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Quality Evaluation And Estimation Of Sulphurdioxide In Different In Brands Of Mango Juice Present Tetrapack

Sonia.K[1]*, Sujatha. K[2], Badri Narayanan.K[3], Lakshmi Narayanan.D[4], Monisha.K[5], Saranya.C[6], Sarath.E[7]

[1*,2,3,4,5,6,7]Department of Pharmaceutical Chemistry, Sri Ramachandra Faculty of Pharmacy, SRIHER, Porur, Chennai.

***Corresponding Author:** Dr. K. Sonia

*Associate Professor, Department of Pharmaceutical Chemistry, Sri Ramachandra Faculty of Pharmacy, SRIHER, Porur, Chennai. E-mail: soniapharm68@gmail.com and soniapharm85@sriramachandra.edu.in

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KEYWORDS:
Sulphurdioxide, Different brands, pH, Temperature, Density, Vitamin C, Free acidity.

ABSTRACT

The research was carried out to determine the nutritional value of different brands of mango juice that were packaged in tetra packs. The following variables were evaluated and tabulated: pH, temperature, density, vitamin C content, free acidity, total and bound sulphur dioxide, as well as free and total sulphur dioxide. The mango juices' pH values ranged from 2.6 to 5.92, their temperatures from 29 to 31, their densities from 1.019 to 1.052, and their vitamin C concentrations from 0.04 to 0.161. The ranges for free acidity, free sulphurdioxide, total sulphurdioxide, and bound sulphurdioxide are 0.003 to 0.101, 12.8 to 211.2, 128.0 to 262.4, and 51.2-128 ppm, respectively. The overall findings of these juices show that the Tetra-packed mango juice samples were suitable for human consumption.These days, kids are more drawn to these juices in tetra packs so the Health Benefits must Be Considered, thus, Sulphur dioxide concentrations are typically not estimated in research publications; nevertheless, in the current investigation, sulphur dioxide determination was Analysed and submitted.

INTRODUCTION :

One of the most prominent and widely grown fruits in the tropics is the mango, or Manifera indica, which belongs to the Anacardiaceae family. There are numerous cultivars of the mango tree, which is thought to be native to Southern Asia, mainly Myanmar and the Indian state of Assam. The mango comes in a variety of forms, including oval, heart, kidney, long, and slender. The tiniest mangoes are only a little larger than plums, whilst others can weigh up to 5 pounds and range in size from 1.8 to 2.3 kilograms. Mango has a number of health benefits, including the ability to prevent cancer, increase brain and immune system function, support heart health, relieve indigestion and acid reflux, treat acne, and delay the aging process. Mangoes are rich in calcium, phosphorus, iron, potassium, vitamin C, vitamin A, and vitamin D. In India, there are hundreds of different mango kinds, including Alphonso, Dasher, Langra , Neelam, Totapuri, Hapus, and Kesar. Mangos are a delectable fruit with a sweet, juicy flavor. It is frequently used to make a range of sweet and savoury foods, including juices, jams, jellies, and pickles. There are now numerous new fruit juice-based beverage brands available in glass, plastic, brick packs, and tetra containers. Although there are laws governing the manufacturing of high quality, the majority of producers do not properly abide by them. Food adulteration can be very detrimental to the development of a healthy society. Numerous illnesses, such as paralysis, cancer, mental retardation, etc., might be brought on by it. It is essential to take the required steps in order to avoid food adulteration and other problems. One of the most important stages in this direction is educating the public about hygienic conditions. It is crucial to call attention to the various pollutants included in commercial food products. This can only be done by the media through advertising. The government needs to start a campaign against food adulteration to compel businesses to change how they produce their goods[16-17]. Sulphur dioxide is an odourless gas that has a pungent scent. It becomes liquid under pressure and easily dissolves in water. The smelting of copper and the burning of coal and oil in power plants are the main contributors of sulphur dioxide in the atmosphere. Volcanic eruptions can release sulphur dioxide into the atmosphere in the natural world. To keep the dried fruit from turning brown, some dried fruits are kept with SO_2. Additionally, SO_2 is utilized as a fumigant and in bleaching products. Smoke from cigarettes, incorrectly or insufficiently vented gas equipment (such as stoves, ranges, furnaces or clothes dryers), gas or kerosene heaters, wood or coal stoves, car exhaust from linked garages, and damaged chimneys can all produce sulphur dioxide gas in a residence. Due to their qualities,sulfites and sulphur dioxide are frequently utilized as preservatives and antioxidants in the food sector. Sulphur dioxide is frequently used in seafood, wine, dried fruits, fruit juices, jams, and potato-based recipes. It increases the time that food remains fresh by preventing the growth of bacterial and fungal cultures. Sulphur dioxide also slows down the oxidation of food when it comes into touch with oxygen. This helps food keep fresher for longer by greatly slowing down the destruction of its smells, colours, and vitamins. In contrast to the fruit's brown colouring, dried fruits like apricots, for instance, retain their golden colour for a longer period. However, sulphur dioxide's poisonous effects make its usage in food not fully risk-free. Although most people do not have a problem with low levels of intake, intolerant reactions like headaches and nausea do happen frequently. Even allergic reactions could happen in the worst-case scenario. Due to this, sulphur dioxide use is subject to internationally enforceable limit levels. There is a labeling need if specific quantities are exceeded, which are 10 mg/kg and 10 mg/l in the EU and the USA, respectively. The colour and flavour of some frozen fruits as well as dried fruits are frequently preserved with sulphur dioxide. Its application necessitates management within relatively limited limitations for frozen fruits but very vast boundaries for dried fruits. The issue of controlling sulphur dioxide concentration in frozen fruits has grown in importance as a result of the frozen fruit industry's recent enormous expansion. Sulphur dioxide is frequently used in the food and beverage industries due to its qualities as an antioxidant and preservative. It is safe for healthy persons to use at the recommended dosages, but it can trigger asthma in those who are vulnerable when inhaled or ingested, even at high dilution. Approximately one in nine asthmatics report having a history of their asthma being made worse by consuming' soft drinks' that contain sulphur dioxide. Since they are still so young, most of their asthma is extrinsic. The amount of sulphur dioxide that can be detected in food is restricted by laws in the UK, guidelines in the EEC, and suggestions for "good manufacturing practises" in the USA. There is a list of popular foods and beverages that contain sulphur dioxide. Sulphur dioxide is a class II preservative that is theoretically added to food products. Undissociated sulphuric acid, free bisulphate or sulphide ions, mixed SO_2 in the form of hydroxy, sulphonates, or free bisulphate or sulphide ions are some of the possible forms. The unit used to measure sulphur dioxide is total or free SO_2 Estimating SO_2 levels in squash, jam, and RTS drinks is essential because their presence beyond the stipulated FPO limits makes the product illegal to sell under Indian food rules. For every two parts of KMS (potassium metabisulphite), one part of SO_2 is typically emitted.Iodine is used in direct titration to quantify free SO_2. The combined SO_2 is freed for use in the measurement of total SO2 by treatment with excessive alkali at room temperature, followed by an acidification step to stop recombination and iodine titration. The process is referred to as the Modified Ripper Titration Method.[1],[6-15]. In light of this, the current study was carried out to evaluate several parameters like pH, temperature, density, acidity, and Sulphur Dioxide estimation.

EXPERIMENTAL METHODOLOGY:

MATERIALS AND REAGENTS:

The Tetra packs of various brands of mango juice were purchased from the neighborhood market. The raw materials like NaOH pellets were procured from Thermo Fisher Scientific India Pvt. Ltd (Mumbai) for preparation of 5N NaOH. Iodine and potassium iodide were procured from Sisco Research Laboratories Pvt. Ltd (Maharashtra) for preparation for 0.02N Iodine solution and 0.005M Iodine solution. Concentrated H_2SO_4 were procured from Merck Life Science Pvt. Ltd(Mumbai) for preparation of Diluted H_2SO_4. Concentrated Hcl were procured from Merck Life Science Pvt. Ltd (Mumbai) for the preparation of 5N Hcl. Starch was procured from Hi Media Laboratories Pvt. Ltd (Mumbai) for preparation of 1% starch indicator. Formaldehyde were procured from Sisco

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Research Laboratories Pvt. Ltd. (New Mumbai). Sodium carbonate were procured from Thermo fischer scientific Pvt. Ltd. Phenolphthalein were procured from Central Drug House Pvt. Ltd.

EQUIPMENT AND APPARATUS USED

The equipment like the Digital weighing balance was procured from Nano Technologies Pvt. Ltd(Bengaluru). Digital pH meter were procured from Avi Scientific (India).

PREPARATION OF REAGENTS

0.005M Iodine solution – In a 100ml beaker, weigh 2g of potassium iodide, add 1.3g of iodine and, a few ml of distilled water were added and stir the mixture for a few minutes and makeup to 100ml with distilled water.

5N NaOH – 20gm of NaOH pellet was dissolved in 80 ml of distilled water in a beaker and final volume was made to 100ml after it has cooled.

Diluted H_2SO_4 - Using a funnel, took 15ml Con H_2SO_4 in a measuring cylinder kept aside, 300ml of water were taken in a beaker. Gently add 15ml of Con H_2SO_4 in a beaker of 200ml of H_2O.

1% Starch indicator – Weigh 1gm of Starch powder, dissolve to a little of distilled water, and dilute to solution to 100ml with hot water.

5N HCl – 43 gm of Con Hcl were diluted with 100 ml of distilled water.

0.002N Iodine solution - Accurately weigh 2.54g of Iodine were transfer to a glass beaker, add a small amount of distilled water 50 mL then go on adding in small portions of well-powdered potassium iodide about 5gram with continuous stirring until you get a transparent solution all the crystals of Iodine completely dissolved. Keep the solution to attain room temperature. Transfer this solution to a 1000ml volumetric flask, wash the beaker 3-4 times with distilled water, transfer the washings also to a flask, and finally dilute upto the mark correctly.

METHODOLOGY:

ESTIMATION OF FREE SO_2

Place two separate flasks with known weights (10–20 g) of sample material (mango juice). To acidify, add 5 ml of diluted H_2SO_4 to each. To remove the air in the sample, add 0.5 g sodium carbonate to the first flask. As an indicator, add 5-7 drops of starch solution. Titrate the end point immediately with 0.02 N iodine solution and note the titre value as 'a.' Acidify a comparable aliquot of the sample with 5 ml of diluted H_2SO_4 to measure the titre owing to iodine-reducing compounds other than SO_2. Fill the second flask with 10 ml of formaldehyde and let it keep it aside for 10 minutes. The titer value should be recorded as "b" when titrating against iodine to generate a faint permanent blue tint. Determine the quantity of iodine absorbed by the free SO2 contained in the sample by subtracting titre 'b' from titer 'a' (a-b), then calculate free SO2 using the above-mentioned formula.

$$\text{Free SO2 (ppm)} = \frac{\text{Titre} \times 0.64 \times 1000}{\text{Weight of sample}}$$

ESTIMATION OF TOTAL SO_2

Add 5ml of 5 N NaOH to each flask after placing a known volume of the sample from the sample used to calculate the amount of free sulphur dioxide in each flask.. Allow to stand for 20 minutes after a gentle stir. One of the samples should be given 7 ml of 5 N Hcl. Use 1 ml of the 1% starch solution as an indicator of a definite dark blue colour before titrating right away with 0.02 N iodine. 'c' should be entered as the titre value.

This titration shows the sample's overall iodine reduction value. Acidify the second sample in the same manner with 5 ml of diluted H_2SO_4 to identify any reducing agents other than sulfites, such as ascorbic acid.Add 10 ml of formaldehyde (36–40%) to the sample to bind the sulphite, and then leave it alone for 10 minutes. Titrate quickly with constant stirring (or use a mechanical stirrer) against a 0.02 N iodine solution until a dark blue colour appears and lasts for at least 15 seconds. Add the 1% starch solution as an indicator. Enter a 'd' for the titre value. Subtract titre d from titre c ('c-d') to determine the volume of iodine required to dissolve all of the SO_2 in the sample.

$$\text{Total } SO_2 \text{ (ppm)} = \frac{\text{Titre x 0.64 x 1000}}{\text{Weight of sample}}$$

ESTIMATION OF BOUND SO_2

Total SO_2 – Free SO_2.

DETERMINATION OF pH:

Follow the instructions to calibrate the pH metre. Fill a clean beaker with the sample of 20ml mango juice. To avoid any carryover, give the probe a thorough rinse with distilled water. Change to pH mode. the sample with the

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probe submerged. Create homogeneity by stirring to bring the probe and sample into equilibrium. After placing the beaker on a magnetic stirrer, gently drop a stirring bar into the sample. Start the magnetic stirrer, and then change the speed for thorough but gentle mixing. Check and note the pH. Use distilled water to completely rinse the electrode and note the pH value.

DETERMINATION OF TEMPERATURE:

Take a 50ml of mango juice sample, place the thermometer in the beaker, and note the constant reading.

DETERMINATION OF DENSITY:

First determine the weight of the density bottle(W_1) when it's empty. Then fill it with the sample mango juice to determine the density. Then determine the weight of the bottle with the sample mango juice (W_2). Then the weight of the liquid is equal to (W_2-W_1). We already know the volume of the bottle. (v)

Density of juice sample (p) = W_2-W_1/ v

DETERMINATION OF FREE ACIDITY:

Titrate 10 ml of a sample fruit juice in a clean, dry conical flask with 3–4 drops of phenolphthalein indicator in a standardized sodium hydroxide (NaOH) Solution. The produced pink colour should last for at least 10 seconds. Take note of the required amount of standard sodium hydroxide solution. Using the following formula, we can determine the free acidity of fruit juice.

Free acidity(N) = N * Volume of NaOH/ Volume of sample used

Where; N = Normality of NaOH.

DETERMINATION OF VITAMIN C BY IODOMETRIC TITRATION

Into a conical flask, pipette 20 ml of the sample solution. 150 ml of distilled water should be added along with 1 ml of the 1% starch indicator solution. Use a 0.005M iodine solution to titrate the sample. The first trace of a dark blue colour caused by the starch iodine complex is used to identify the titration's endpoint. Continue the titration with additional aliquots of the sample solution until concordant results are obtained.[2-5]

Concentration in juices (g/ml) = y/b

Where; y = Titrate value b = volume of sample

RESULTS AND DISCUSSION

By examining their criteria, this study was done to assess the mango juices quality. Sulphur dioxide is widely utilised for conservation. The mango juices' pH values ranged from 2.61 to 5.92, their temperatures from 29 to 31, and their densities from 1.019 to 1.052. Vitamin C concentrations range from 0.04 to 0.161. According to Table 1, free acidity ranges from 0.003 to 0.10. According to the table2, bound sulphur dioxide ranges from 51.2-12 to 128ppm, free sulphur dioxide ranges from 12.8 to 211.2, total sulphur dioxide ranges from 128.0 to 262.4, and free sulphur dioxide ranges from 12.8 to 211.2.

TABLE 1: SUMMARY OF PARAMETERS

BRANDS	TEMPERATURE	pH	DENSITY	VITAMIN C	FREE ACIDITY
A	30 ˚ C	2.61	1.019	0.04 g/L	0.004N
B	31 ˚ C	2.80	1.029	0.03 g/L	0.003N
C	29 ˚ C	4.92	1.031	0.32 g/L	0.003N
D	30 C	4.68	1.022	0.25 g/L	0.016N
E	30˚ C	5.92	1.052	0.161g/L	0.101N
F	30˚ C	5.08	1.026	0.065g/L	0.005N

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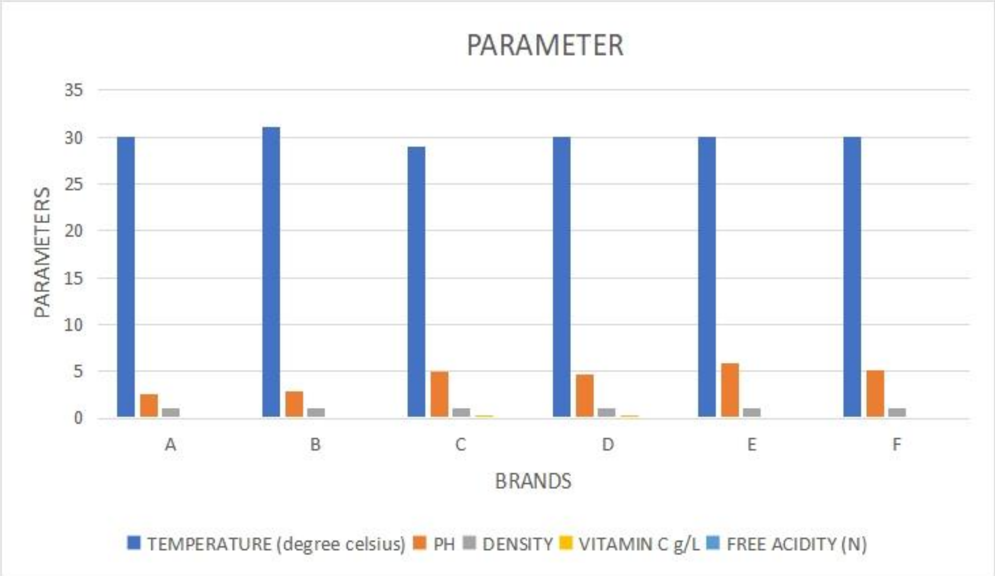

FIGURE 1: SUMMARY OF PARAMETERS

TABLE 2: ESTIMATION OF SULPHUR DIOXIDE

BRANDS	FREE SO_2	TOTAL SO_2.	BOUND SO_2.
A	211.2 ppm	262.4 ppm	51.2 ppm
B	76.8 ppm	166.4 ppm	89.6 ppm
C	51.2 ppm	134.4 ppm	83.2 ppm
D	128.0 ppm	224.0 ppm	96.0 ppm
E	32.0 ppm	128.0 ppm	96.0 ppm
F	12.8 ppm	14O.8 ppm	128.0 ppm

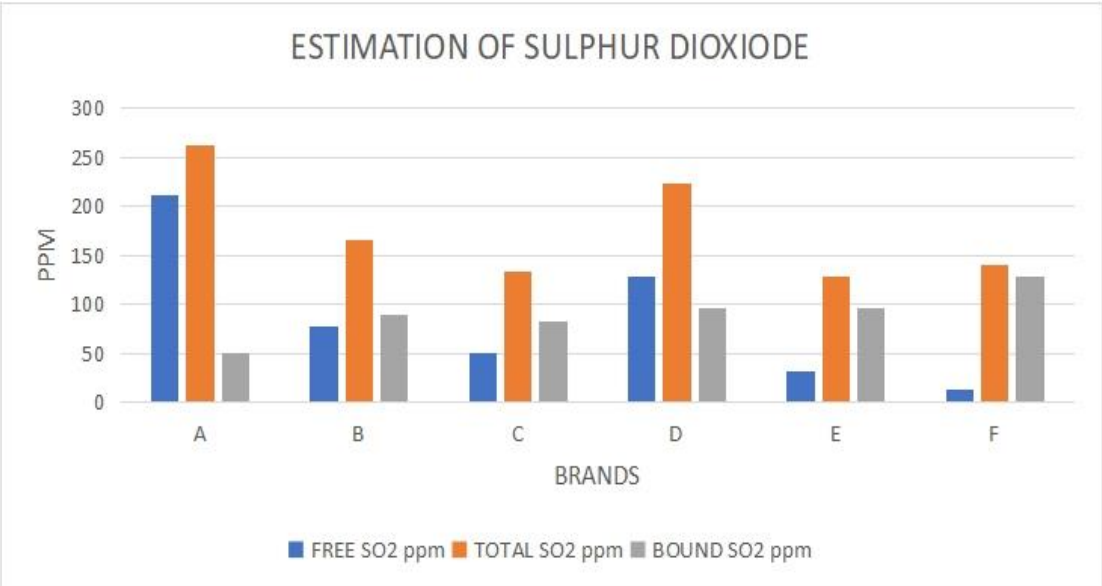

FIGURE 2: ESTIMATION OF SULPHUR DIOXIDE

CONCLUSION:

There are numerous techniques for fermenting and preserving food, but to the best of our knowledge, neither one can be used to calculate the quantity of sulphur dioxide present in fruit juices. The assessment of free and total sulphur dioxide was carried out for a variety of mango-flavored tetra packs that are available in stores. The current study's objective was to investigate and estimate the sulphide levels in the mango-flavored tetrapacks that are readily available, and affordable, and youngsters are drawn to the tetrapacks containing juices. Therefore, it is necessary to consider the health benefits. and the information gathered from this experiment is coupled with the results for the different brands of Tetra-packed mango juices that can be found on the market.

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