THE EFFECTS OF SULFITATION ON THE PHYSICAL PROPERTIES OF DATE JUICE

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Abstract: *ne of the most important stages in producing date syrup is purification and bleaching because date syrup extracted is brown and unsuitable for using in food industries.*

In sugar industries, juice sulfitation is the process of adding sulfur dioxide (SO_2) to the juice to reduce color and prevent color formation in the next steps of operation. In this investigation, the effects of sulfitation on some properties of purified date juice such as color, viscosity, and thermostability were studied. To prepare purified juice, juice extracted was purified by liming-phosphatation method. To add 15ppm SO_2 to purified date juice, a solution with the concentration of 29 ppm fromSodium thiosulfate was prepared and added to the purified date juice. Results showed that the viscosity and color of sulfitated juice were decreased; also at the initial times of heating at 95°C, thermostabilityof juice was increased, but after 30 min, thermostability was decreased highly.

Keywords: *Date juice, Sulfitation, Viscosity, Evaporation rate, decolorization, Thermostability.*

Introduction

Date syrup is a viscous liquid produced as a by-product of the date industry and it is rich in carbohydrate (75%W/W) and contains small amounts

of protein and fat (1.1 and 2.9%, respectively in addition too many macro and micro-elements [1].

One of the most important stages in producing date syrup is purification and bleaching because date syrup extracted is brown and not suitable for using in food industries.

Sulfitation is the practice of adding sulfur dioxide (SO_2) to beet and cane juice for the purpose of color control. The purpose of this study is evaluation of some properties of purified date juice such as viscosity, thermostability, and evaporation rate after sulfitation.

Materials and Methods

10kg dates from a variety of Shahani from Fars Province were provided afterwashing and sorting the kernels of dates by hand and changing them into a paste in a grinder[1].Extraction of juice was carried out by the reciprocal method. The properties of extracted juice are shown in table1.

*Table 1.*Chemical characteristics of the prepared date juice

Date juice Content	Concentration (g/100g) *SHAHANI*'s Date juice
Protein	0.76
Ash	0.77
Sucrose	0.26
Glucose	18.8
Fructose	17.9

Liming- phosphatation was used for the clarification of date juice. At first, saturated lime milk was prepared (212g CaO /1 liter H_2O) and added to raw juice through mixing and pH of juice was reached to 9.5.Themixture of date juice and milk of lime was mixed by a magnetic hot plate for 15min. To reduce viscosity of mixture, temperature was adjusted at 60°C. After 15 min, pH of mixture was decreased gradually to about 5 by phosphoric acid. FDA (Food and Drug Administration) requires that the amount of sulfur dioxide in foodproducts not exceed 20 ppm. Other standards, such as the Codex Alimentarius Standard, permit a maximum level of 15 ppm.

1 Matsushita, Osaka, Japan--National Company1

To prepare sulfitated date juice with the concentration of 15 ppm, a solution of Sodium thiosulfate ($Na_2S_2O_3(5H_2O)$ with 248.2 molecular weight) with the concentration of 2.9 g/l was prepared; then 1ml of this solution with the purified date juice was reached to the volume of 100 ml. So a solution with the concentration of 29 ppm from Sodium thiosulfate was produced 15 ppm SO_2 in the environmentaccording toEquation 6.

Equation 6:

$$Na_2S_2O_3(5H_2O) \longrightarrow Na_2S_2O_3 + SO_2$$

The color of raw, purified and, sulfitated date juice, using ICUMSA method in thewavelength420 andEquation 7,was measured and named ICUMSA Color [2](IU) [2].

Results and Discussion

The effects of sulfitation on color of date juice

As shown in table 2, sulfitation of clarified date juice (purifiedjuice) as the mentioned condition reduces the color of juice about 14% in the wavelength of 420 nm (related to yellow colorants) and 7% in thewavelength560 nm (related to red colorants).Sulfite ions act as a decolorization agent to reduce the color. Color isalso reduced by fastening hydrogen ions of sulfurous acid to the colorant structure. Because of both reactions, the color reduction occurred.[3]

*Table 2.*The color of the purified and sulfitated juice in the wavelengths of 420 and 560 nm

Color in the wavelength of 560 nm	Color in the wavelength of 420 nm	sample
100.96	1195.6	Purified juice
93.96	1038.05	Sulfitated juice

The effects of sulfitation on the viscosity of date juice

Viscosity, defined as resistance to flow, is dependent on the concentration and molecular size and shape. Sucrose solutions will have a measurable higher viscosity than invert sugar solutions if both are at equivalent concen-

2 ICUMSA UNIT

trations, because of sucrose's larger molecular size.[4]. As shown in fig 1, sulfitated date juice has a lower viscosity than purified juice. It is because Sulfite reacts with a series of food constituents, such as proteins with cleavage of disulfide bonds.[5,6]

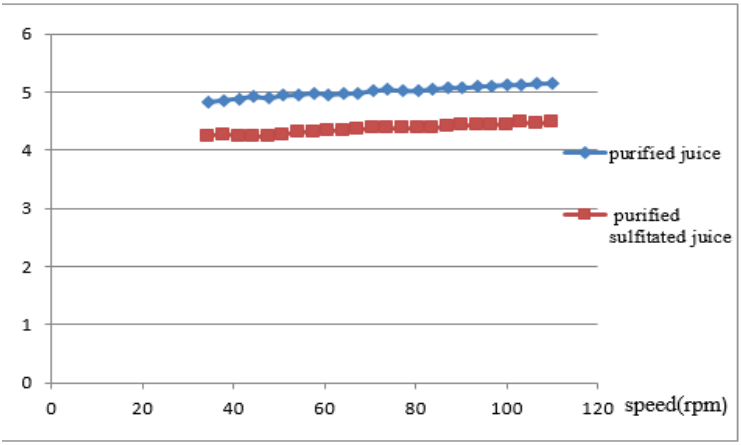

Fig 1.The viscosity of purified and sulfitated juice at 25 °C

The effects of sulfitation on thermostability of date juice

One of the most important reactions in the field of food chemistry is the maillard reaction. It takes place when reducing saccharidde, (such as invert sugars) and amines, or amino acids are available for the reaction.[7]

In some juices such as cane and date juice, the invert sugar is high and during evaporation, they tend to exhibit a higher color formation than thermostable juices.[8,].

Fig 3 shows that the thermostability (the color formation during heating) of purifiedjuice islower than the raw juice; this is because of the removal of suspended particles such as proteins which play an important role in the maillard reaction.

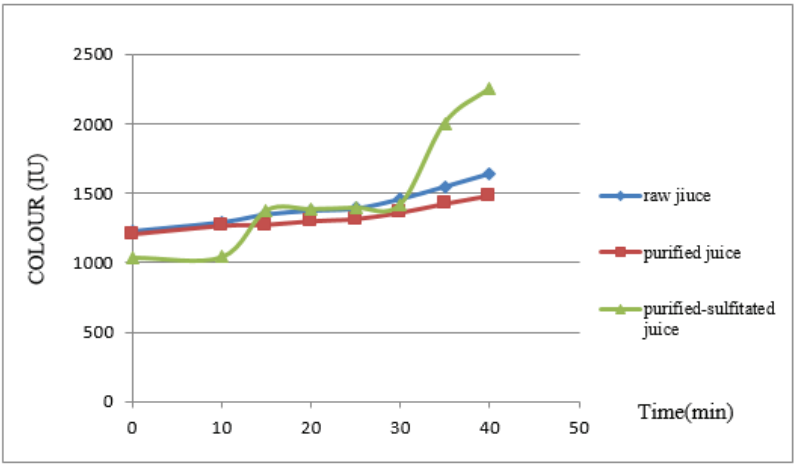

Fig2.The termostability of raw, purified and sulfitated juice in the wavelenghth of 420 nm at 95°C after 40 minutes

As shown in fig3, sulfitation prevents color formation to about 15 min after heating.From 15 to 20 min, thermostability was rather constant and the rate of production of SO_2 and color formation was equal. Almost after 30 min, the color formation of sulfitated juice was highly increased because the blankite was used and the concentration of precursors of maillard reactions was increased and sulfit ions which blocked color forming maillard reactions were excluded from the environment in the form of SO_2.

Conclusion

The use of FDA and codex alimentarius standard requires that the amount of sulfur dioxide in food products not exceed 15 ppm. Results showed that sulfitation had a small effect one decolorization of date juice (14% in 420 nm and 7% in 560 nm), reduced viscosity, , increased thermostability of date juice at the initial time of heating to 15min after heating, and decreased thermostability after 30 min in 95°C.

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THE IMPACT OF MEDICAL DRUGS ON THE MORTALITY RATE OF BIFIDOBACTERIUM STRAINS

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Abstract: *The objective of this study was to determine the impact of commonly administered medical drugs on the death rate of Bifidobacterium. Four strains of Bifidobacterium (B.breve, B.longum, B.infantis, B.adolescentis, and B.bifidium) and eight medical drugs (Aleve, Aspirin, Tylenol, Hydrochlorothiazide, Lisinopril, Metformin, Metoprolol, or Glipizide) were used in the study. One tablet of each medical drug was ground*