

ZION INTERNATIONAL PUBLIC SCHOOL

MAPPEDU, CHENNAI-600126.



CHEMISTRY INVESTIGATORY PROJECT

AISSCE (2023-2024)

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STD: XII

SEC: "B"

TOPIC: STUDY OF EFFECT OF POTASSIUM BISULPHITE AS
FOOD PRESERVATIVE UNDER VARIOUS CONDITIONS.

CERTIFICATION

Certified to be bonafide Investigatory project
done by s.c. kiruthika of XII “B” during the
academic year 2023-2024.

Reg.No.

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Submitted for the practical examination held on
----- at the zion international
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Internal examiner

external examiner

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INTRODUCTION

- Chemical food preservatives are substances which, under certain conditions, either delay the growth of microorganisms without necessarily destroying them or prevent deterioration of quality during manufacture and distribution.
- The Growth of microorganisms in a food material can be inhibited by adding certain chemical substances. However the chemical substances should not be harmful to the human beings.
- Such chemical substances which are added to food materials to prevent their spoilage are known as chemical preservatives.
- Potassium bisulphite is a chemical compound with the chemical formula KHSO_3 . Potassium bisulphite is used for the preservation of colourless food materials such as fruit juices, squashes, apples and raw mango chutney. When potassium bisulphite is dissolved in water, it forms a sulfurous acid. The acid lowers the pH of the food, which helps inhibit the growth of

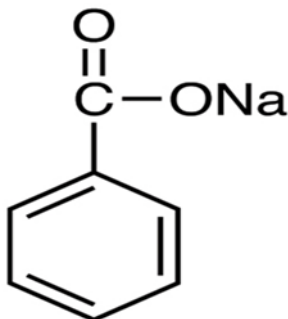
harmful organisms, including bacteria such as E. coli, as well as yeast and mold.

- Potassium bisulfite is used as a sterilising agent in the production of alcoholic beverages.
- In our country, two chemical preservatives which are permitted for used are:
 1. Benzoic acid (or sodium benzoate)
 2. Sulphur dioxide (or potassium bisulphite)

Benzoic acid:

Structural formulae – $C_7H_5NaO_2$

CHEMICAL NAME – Sodium Benzoate



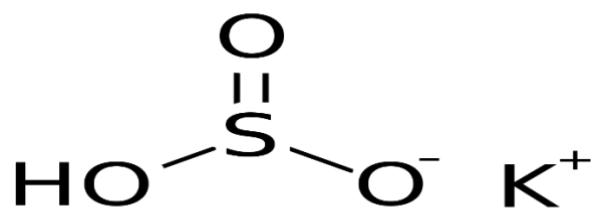
- Benzoic acid (BA) is a commonly used antimicrobial preservative in food and beverages, especially in carbonated beverages,

as it presents its strongest antibacterial activity at pH 2.5–4.0.

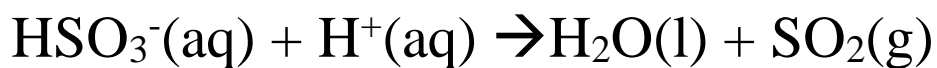
- Benzoic acid has inhibitory effects on the proliferation of bacteria and yeasts, a major cause of food spoilage.
- Benzoic acid or its sodium salt, sodium benzoate is commonly used for the preservation of food materials.
- For the preservation of fruits, fruit juices, squashes and jams sodium benzoate is used as preservative because it is soluble in water and hence easily mixes with the food product.

POTASSIUM BISULPHITE:

chemical formula – KHSO_3



- Potassium bisulphite is a good preservative.
There are a number of uses for potassium bisulfite as a food preservative.
- The Manitoba Agriculture, Food and Rural Initiatives reports this product works to prevent the growth of mold, yeast and bacteria in foods.
- It is also an additive for homemade wine and it is used for the preservation of colourless food materials such as fruit juices, squashes, apples and raw mango chutney.
- This is not used for preserving coloured food materials because Sulphur dioxide produced from this chemical is a bleaching powder.
- Potassium bisulphite on reaction with acid of the juice liberates Sulphur dioxide which is very effective in killing the harmful microorganisms present in food and thus prevents it from getting spoiled.

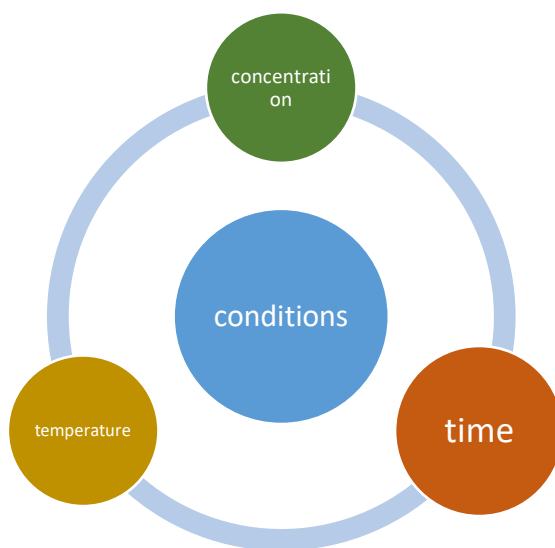


The advantage of this method is that no harmful chemical is left in the food.

The aim of this project is to study the effect of potassium bisulphite as food preservative.

- i. At different temperatures.
- ii. At different concentrations of sugar.
- iii. For different concentration of KHSO_3 .

These are all the different conditons on which the effect of this potassium bisulphide can be studied.



EXPERIMENT

AIM:

To study the effect of potassium bisulphite as a food preservative under various conditions (temperature, concentration and time).

REQUIREMENTS:

1. Conical flasks(100ml)



3. Glass rod



2. Mixer



4. knife



5. Apples



6. Sugar



7. Potassium bisulphite



8. Beaker



9. pestle & mortar



10. glass bottles



11. peeler



THEORY:

Food materials undergo changes due to time, temperature and enzymatic action. So these become unfit for use. These changes can be checked by adding small amounts of potassium bisulphite. The effectiveness of potassium bisulphite as preservative depends upon its concentration under different conditions.

PROCEDURE:

1. Take fresh fruits, wash them thoroughly with water and peel off their outer layer using peeler.
2. Grind it into a paste in the mortar with a pestle.
3. mix with sugar and heat the contents slowly for about 10 minutes and add colouring matter.
4. The material so obtained is a fruit jam. It may be used to study the effect of concentration of sugar and potassium bisulphite, temperature and time.

STUDY THE EFFECT OF CONCENTRATION OF POTASSIUM BISULPHITE AND THE EFFECT OF TIME:

1. Take four conical flasks and label them as A, B, C, and D. add 50g of Jam in each of the four conical flasks.
2. To flask A add 0.1g, flask B 0.2g, flask C 0.5g, flask D 1.0g of potassium bisulphite. Mix the contents in each flask and leave them undisturbed at room temperature.
3. Mix the contents thoroughly and close the bottle. Keep these bottles to stand for a week. Note the changes taking place in jam daily.
4. For some days check any growth of microorganism after each day and record the observations in a table.

OBSERVATION

SAMPLE	AMT. OF JAM	AMT. OF KHSO ₃	GROWTH OF MICROORGANISM AFTER					
			1 DAY	2 DAY	3 DAY	4 DAY	5 DAY	6 DAY
A	50g	0.1g	No change	No change	No change	Few change	Few more change	Few More change
B	50g	0.2g	No change	No change	Some change	Some change	Few More change	More change
C	50g	0.5g	No change	Few change	Some change	Some change	few More change	More change
D	50g	1.0g	No change	No change	No change	No change	Few change	Few more change

RESULT

As the concentration of potassium bisulphite is increased, the growth of microorganisms appears after more days(longer period). The minimum concentration of potassium bisulphite required for preserving jam is approximately 1%.

Once the microorganism appear their growth increases with the passage of time.



Study Of Effect of Temperature

1. Take three conical flasks and label them as A.B and C. add 50g of jam in each of the three flasks.
2. Add 0.5g of potassium bisulphite to each of the three conical flasks. Stir the content with the help of glass rod to affect thorough mixing.
3. Keep flasak A in a refrigerator, flask B at room temperature and flask C in an oven maintained at a temperature of 60·c, leave them undisturbed for few days.
4. Check for any growth of microorganism after each day and record the observations.



OBSERVATION

SAMPLE	AMT. OF JAM	AMT. OF KHSO ₃	TEMP.	GROWTH OF MICROORGANISM AFTER		
				5 DAYS	10 DAYS	15 DAYS
A	50g	0.5g	0-25°C	No change	No change	
B	50g	0.5g	25-30°C	No change	some change	Few fermented
C	50g	0.5g	60-70°C	No change	Few fermented	Some more fermented

RESULT

The growth of microorganism occurs earliest in the flask kept at room temperature. The preservation of jam by potassium bisulphite is maximum at lower temperature (0–5°C). The increase in Temperature causes fast fermentation of jam.



Conclusion

The applications of potassium bisulphite are,

- Food containing more amount of sugar is not favorable to keep for a long time Potassium bisulphite as a good preservative.
- There are a number of uses for potassium bisulfite as a food preservative. The Manitoba Agriculture, Food and Rural Initiatives reports this product works to prevent the growth of mold, yeast and bacteria in foods.
- It is also an additive for homemade wine. Potassium bisulfate is found in some cold drinks and fruit juice concentrates.
- Sulfites are common preservatives in smoked or processed meats and dried fruits. In spray form, it may help prevent foods from discoloring or browning.
- Potassium bisulfite is primarily a commercial product. This chemical compound is found at meat processing plants.

- Manufacturers of juice drinks and concentrate will use potassium bisulfite to increase the shelf life of their products.