

Modern Trends in Fruit Preservation

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Introduction : Although the subject for today's symposium is 'Modern trends in Indian Agriculture', I shall confine myself to 'Modern trends in Fruit preservation'.

Fruit Preservation Industry in India : Fruit preservation was not a profitable enterprise so far due to the high cost of fruits and sugar and for want of capital. One of the main objects of the five year plan was to achieve substantial industrial development during 1951-56. Taking the industrial aspect, the trend is towards establishing more factories and also cottage scale industries which would utilize the surplus fruits that might otherwise go to waste and thereby encourage the fruit grower and the businessman. The industry aims at producing a variety of fruit products and make them available to the general public during the off-season at a cheaper rate. It is well known that malnutrition among the people can be combated by distributing fruit products like tomato juice among the school children and also by making the fruit products available to the public at cost price.

Fruit Products Manufactured in India : Fruit products such as synthetic beverages, syrups, shirbats, vinegar, brewed or synthetic, pickles, dehydrated fruits and vegetables, squashes, crushes, cordials, barley water, bared juice, ready to serve beverages or any other beverage containing fruit juice or fruit pulp, jams, jellies, marmalades, tomato ketchup, sauces, preserves, candied and crystallized fruits and peels, chutneys, canned and bottled vegetables frozen fruits and vegetables, aerated waters containing fruit juices or pulp, and other items related to fruits and vegetables are manufactured and sold but due to the exorbitant rates, they are not within the reach of even the middle class. In the household it is a common practice to prepare products like pickles, dried vegetables and fruits, jams, preserves cheese, mango lether, fruits preserved in brine, jack fruit and sweet potato pappadams and such other products. The aim in fruit preservation is to prepare nutritive products of good keeping quality, good taste, possessing the characteristic flavour of the original fruit. Besides the products are to be attractive, cheap, easy to prepare,

profitable, involve less of labour and encourage thrift. This can be facilitated by the use of modern scientific methods, equipment, machinery, good packing, and transport facilities.

Modern Trends in the Preparation and Preservation of Fruit Products:

(a) *Jams, jellies, marmalades preserves, and chutneys*: The techniques and methods adopted in fruit preservation have undergone certain changes. The modern trend in Germany is to do away with preservative or to restrict their use to the minimum. Years back it was a common practice to preserve jams by covering their top surface with a coating of wax. This practice has gone out of existence. The use of chemical preservatives to prevent spoliage of such fruit products was also in vogue. Now the practice is to prevent spoilage by making the sugar concentration of the product reach 70 percent. The products such as jams, jellies and marmalades are poured into sterilized bottles, closed air-tight and sealed. Such products keep for a long time. But the keeping quality can be assured if the bottles are processed in water or steam for a short time. The fruit control order has laid down the specifications for different products. The specifications for jams say that there should be at least 45% of fruit in the jam and that the total soluble solids in the final product should be at least 68%. It is said that dry or canned fruit, preserved pulp or juice may be used. Pectin derived from fruit may be added. The use of preservative is allowed. The order requires that the use of dry fruit should be prominently shown on the label. Combining fruit pulp with pectin or apple juice is becoming a more general practice in the commercial manufacture of fruit jam. Similarly for jellies the minimum fruit content is to be 45% and the total soluble solids in the final product 65%. The use of preservative is allowed but not the use of an artificial sweetening agent. Commercial pectin has come into rather a widespread use in the making of a jelly. Its addition should be declared on the label. The jelly is to be called synthetic jelly. At one time commercially prepared jellies were preserved generally by the use of sodium benzoate. Since public sentiment has turned against food products containing preservatives, manufacturers have adopted pasteurization. Such jellies need not be concentrated to a high sugar content and so the saving in sugar content and so the saving in sugar may pay for the added cost of pasteurization. For preserves, the fruit portion is to be 55% and the total soluble solids 65%. Preservative is allowed. For fruit chutneys, the minimum percentage of fruit required in the final product is 40, and the total soluble solids 50. Preservative is allowed.

(b) *Juices and squashes*: Juices and squashes are preserved by one of two methods either by pasteurization or by the addition of a preservative. Two preservatives are in use, potassium metabisulphite and sodium benzoate. The former is added at the rate of one oz. per 100 lbs of the total product and the latter at the rate of 0.1%. The latter is used for coloured squashes, since the sulphur dioxide formed in the former bleaches the natural colour of the coloured squashes, like tomato ketchup. Usually squashes from limes, oranges, mango and pomegranate are preserved by the addition of a preservative. Squashes from fruits like the plum, cashew apple and pine-apple can be preserved either by pasteurization or by the use of a preservative. By pasteurization is meant that the squashes are heated to a temperature of about 180 to 185°F, poured into sterilized bottles, closed with crown corks and then either pasteurized at a temperature of 180°F or sterilised in boiling water for half an hour. It can be preserved by the addition of a preservative as well. The juice thus prepared keeps well. The flavour is well retained. The juice which is kept for settling is decanted, filtered and then used in the preparation of cordial. The preserved juice can be made use of in the preparation of cordial. The preserved juice can be made use of in the preparation of squashes and other beverages like Lime-barley water. It was a common practice in early times to prepare clear squashes devoid of pulp. Though such a product may keep better, the trend now is towards squashes with fruit pulp. Fruit pulp has food value and should not be filtered off. Moreover since it gives a realistic appearance to the squashes, it is customary to introduce some juice sacs in lime and orange squashes when the product is bottled. Certain fruits like wood-apple, plum, guava and certain varieties of mangoes do not have any juice. So the pulp is diluted or in certain cases heated with water to prepare the juice. From apricots, peaches and tomatoes, pulpy juices are prepared. Consequently the raw or the cooked fruits is passed through some sort of pulper to give a puree like liquid, containing a large proportion of finely divided solids. At present most of the juices preserved in the market are cloudy or pulpy. At one time it was customary to separate tomato juice from the insoluble solids by discarding the juice. This practice has since been discontinued, as this leads to lower yield and injury to the quality. Orange juice was at one time prepared by crushing and pressing the whole fruit and separating as much of the essential oils from the juice as possible by centrifugal separators. It is now believed that essential oils from the rind should be excluded as it spoils the flavour of the product. Recently

in other countries fruit juices have been preserved by cold storage for shipment over a distance of 500 miles in glass lined tank cars by precooling the juice to about 28°F and placing in well insulated tanks of several thousand gallons capacity. Orange syrups are used as a base for carbonated and non-carbonated bottled beverages. In both cases the syrup or concentrate is diluted with water before bottling and then preserved with sodium benzoate. According to specifications in the fruit control order a beverage which does not contain 10% of fruit syrup, juice, squash, cordial or crush shall be described as a synthetic syrup. The minimum quantity of fruit juice required to be present in syrup is 10% in crush, squash, cordial lime-barely water 25% in unsweetened juice 85% and in ready to serve beverages 5%. Similarly the minimum quantity of total soluble solids in the above beverages have been fixed at 65, 55, 40, 30, natural, 10 and 10 percent respectively.

(c) *Tomato products*: According to food regulations, it is said that tomato juice may contain finely divided insoluble solids from the flesh of tomatoes but should be free from pieces of skin, seeds, bits of coarse tissue and any extraneous matter. The specifications for tomato juice is that it should contain atleast 5 percent of total soluble solids. The minimum quantity of soluble solids required to be present in tomato ketchup is 25%. It is said that tomato ketchup if filled boiling hot, need not be sterilized, but in actual practice the product is sterilized in boiling water for half an hour. At one time it was preserved with 0.1% of sodium benzoate. It is not now used in any of the leading brands of ketchup. The present day manufactures depend upon the acetic acid of the vinegar and the preservative action of the spices to prevent spoilage after the bottle is opened. Canned tomato juice is very generally used in restaurants and hotels for flavouring and for soups. Hot sauce and chillie sauce are much in favour in recent years. Canned tomato juice is very popular. In former years it was customary to store tomato pulp in wooden barrels with distilled vinegar or sodium benzoate as a preservative. This method has since gone out of existence and has been replaced by sterilization in 5 gallon or No. 10 cans.

(d) *Bottled and canned products*: With regard to bottling and canning, syrup strengths have been worked out for each variety and grade of fruits. So also the temperature and time of sterilization. For vegetables the optimum time, temperature and pressure required for processing is worked out. Now the vegetables are

processed at 240°F corresponding to 10 lb. steam pressure. Only the time is varied for different vegetables the fruit control order has set up a standard for the quality and fill of bottled and canned fruit and vegetable products. The use of preservative is not allowed and so also any artificial colouring matter except in the case of cherries and strawberries where harmless food colours are allowed.

(e) *Dehydrated products*: Primitive method of drying which was practiced in India consisted of exposing fruits and vegetables to the sun for a number of days. According to the modern process dehydration is done by passing a current of hot air through them, the degree of heat employed and other details of the operation varying according to the nature of the food stuff. The dehydrated products are ready on boiling in water for three or four minutes. Methods, treatments, safe-finishing temperatures, have been worked out for the dehydration of fruits like apples, apricots, bananas, cherries, berries, dates, figs, grapes, peaches, pears, plums, prunes and vegetables such as beans, cabbage, carrots, sweet corn, onion, peas, potatoes, sweet potatoes, pumpkin, spinach and tomatoes. Modern forms of dehydration have opened up opportunities for the development of the industry on a wider scale. Besides drying the whole fruit it is possible to preserve even fruit juices in a dehydrated form. Like powdered milk, powdered lemon juice and powdered mango juice are now prepared without affecting much of their food values.

Modern Equipment and Machinery: Science has made good progress with regard to equipment and machinery. Labour saving devices have been invented for crushing, pressing, extraction of the juice, filtering, grading, cooking, concentration, filling and sterilisation. For example, for the extraction of juice from tight skinned oranges, the cone type or the electrically worked juice extractor is used. For loose skinned oranges the screw type of juice extractor is used. For limes the lime squeezer or basket press is used. For lemons the mix master is in use. In the case of mango, the pulping machine is used for the extraction of the pulp. Superior type of sealing machines has been invented. For sterilizing cans in retorts under steam pressure continuous agitating pressure sterilizer has been perfected.

Containers: Both glass and tin containers are in use as containers for preserving fruits and vegetables and the products prepared. Screw type bottles with metallic lids or air-tight glass top bottles are used successfully. The metallic lids are coated with lacquer to prevent metallic contamination and corrosion.

Regarding the cans, in the present century, several important advances have been made. Some of these are invention and perfecting of the sanitary double seam can, improved baked enamel coatings, cellulose lacquer linings, special wax linings, zinc oxide containing enamels for corn cans and the recently developed cold rolled plate which is very resistant to corrosion. The fruit control order has specified the containers for the different fruit products.

Colours and Essences: Harmless food colours like carmel, cochineal, chlorophyll, saffron and some synthetic organic food colours, fruit essences and flavouring materials are allowed in the preparation of fruit products in order to make them attractive and appetizing.

Conclusion: The intelligent application of scientific methods and principles in the fruit and vegetable product industries has been comparatively recent. Although notable advances have been made in the knowledge of the fundamental principles underlying the processes used in these industries, there remains to be done a vast amount of research before the manufacturing processes are placed upon a high plane of efficiency. The opportunities for investigation by Chemists, Physicists, Bacteriologists and Engineers in the fruit and vegetable field are almost unlimited.

REFERENCES.

- Crues W. V., 1938—Commercial Fruit and Vegetable Products.
- Technical aid to Food Industries, 1953—1954—Central Food Technological Research Institute, Mysore.
- Food and Population and Development of Food Industries in India—1952—Central Food Technological Research Institute, Mysore.
- Bulletins C. F. T. R. I., Mysore—1956—Central Food Technological Institute, Mysore.
- Brochure in Home scale food preparation series—1955—Second Edition Central Food Technological Research Institute, Mysore.
- Fruit products order 1955—Notification of the Government of India—1955—Government of India.