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PHYSICO-CHEMICAL AND ORGANOLEPTIC PROPERTIES OF RED BEET JUICE PURIFIED BY SHUNGITE

Lyudmila Melnyk[1*], Volodymyr Kryvorodko[1], Zinoviy Melnyk[1]

[1]National University of Food technologies, Volodymyrska 68, 1601 Kyiv, Ukraine

[*]e-mail: oloore@gmail.com

Abstract

Fresh red beet juice contains substances which could deteriorate its quality. Therefore, juice should be purified first. The promising method of purifying red beet juice from unwanted impurities is using carbon-bearing adsorbent - shungite, uniqueness of which can be explained by existence of fullerenes and nanotubes. The aim of this paper is to study how physico-chemical and organoleptic properties of red beet juice change when processed by shungite.

Such study is done according to following methodology: previously thermo - activated shungite in quantity of 3.23 - 9.09 weight percents (% wt) is placed in juice at 50 ^{0}C. The mixture is stirred and kept during 20, 40 and 60 min, filtrated, and filtrate is examined for availability of dry solids. The obtained results show that content of dry solids in red beet juice, purified by shungite, changes within experimental precision.

Organoleptic assessment of juice, processed by shungite, showed that its taste, consistency, color, total acidity level and pH practically do not differ from the control sample. Juice processed by shungite received 4.9 out of 5 points.

Thus, shungite doesn't deteriorate the content of dry solids in red beet juice and doesn't deteriorate its organoleptic properties compared with juice which was not processed by shungite.

***Key words**: Natural adsorbent, Shungite, Red beet juice purification, Dry solids.*

1. Introduction

Red beet juice contains protein, sugars, vitamins, minerals, microelements, amino acids, pectin and nitrogenous substances, and is an important food product. Canning industry produces red beet juice without pulp and such juice should be transparent, freed from visible nonsettleable particles. However, use of filtering and centrifugal processes can not help to manufacture a transparent product. Thus, gelatin and enzymes are used to clarify red beet juice.

One of potential technologies to obtain clarified juices is to apply carbon-bearing natural mineral shungite for their additional purification [1 - 8].

Considering the above, determination of physico-chemical and organoleptic parameters of red beet juice purified by shungite is a pressing matter and a purpose of this paper.

2. Materials and Methods

In order to determine titrated acidity of red beet juice 25 cm^3 of juice were placed in a measuring cup of 250 cm^3 and distilled water was filled in till top marking. After stirring, phenolphthalein indicator was added to the taken sample of 50 cm^3, and the mixture was titrated by NaOH solution with 0.1 molarity. Weight percentage (%) of titrated acidity was determined under the following formula:

$$X_{m.k.} = \frac{V_1 \cdot K \cdot V_o}{m \cdot V_2} \times 100,$$

Whereas:

V_1 stands for quantity of alkali solution with 0.1 molarity spent for titration, cm^3;

K stands for a coefficient of convention into corresponding acid (for apple acid – 0.0067);

V_0 stands for volume of diluted juice, cm^3;

V_2 stands for volume of solution taken for titration, cm^3;

m stands for juice volume, cm^3.

Measurement of pH was done by pH-meter at 20^{o}C. Arithmetical average of three parallel measurements was considered as the end result.

For the purpose of processing red beet juice adsorbent was prepared in the following way: weighted portion of adsorbent was washed with cold water to remove dirt and dust, dried in a drying oven for 90 minutes

at 90 - 100 ^{0}C, cooled in exicator till 20 ^{0}C and put in adsorber, using adsorbent to juice ratio - 1:10, 1:20, 1:30, which is equal to 9.09, 4.76 and 3.23 weight percent (% wt). Organoleptic assessment of red beet juice was done according to the scoring system based on organoleptic research results. The Ukrainian canning industry uses 5 - points scoring system. Organoleptic assessment is done by a commission on the basis of arithmetic average of points awarded by all members of a commission.

Dry solids content was determined at 20 ^{0}C with the help of refractometer. In event of temperature deviation, correction was made which was calculated under formula:

$$\Delta n = -1.5 + 0.0026 \cdot m + 0.0812 \cdot t - 0.0000186 \cdot m \cdot t ,$$

Whereas:

m stands for weighted percentage of dry solids in a product at certain temperature, %;

t stands for temperature at which measurement was done, °C.

Arithmetical average of three parallel measurements was considered as the end result.

3. Results and Discussion

Previous research established rational parameters for processing red beet juice by shungite [9 - 12]. They are: temperature of 50 ^{0}C and duration of 30 min.

Fresh red beet juice was heated up to 50 ^{0}C, prepared shungite was added in quantity of 9.09, 4.76 and 3.23 % wt, the mixture was stirred during 30 minutes, filtrated and filtrate was used to determine physico - chemical and organoleptic parameters as well as dry solids content. Average results are presented in Table 1 below.

Table 1. Organoleptic and physico-chemical parameters of red beet juice processed by shungite under rational parameters

Parameter name	Control sample	Juice processed by shungite
Visual appearance	Clear juice without foreign impurities or nonsettleable particles	Clear juice without foreign impurities or nonsettleable particles
Color	Burgundy, appropriate for red beet juice without unacceptable impurities and particles	Dark-red, appropriate for red beet juice
Consistency	Homogeneous liquid without separation	Homogeneous liquid without separation
Taste	Appropriate for red beet juice without unacceptable smell or aftertaste	Appropriate for red beet
Total acidity, %	0.0268	0.017
pH	7.5	7.3

It follows from the obtained results, that physico-chemical parameters of juiced processed by shungite, in principle, do not differ from the control sample parameters. Organoleptic assessment of juice processed by shungite showed that its taste, consistency and color correspond to the control sample.

The obtained results of laboratory research were confirmed by the Minutes of the Taste Panel Meeting of the Central Laboratory for processed products of fruits, vegetables, potatoes and grapes at the Ministry of Agricultural Policy of Ukraine. Juice processed by shungite was awarded 4.9 points out of 5.

Red beet juice, after being processed by shungite, has to comply with the standards, established for its products. For this purpose the dry solids content was determined before and after processing juice by shungite in quantity of 9.09, 4.76 and 3.23 % wt at 50 ^{0}C. The results are presented on Figure 1 below.

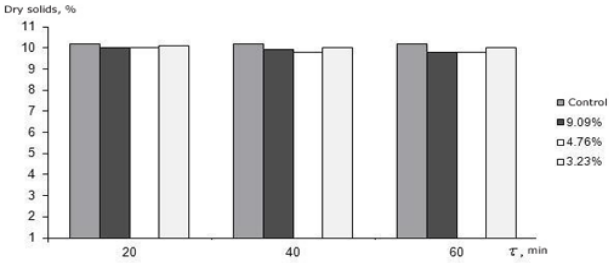

Figure 1. Dry solids content in juice processed by shungite, based on duration of its processing and different concentration of sorbent at 50 ^{0}C.

Figure 1 shows that due to interaction between adsorbent and juice during 20, 40 and 60 min., irrespective of sorbent's quantity, content of dry solids decreases from 10.2% to 9.9%. Such decrease is not significant and is within experimental precision.

4. Conclusions

- Physico-chemical parameters of red beet juice after being processed by shungite in quantity of 9.09, 4.76 and 3.23% wt at 50 ^{0}C during 30 min do not differ from parameters of juice which was not processed.
- Decrease in dry solids content detected in red beet juice processed by shungite, compared with the control sample, is within the limits of experimental precision.
- Quality of red beet juice processed by shungite is awarded with 4.9 points of the 5-points scoring system. Taste, consistency and color of the processed juice meet the requirement of statutory documents.

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