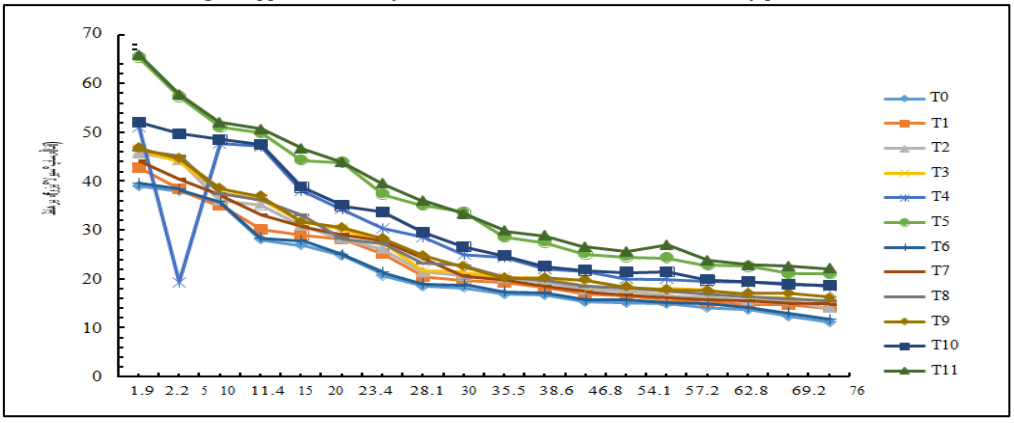
Table-2. Chemical measurement attributes of cranberry extraction

Protein	Ash	Moisture	Fat	Carbohydrate
15.0±453.46	0.0±0.813	11.01±555.02	1.01±110.1	67.01±55.35

3.1. Apparent Viscosity

Apparent viscosity of cake batter with cranberry powder with different levels show in Fig 1. Application of cranberry powder caused increasing apparent viscosity at 50% replacement. In generally, there is soluble and insoluble complex carbohydrate fiber such as glucose and pectin (High methoxy pectin) that could take incresed and improvement interaction and linked with complex between carbohydrate and phenolic. Meanwhile, exist of soluble in water fiber such as arabinose and galactose/rhamonose is another reasone to take ability to share hydroxile and methoxyle hydrogen fraction. In addition, ability of cranberry phenolic compound are covalent bound to complex with macromulcules like Carbohydrate. Strongly recommende that, nondianalyzable material or NDM dedicated to NDM of cranberry is heterogeneous mixture of condensed phenols and flavonoids whose structure variability will prevent any concrete structural elucidation. Finally, it seems that high and low amount of compuont in testifier and new formulation with cranberry take interaction (Attraction and repulsion) with polar and non-polar group in cake batter (Oil in Water emulsion) structure.

Fig-1. Apparent viscosity of cake batter formulation with cranberry powder



3.2. Antioxidation Activity

The Antioxidant parameters determined are shown in Table 3. The data from this research pointed that with increasing level of cake batter prepared with cranberry concentration, amount of antioxidation avtivity increasing. It semms that to exist of soluble phenolic fraction of cranberry varites contains a large amount of compunds that undoubtedly effect to the antioxidation capacity. It is clear that being numerous pigment into the structure of cranberry and also being of phytochemical compound like phenolic compoundand trans Cinamic acids and low total banzoates. An phenolic compound named (3,5.4-trihydroxy-trans-stilbene) is most importand and vital elemt and agent in cranberry varieties that has anticancer, antimicrobial and antioxidatin ability (Pappas and Schaich, 2009). Moreover, based on experimental comparison of application of cranberries products, it would be natural that dried (powder) cranberries has higher bioactive compounds than pomace and cranberiees juice (Oszmianski *et al.*, 2015).

Table-3. Antioxidant activity properties of cranberry extraction

	Total phenolic (Galic Acid)	**Free Radical scavenger (DPPH)**
Cranberry extraction	9.0±666.35	30.0±550.40
TBHQ	-	91.0±0.100

3.3. Colour Attributes

The color measurement results are listed in in Table 4. In generaly, control sample had highest lightness and b* value index in this study. As respected based on original color of cranberries fruits, red value of new cake formulation increased directly with increasing level of cranberry samples, respectivility. It seems that some of high weight molucules like polymeric water in solule pigment such as monomeric anthocyanins are basic compount to increasing dark redness value. Also, degree of the color of anthocyanind depend on mass fraction and cultivation technologies. These results were good agreement with Choi and Lee (2015). They reported that lightness value of cookies decreased with high amount of cranberry powder.

Table-4. Color attributes of cake batter with different levels of cranberry powder

Treatment	***L****	***a****	***b****
T0	88±18.07^{a}	-2±223.1^{b}	35±92.53^{a}
T1	85±92.44^{a}	-1±273.02^{b}	30.0±99.81^{a}
T2	84±41.61^{a}	-0.0±180.00^{b}	29.0±17.24^{b}
T3	81.0±69.74^{a}	0.0±600.0^{a}	27.0±66.00^{b}
T4	80.0±00.85^{a}	1.0±960.00^{a}	24.0±0.55^{b}
T5	75.0±47.17^{b}	2.0±626.01^{a}	22.0±82.22^{b}
T6	88.0±22.22^{a}	2.0±170.99^{a}	36.0±0.81^{a}
T7	85±89.54^{a}	-1.0±120.1^{b}	31.0±23.81^{a}
T8	84.0±53.59^{a}	-0.0±130.00^{b}	29.0±37.56^{b}
T9	81.0±60.70^{a}	0.0±0.503^{a}	27.0±55.55^{b}
T10	78.00+96.00^{b}	2.0±090.90^{a}	24.0±0.22^{b}
T11	75.01±11.11^{b}	2.0±650.1^{a}	22.0±63.63^{b}

4. Conclusion

The results gained from this research pointed that cake batter enriched with cranberry powder presented high amount of apparent viscosity than testifier that is desired to high quality and great texture at final product. In this present research, data showed that cranberry powder has high antioxidative ability to apply as natural, functional and organic ingredients at bakery products to increasing technological and nutritunal value. In color attributes, samples with cranberry powder were proper than testifier that is optional point to baked cake.

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