

# Analysis Of Sodium Benzoat Levels In Drink Samples Carbonized With Brand X

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**Abstract.** to determine the suitability of the levels of sodium benzoate in drinks with brand X concentration. The method used qualitatively with FeCl<sub>3</sub> and quantitatively with Acidimetry-Alkalimetry and Spectrophotometry Titration. Qualitative analysis of sodium benzoate with FeCl<sub>3</sub> test showed positive results with changes in the color of the solution to brown. Quantitative analysis of sodium benzoate with acidimetry-alkalimetry titration method was 7.776% and spectrophotometric method was 13.402 ppm. the results of the research on brand x carbonated drinks show that the maximum level set by the government is 1000 ppm.mg/ml.

**Keywords:** carbonated drinks ,sodium benzoate, acidimetry-alkalimetry, spectrophotometric

## 1. Introduction

Food safety is a key requirement that must be possessed by every production circulating in the market, therefore to guarantee the safety of processed food requires cooperation between the government and producers of the food and beverage industry. The use of food additives in the food production process needs to be watched out together, both by producers and by consumers. The impact of its use can be both positive and negative for the community [1].

Carbonated drinks or what is known as soft drinks (softdrink) become one of the favorite drinks as a thirst release because it tastes good and fresh [2]. Because it is stored for a certain period of time, this drink is often given additional preservatives to maintain its quality (Sidik, 2013). One of the preservatives that is often used is sodium benzoate. The salt form of benzoic acid is preferred because it is 200 times more soluble than its form the acid (Glevitzky, et al., 2009; Dionex, 2004).

*Food and drug administration (FDA).* The FDA includes benzoate as a commonly recommended ingredient with a maximum allowable concentration of 0.1%. The use of a higher benzoate of about 0.1% will change the taste in soft drinks [3].

The use of sodium benzoate in food is permitted by the government, but may not exceed the maximum level that has been set. The maximum amount of benzoic acid allowed is 600 mg / kg mentioned in the Head of BPOM RI Regulation No. 36 of 2013 concerning the maximum limit on the use of preservative additid.

One of the synthetic sweeteners that is often used by manufacturers is cyclamate. Limits limit on the use of preservative additives. The application of synthetic sweetener which is permitted in accordance with the regulation of the Minister of Health of the Republic of Indonesia Number 208 / Menkes / Per / VI / 1985, which is cyclamate for the maximum usage limit of 2 g / kg is calculated as cyclamic acid. This is because the consumption of cyclamate in more doses will result in bladder cancer. It will also cause lung, liver, and lymph tumors [4].

Based on the background above, the authors intend to determine the suitability of sodium benzoate as a preservative and cyclamate as a synthetic sweetener in one of the brands of carbonated drinks (soft drinks) with a limit on the maximum levels set by the government with qualitative and quantitative methods using alkaline asidi and spectrophotometric instruments Uv- Vis

## 2. Methodology

The tools used in this research are: volumetric flask, Erlenmeyer, Stirring Rod, Spatula, Watch Glass, Filter Paper, burette, stative and clamps, measuring cups, volume pipettes, analytical scales, test tubes, separating funnels, Uv-Vis Spectrovetometri .

Material. The ingredients used are: Sodium benzoate, Sodium Cyclamate, 3N HCl, Sodium nitrite 10%, Diethyl ether, Ethanol, NaOH 0.3N, Ether, NH<sub>4</sub>OH, NH<sub>3</sub>, FeCl<sub>3</sub> 5%, Indicators PP, BaCl<sub>2</sub> 10%

## 3. Material and Method

Sampling is done by purposive method. Samples of soft drinks are taken with the characteristics - not sold at this famous market The tools used in the study are: Pumpkin, Erlenmeyer, Stirring Rod, Spatula, Watch Glass, Filter Paper, burette, stative and clamps, measuring cups, volley pipettes, analytical scales, test tubes, separating funnels, Uv-Vis Spectrovetometri . The principle of work in the identification and determination of Na Benzoate in carbonated drinks in the city of Banjarmasin is done by qualitative and quantitative methods, quantitative methods are carried out by the test identification with FeCl<sub>3</sub>, whereas quantitative methods by the Acidimetry-Alkali and Spectrophotometry methods.

### 3.1 Qualitative analysis

Uji with FeCl<sub>3</sub> :

The FeCl<sub>3</sub> content test is carried out by the following method:

- a. Enter 50 grams of the sample into a 250 mL volumetric flask
- b. Add 10 ml of 10% NaOH to be alkaline,
- c. Add saturated NaCl solution and biarka for 2 hours filter and identify with the addition of 5 drops of FeCl<sub>3</sub>

### 3.2 Quantitative analysis

- a. The Acidimetry-Alkalimetry Titration Method
  - 1) Standardization of NaOH with Oxalic Acid, Standardize Oxalic Acid with 0.1 N NaOH titration until pink or TAT is formed and calculate NaOH levels
  - 2) Determination of Sodium Benzoate Sample Levels. Sample 10 ml dissolve with 30 ml aquadet, add PP indicator 2-3 drops, titrate with NaOH which rests until a pink TAT is formed, record and calculate% of sodium benzoate
- b. Determination of levels with Uv-Vis Spectrophotometry
  - 1) Making of the Sodium Benzoate Standard curve
  - 2) Weigh Sodium Benzoate 1 gram dissolve with 100 ml aquadest add
  - 3) Dilutions were made at concentrations of 8000, 6000, 4000, and 2000 ppm
  - 4) 8000 ppm: 8 ml of standard solution diluted with 10 ml of aquadest, 6000 ppm: 6 ml of standard solution diluted with 10 ml of aquadest, 2000 ppm: 2 ml of standard solution diluted with 10 ml of aquadest, Read the absorbance of the blank and absorbance of the sample in wavelength of 288 nm

## 4. Result and Discussion

Qualitative examination on forms shows positive results on identification of the FeCl<sub>3</sub> test, this is marked by the color of the solution being brown and showing that the sample contains Sodium Benzoate



Fig. 1. Analysis of Sodium Benzoate with FeCl<sub>3</sub>

### 4.1 Quantitative Analysis of Sodium Benzoate by Acidimetry-Alkalimetry Titration

- a. NaOH standardization NaOH normality calculation is as follows:

$$\text{Diketahui: } V_{\text{Titran}} = V_{\text{NaOH}} = (3,2 \text{ ml} + 3,5 \text{ ml})/2 = 3,35 \text{ ml}$$

$$V_{\text{Titrat}} = V_{\text{Asam Oksalat}} = 10 \text{ ml}$$

$$N_{\text{Titrat}} = N_{\text{Asam Oksalat}} = 0,1 \text{ N}$$

$$V_{\text{Titran}} \times N_{\text{Titran}} = V_{\text{Titrat}} \times N_{\text{Titrat}}$$

$$N_{\text{Titran}} \frac{V_{\text{Titrat}} \times N_{\text{Titrat}}}{V_{\text{Titran}}} = \frac{10 \text{ ml} \times 0,1 \text{ N}}{3,35 \text{ ml}} = 0,3 \text{ N}$$

b. Determination of Sodium Benzoate Levels

Calculation of sodium benzoate in the sample can be done with the following formula

$$\% \text{Kadar} = \frac{N_{\text{titran}} \times V_{\text{titran}} \times \text{BE natrium benzoat} \times \text{faktor pengenceran}}{\text{ml sampel} \times 1000} \times 100\%$$

$$N_{\text{Titran}} = 0,3\text{N}$$

$$V_{\text{Titran}} = 6 \text{ ml}$$

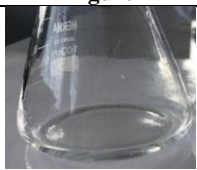
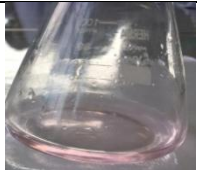
$$\text{BE}_{\text{Natrium Benzoat}} = \text{BM/valensi} = 144/1 = 144$$

$$\text{FP} = 30 \text{ ml}/10 \text{ ml} = 3$$

$$\text{ml Sample} = 10 \text{ ml}$$

$$\% \text{ Kadar} = \frac{0,3\text{N} \times 6 \text{ ml} \times 144 \times 3}{10 \text{ ml} \times 1000} \times 100\% = 7,776\%$$

**Table 1.** Results of Determination of Sodium Benzoate Levels

No	Reaction	Volume	Level	Figure
1	NaOH standardization	3,3 ml	0,3 N	
2	Determination of sodium benzoate levels	6 ml	7,776%	

#### 4.2 Qualitative of analisis Spektrofotometri Uv-Vis

**Table 2.** Sodium Benzoate Standard Curve

Konsentrasi (ppm)	Absorbansi
2000	0,159
4000	0,252
6000	0,362
8000	0,442

Benzoate Based on a standard curve, values are obtained:

$$a = 0,064$$

$$b = 4,79 \times 10^{-5}$$

$$r = 0,99$$

The absorbance value (y) of sodium benzoate with a wavelength of 288 nm in the sample is 0.706 ppm. Then the concentration is calculated using the formula  $y = a + bx$

$$x = \frac{y - a}{b} = \frac{0,706 - 0,064}{4,79 \times 10^{-5}} = 13.402 \text{ ppm}$$

Drink X samples were analyzed to determine the content of sodium benzoate preservatives and cyclamate food sweeteners. Prior to qualitative and quantitative analysis, extraction is carried out in advance to extract specific extracts so that they are not disturbed by other compounds when further analysis is carried out. In the extraction process acidification is carried out on 10 ml of sample with the addition of 15 ml of HCl. The purpose of acidification is to turn benzoic compounds back into benzoic acid which is not soluble in water but dissolved in organic solvents (chloroform). So the results of extraction using separating funnel can attract benzoate preservatives in the organic / chloroform phase.

The compound analyzed is sodium benzoate whose composition is listed on the beverage sample X pack. The qualitative analysis of sodium benzoate in the sample is carried out by weighing a sample of 50 grams and then adding 10% NaOH to alkalise the sample solution, so that all the benzoate is present as its water-soluble salt. Then added saturated NaCl to increase the level of ionization from water to be more polar so that the level of water mixing with chloroform will not increase which is useful in phase separation. Saturated for 2 hours then filtered and acidified with 3N HCl. The purpose of acidification is to turn benzoic compounds back into benzoic acid which is not soluble in water but dissolved in organic solvents (chloroform). Then heated to dry and added aquadest to be tested with  $\text{FeCl}_3$  to identify sodium benzoate in the sample. The test results show the color change of the solution to brownish stating that the positive sample contains sodium benzoate.

Quantitative sodium benzoate test was carried out by 2 methods, namely the titration method and UV-Vis spectrophotometry. The titration method is a method for determining the concentration of a substance using other substances whose concentration is known. The concentration or concentration of acid-base solutions can be determined by the volumetric method with the acid-base titration technique. Before determining the level, NaOH standardization was done first with oxalic acid and NaOH concentration value obtained was 0.3 N. After that the determination of sodium benzoate was done by means of the titration material inserted into the biuret that is 30 ml distilled water, add 2 drops dropper pp, after dropping the pipette it was titrated with 0.3 N NaOH until it was pink. The titrant used is NaOH which is alkaline because sodium benzoate is weak acid. In quantitative test calculations the determination of sodium benzoate levels, the lower the volume of the titration, the higher the sodium benzoate content, otherwise the higher the titration volume, the lower the sodium benzoate content contained in the sample. Titration results with 2 replications gave an average value of 6 ml and after the calculation of% sodium benzoate levels obtained values of 7.776%.

The quantitative analysis method that is performed next is the UV-Vis spectrophotometry. Previously, sodium benzoate absorbance measurements were taken on the sample, standard curves were determined first with concentrations of 2000, 4000, 6000 and 8000 ppm so that a value of  $a = 0.064$ ,  $b = 4.79 \times 10^{-5}$  and  $r = 0.99$  was obtained. The absorbance value

of sodium benzoate obtained at a wavelength of 288 nm is 0.706 ppm. And the concentration obtained after the calculation is 13,402 ppm.

The calculated value after the quantitative test using the titration method and UV-Vis spectrophotometry is very large but cannot be compared with the levels listed on the package because the levels of sodium benzoate used as preservatives in the sample are not listed. However, the use of permissible sodium benzoate and food additives has been regulated by BPOM No.36 of 2013 concerning the maximum limit of the use of Preservative BTP, ie the maximum amount of sodium benzoate that can be used is 1000 ppm or 1 gram per kg of material and benzoic acid has ADI 5 mg per kg body weight. Because if sodium benzoate is consumed in excessive amounts will cause adverse side effects for health.

The conclusion obtained from this practicum is a qualitative analysis of sodium benzoate with the FeCl<sub>3</sub> test showing positive results with the change in color of the solution to brown. Quantitative analysis of sodium benzoate by the acidimetry-alkalimetry titration method is 7.776% and by the spectrophotometric method is 13.402 ppm

## 5. References

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