Practical 6

IDENTIFICATION OF PRESERVATIVES AND PREPARATION OF SYRUPS & BRINES

EXERCISE

6.1 Identification of different preservatives used in food industry and preparation of syrups and brines

OBJECTIVES

- To learn about identification of different preservatives used in food industry
- To learn preparation of syrups and brines used for food preservation

Delivery schedule: 01 periods

Student expectations/learning objectives

- To know and identify different preservatives used in food industry
- To learn how to prepare syrups and brines, commonly used for food preservation
- Preservation of some fruits and vegetables in syrups and brines

Pre-learning required: Basic knowledge about preservatives, syrups and brines and their basic constituents.

Handouts/material/equipment's & tools required: Paper sheet and pen to note down the attributes and basic material required for preparation of syrups and brines.

INTRODUCTION

Fruits and vegetables have limited life. Hence, these are processed in several value added products such as jam, jelly, squash, nectar, RTS, juices, nectar, cordial, candy, preserve (*murabah*), pickles etc. These products can't also be kept for longer time until and unless these are preserved by using some preservatives. Hence, food industry uses several chemicals to keep these products for longer time. Sometimes, we need to use only sugar solution (syrup) or salt solution (brine) and sometimes class -II preservatives such as potassium metabisulphite or sodium benjoate (benjoic acid) or some other preservative.

Syrup

A solution of sugar in water is called a syrup and process of adding syrup in fruit product is called as 'syruping'. White, refined sucrose is used for making syrup. Usually, sucrose syrup is used in canning. Syrup is added to improve the flavour and to serve as a heat transfer medium for facilitating processing. Syruping is done only for fruits.

Strained, hot syrup of concentration 20 to 55° Brix is poured on the fruit. Fruits rich in acid require more concentrated syrup than less acid fruits. The syrup should be filled at about 79 to 82°C, leaving a head space of 0.3 to 0.5 cm. Sometimes citric acid and ascorbic acid are also mixed with the syrup to improve flavour and nutritional value, respectively.

> ***For teachers***
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> Demonstrate the preparation of sugar syrups of different concentrations to the students. Ask them to preserve some items in different syrups such as *petha*, *murabbhas* etc. and brine solution such as cut vegetables.

The quantities of sugar to be dissolved in one litre of water to make syrups of different concentrations are given in the table below:

Sugar (kg)	Syrup concentration (%)
0.250	20
0.333	25
0.428	30
0.538	35
0.666	40
0.818	45
1.000	50
1.222	55

Sugar syrup in a bottle

Syrups of various strength can be made by dissolving 1 kg of sugar in different volumes of water as shown hereunder:

Syrup strength	Water (litre)
Light	2.0
Medium	1.5
Heavy	1.0

Brine

A solution of salt in water is called a 'brine'. The objective of brining is similar to syruping, however brining is done only in vegetables. Good quality common salt is used for making brine of different concentrations. However, in general, hot brine of 1-3 % concentration is used for vegetables filled at 79-82ºC. Brines of different concentrations can be prepared by dissolving known quantity of salt in one litre of water as under:

Salt (g)	Brine concentration (%)	Salt (g)	Brine concentration (%)
10.0	1	47.33	5
20.4	2	111.11	10
30.92	3	176.47	15
41.66	4		

Preparation of a brine solution

Vegetables preserved in a brine solution

Use of preservatives

In several food products, chemical preservatives are used to enhance their life and attractiveness. Any substance which is capable of inhibiting, retarding or arresting the process of fermentation, acidification or other decomposition of food or masking any of the evidence of any such process or of neutralizing the acid generated by any such process but does not include salt, sugars, vinegar, spices or oils extracted from spices'. Chemical food preservatives are added in very small quantities

(up to 0.2 per cent) and they do not alter the organoleptic and physico-chemical properties of the foods. Certain preservatives are being used either intentionally or accidentally for centuries, which include sodium chloride (common salt), sugar, acids, and alcohols. In addition to preservation, these compounds contribute to the quality and identity of the products.

Preservatives for fruits and vegetable products

Several preservatives are used for keeping fruits, vegetables or flowers in good conditions. In general, chemical food preservatives can be classified as Class I and Class II preservatives. Class I preservatives include common salt, sugar, dextrose, spices, vinegar and honey. They are mainly natural products, which are used, in comparatively higher concentrations than Class II preservatives. On the other hand, Class II preservatives are synthetic chemicals used in small quantities. Benzoic acid and its salts, sulphur dioxide and salts of sulphurous acid, nitrites and nitrates, sorbic acid and its salts, propionic acid and its salts, lactic acid and its salts are commonly used class II preservatives.

Mode of action of food additives involves alteration of cell wall permeability, alteration of colloidal nature of protoplasm, damage of the cell wall, damage of proteins, inhibition of enzyme activity, disruption of cytoplasmic membrane, bacteriostatic or bactericidal action (toxicity of the antimicrobial agent towards microorganisms) and interference with synthetic processes.

a. Sulphur dioxide

Sulphur dioxide (as potassium metabisulphite) and its derivatives can be considered as "universal" preservatives. They have an antiseptic action on bacteria as well as on yeasts and moulds.

A bottle of potassium metabisulphite (KMS)

The advantages of using sulphur dioxide are : (a) it has a better preserving action than sodium benzoate against bacterial fermentation, (b) it helps to retain the colour of the beverage for a longer time than sodium benzoate, (c) being a gas, it helps in preserving the surface layer of juices also, (d) being highly soluble in juices and squashes, it ensures better mixing and hence their preservation, and (e) any excess of sulphur


Granules of sodium benzoate

dioxide present can be removed either by heating the juice to about 71°C or by passing air through it or by subjecting the juice to vacuum.

The major limitations of sulphur dioxide are : (a) it can't be used in the case of some naturally coloured juices like those of *phalsa*, *jamun*, pomegranate, strawberry, coloured grapes, plum, etc., on account of its bleaching action, (b) it can't also be used for juices, which are to be packed in tin containers, because it not only corrods the tin causing pinholes, but also forms hydrogen sulphide, which has a disagreeable smell and reacts with the iron of the tin container to form a black compound, both of which are highly undesirable, and (c} sulphur dioxide gives a slight taste and odour to freshly prepared beverages but these are not serious defects if the beverage is diluted before drinking.

Potassium metabisulphite

b. Benjoic acid

Benzoic acid (as sodium benzoate) and its derivatives have a preservative action, which is stronger against bacteria than on yeasts and moulds. Sorbic acid acts on moulds and certain yeast species, which in higher dosage levels also acts on bacteria.

The preservative should never be added in solid form but should be dissolved in a small quantity of juice or water, and the solution added to the bulk of the product. If this care is not taken, the solid may settle undissolved at the bottom of the container with the result that fermentation may start before the action of preservative begins.

Some common preservatives used in food industry

STUDENT'S ACTIVITIES/EXERCISES

- Go to a market. Purchase some preservatives and note down the differences between them.
- Prepare syrups and brines of different concentrations in the lab. Preserve food items in different syrups and brines and note down the differences in preservation period on the basis of colour and quality changes.

RESOURCE MATERIAL

- Sharma, S.K. and Nautiyal, M.C. (2009). Postharvest technology of horticultural crops. New India Publishing Agency, New Delhi.
- Siddappa, G. and Tandon, D.K. (1998). Preservation of fruits and vegetables. ICAR, New Delhi.
- Srivastava, R.P. and Kumar, S. (2001). Fruit and vegetable preservation: Principles and practices. International Book Distributing Co., Lucknow, India.
- Verma, L.R. and Joshi, V.K. (2000). Post harvest technology of fruits and vegetables. Volume 1 and 2. Indus Publishing House, New Delhi.