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DEHYDRATION OF FRUITS

Turn Potential Into Profit



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Fruit dehydration is one of the oldest unit operations used by the Fruit processing industry. Fruit dehydration is a process of reducing moisture of Fruit to low levels for improved shelf life by adding one or more forms of energy to it. However, it does not include removal of moisture from Fruit by mechanical pressing or concentration of liquid foods. Most commonly, heat is added to the Fruit by hot air, which also carries the moisture away from the food. The process of Fruit dehydration involves simultaneous transfer of mass and heat within the Fruit and the medium used to transfer energy to the food.

Though food preservation is that the primary reason for dehydration of fruits and vegetables, additionally it lowers the price of packaging, storing, and transportation by reducing each the burden and volume of the ultimate product. Given the improvements within the quality of dehydrated foods, together with the multiplied specialize in instant and convenience foods; the potential of dehydrated fruits and vegetables is larger than ever.

Pretreating Fruits:

Some foods such as apples, pears, peaches, and apricots dry better when pretreated. Pretreatment reduces oxidation, giving a better color, reducing vitamin loss, and lengthening shelf life. Research studies

have shown that pretreating with an acidic solution enhances the destruction of potentially harmful bacteria during drying. Place cut fruits in a solution of $3\frac{3}{4}$ teaspoons of powdered ascorbic acid (or crush 20 500-milligram vitamin C tablets) or $\frac{1}{2}$ teaspoon of powdered citric acid in 2 cups of water for 10 minutes before placing on trays to dry.

Equal parts of bottled lemon juice and water can be substituted for the above pretreatment.

Other methods of pretreating fruit include syrup blanching, water blanching, and sulfiting. Sulphuring or sulphiting is an optional stage of processing. The main benefit of sulphuring is to preserve the fruit color. Some consumers object to chemical preservatives and prefer naturally dried fruits. Sulphur dioxide gas (SO_2) is applied to the fruit pieces by placing them in a cabinet or tent in which sulphur is burned. The gas is absorbed by the fruit. For most fruits, 5-6g sulphur per kg food is adequate. The gas given off is toxic and corrosive. Therefore, sulphuring should be carried out in a well-ventilated place, using appropriate equipment. Sulphite can be included in the sugar syrup (as sodium or potassium metabisulphite). Syrup-blanching fruit is sweeter but also stickier than fruit treated by other methods. Refer to a book on food drying for specific times and directions if you choose to blanch fruits.

Although sulfites have been used in the past to prevent oxidation, this fact sheet does not include this method because sulfites are not recommended for use by individuals on restricted-sodium diets or who have asthmatic or respiratory conditions. Sulfited food should be dried outdoors for safety reasons.

Drying or Dehydration:

Drying or dehydration is the removal of the majority of water contained in the fruit or vegetable and is the primary stage in the production of dehydrated fruits and vegetables. Several drying methods are commercially available and the selection of the optimal method is determined by quality requirements, raw material characteristics, and economic factors. There are three types of drying processes: sun and solar drying; atmospheric dehydration including stationary or batch processes (kiln, tower, and cabinet driers) and continuous processes (tunnel, continuous belt, belt-trough, fluidized-bed, explosion puffing, foam-mat, spray, drum, and microwave-heated driers); and subatmospheric dehydration (vacuum shelf, vacuum belt, vacuum drum, and freeze driers).



Sun drying (used almost exclusively for fruit) and solar drying (used for fruit and vegetables) of foods use the power of the sun to remove the moisture from the product. Sun drying of fruit crops is limited to climates with hot sun and dry atmosphere, and to certain fruits, such as prunes, grapes, dates, figs, apricots, and pears. These crops are processed in substantial quantities without much technical aid by simply spreading the fruit

on the ground, racks, trays, or roofs and exposing them to the sun until dry. Advantages of this process are its simplicity and its small capital investment. Disadvantages include complete dependence on the elements and moisture levels no lower than 15 to 20 percent (corresponding to a limited shelf life). Solar drying utilizes black-painted trays, solar trays, collectors, and mirrors to increase solar energy and accelerate drying.

Atmospheric forced-air driers artificially dry fruits and vegetables by passing heated air with controlled relative humidity over the food to be dried, or by passing the food to be dried through the heated air, and is the most widely used method of fruit and vegetable dehydration. Various devices are used to control air circulation and recirculation. Stationary or batch processes include kiln, tower (or stack), and cabinet driers. Continuous processes are used mainly for vegetable dehydration and include tunnel, continuous belt, belt-trough, fluidized-bed, explosion puffing, foam-mat, spray, drum, and microwave-heated driers. Tunnel driers are the most flexible, efficient, and widely used dehydration system available commercially.

Subatmospheric (or vacuum) dehydration occurs at low air pressures and includes vacuum shelf, vacuum drum, vacuum belt, and freeze driers. The main purpose of vacuum drying is to enable the removal of moisture at less than the boiling point under ambient conditions. Because of the high installation and operating costs of vacuum driers, this process is used for drying raw material that may deteriorate as a result of oxidation or may be modified chemically as a result of exposure to air at elevated temperatures. There are two

categories of vacuum driers. In the first category, moisture in the food is evaporated from the liquid to the vapor stage, and includes vacuum shelf, vacuum drum, and vacuum belt driers. In the second category of vacuum driers, the moisture of the food is removed from the product by sublimation, which is converting ice directly into water vapor.

The advantages of freeze drying are high flavor retention, maximum retention of nutritional value, minimal damage to the product texture and structure, little change in product shape and color, and a finished product with an open structure that allows fast and complete rehydration. Disadvantages include high capital investment, high processing costs, and the need for special packing to avoid oxidation and moisture gain in the finished product.

Post Treatment and Packaging:

Treatments of the dehydrated product vary according to the type of fruit or vegetable and the intended use of the product. These treatments may include sweating, screening, inspection, instantization treatments, and packaging. Sweating involves holding the dehydrated product in bins or boxes to equalize the moisture content. Screening removes dehydrated pieces of unwanted size, usually called "fines". The dried product is inspected to remove foreign materials, discolored pieces, or other imperfections such as skin, carpel, or stem particles. Instantization treatments are used to improve the rehydration rate of the low-moisture product.

Packaging is common to most all dehydrated products and has a great deal of influence on the shelf life of the dried product. Packaging of dehydrated fruits and vegetables must protect the product

against moisture, light, air, dust, microflora, foreign odor, insects, and rodents; provide strength and stability to maintain original product size, shape, and appearance throughout storage, handling, and marketing; and consist of materials that are approved for contact with food.

Cost is also an important factor in packaging. Package types include cans, plastic bags, drums, bins, and cartons, and depend on the end-use of the product.

Useful Links:

www.parc.gov.pk

www.pcret.gov.pk

ww3.epa.gov

www.agripunjab.gov.pk

www.amis.pk

www.pakjas.com.pk

www.cpec.punjab.gov.pk

www.scirp.org

www.smeda.org.pk

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