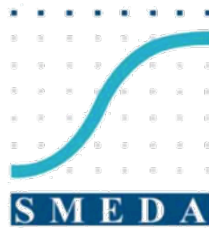


# FOOD PRESERVATION Guidelines for Food Sector SMEs



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## **1. INTRODUCTION OF SMEDA**

The Small and Medium Enterprise Development Authority (SMEDA) was established with the objective to provide fresh impetus to the economy through the launch of an aggressive SME development strategy. Since its inception in October 1998, SMEDA had adopted a sectoral SME development approach. A few priority sectors were selected on the criterion of SME presence. In depth research was conducted and comprehensive development plans were formulated after identification of impediments and retardants. The all-encompassing sectoral development strategy involved overhauling of the regulatory environment by taking into consideration other important aspects including finance, marketing, technology and human resource development.

After successfully qualifying in the first phase of sector development SMEDA reorganized its operations in January 2001 with the task of SME development at a broader scale and enhanced outreach in terms of SMEDA's areas of operation. Currently, SMEDA along with sectoral focus offers a range of services to SMEs including over the counter support systems, exclusive business development facilities, training and development and information dissemination through a wide range of publications. SMEDA's activities can now be classified into the three following broad areas:

1. Creating a Conducive Environment; includes collaboration with policy makers to devise facilitating mechanisms for SMEs by removing regulatory impediments across numerous policy areas
2. Cluster/Sector Development; comprises formulation and implementation of projects for SME clusters/sectors in collaboration with industry/trade associations and chambers
3. Enhancing Access to Business Development Services; development and provision of services to meet the business management, strategic and operational requirements of SMEs.

SMEDA has so far successfully formulated strategies for sectors, including fruits and vegetables, marble and granite, gems and jewelry, marine fisheries, leather and footwear, textiles, surgical instruments, transport and dairy. Whereas the task of SME development at a broader scale still requires more coverage and enhanced reach in terms of SMEDA's areas of operation.

Despite the structural shift towards industrialization, agriculture sector is still the largest sector of the economy with deep impact on socio-economic set up. Knowing this fact, SMEDA, since its inception, is highly committed to enhance the competitiveness of local food processing industry in the country. SMEDA 'Agro Food Services' offers a wide range of services to support the industry, including; Identification of potential investment opportunities in the sector, development of business plans and feasibilities etc. Training and capacity building and hand holding of entrepreneurs.

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## **2. What is Food Production & Processing?**

Food production / processing is the transformation of cooked ingredients, by physical or chemical means into food, or of food into other forms. Food processing combines raw food ingredients to produce marketable food products that can be easily prepared and served by the consumer. Food processing includes the methods and techniques used to transform raw ingredients into food for human consumption. Food processing takes clean, harvested or slaughtered and butchered components and uses them to produce marketable food products.

## **3. Why Food Preservation?**

Food, by nature, is perishable. Without intervention, food falls victim to the forces of nature, namely bacteria, yeast, and fungus, and begin to degrade. The effects of food spoilage are not only unappetizing, but the agents of spoilage can also cause foodborne illnesses or even death.

For thousands of years, humans have been using various methods to prolong the freshness and safety of their food to stabilize their food supply.

Food preservation prevents the growth of microorganisms (such as yeasts), or other microorganisms (although some methods work by introducing benign bacteria or fungi to the food), as well as slowing the oxidation of fats that cause rancidity. Food preservation may also include processes that inhibit visual deterioration, such as the enzymatic browning reaction in apples after they are cut during food preparation.

By adopting Food preservation methods, your food business can achieve following benefits:

- Give suppliers and consumers confidence in your products
- Enhances brand value and recognition amongst consumers
- Increases prospects of better product pricing and profitability
- Reduces a business's chance of being dragged in courts by consumers and authorities
- Reduces a business's cost of doing business in the future
- Contributes in the social wellbeing by reducing food borne illnesses.



## 4. Ways of Food Preservation

While some of these methods are relatively new, many of them date back to ancient times. We may have refined the processes and come to better understand the mechanisms, but the basic concepts remain the same today. Here are a few of the most common ways to preserve food:

### I. Chilling and Freezing

Bacteria and yeast grow best at specific temperatures, usually between 40-140°F. By lowering the temperature below 40°F their metabolic and reproductive action is significantly slowed. While this may not kill the bacteria and yeast, it does slow the spoilage process. Freezing food is the easiest method of food preservation. Although freezing food extends its shelf life, it doesn't compare in shelf life with freeze dried food. It is, however, the closest in taste and nutrition to fresh foods. Meat needs no preparation, they only need to be properly wrapped or sealed. Fruits and vegetables freeze well, but some need preparation before freezing.

**Vegetables:** Freezing vegetables is a little different - they need blanching before freezing. Blanching is a food preservation method before freezing in which boiled water is used. The process for freezing vegetables is as follows:

- Vegetables must be washed, peeled, and the bruised areas must be trimmed. Cut into serving sizes, if desired, before freezing. Blanch all vegetables (except peppers and onions) to preserve quality and stop the enzymes that cause spoilage.
- In a large sauce or stock pan, bring water to boiling. Place the prepared vegetables in a metal strainer that will fit in the pan and lower food into the boiling water. Begin counting the blanching time. (See table below for blanching times.)
- Use one gallon of water for each pound of firm vegetables (about 4 cups) and two gallons of water for each pound of leafy greens (about 8 cups). Don't add more vegetables than suggested at one time, as larger amounts will lower the temperature of the water. Time and temperature are critical to destroying the enzymes that cause spoilage.



- When the blanching time is done, plunge the vegetables into ice water until cooled. This prevents them from over cooking and helps retain the nutrients and color. Upon cooling, drain and dry thoroughly. Drying the vegetables is important because extra moisture can decrease the quality and cause more ice to form on frozen veggies.

The blanching times on the table below are listed according to size of cut vegetables. Blanch smaller sizes for the minimum recommended time and larger sizes for the maximum recommended time.

Vegetable	Preparation	Blanching Time (min)
Asparagus	Cut in desired lengths.	2-4
Beans, string	Cut, slice, or leave whole.	3-4
Beans, lima	Shell, sort, wash.	2-4
Broccoli	Peel stock, trim. Split lengthwise.	3
Brussels sprouts	Wash well and sort (small, medium, large).	3-5
Cabbage	Cut to medium or coarse shreds.	1.5
Carrots	Peel. Cut in slices or dice.	3
Cauliflower	Soak 30 min. in salt water	3
Corn, whole kernel	Husk, de-silk, blanch, and cut from cob.	4-5
Greens, all kinds	Wash well. Discard tough leaves and stems.	2-3
Okra	Trim stem – do not break pods.	3-4
Peas, pod	Wash, remove stems and strings.	2-3
Peas, green, black eye	Shell, sort, wash.	1-2
Summer squash	Wash, cut into 1/2-inch slices.	3
Turnips/Parsnips	If using sugar syrup, prep	3

*\*Source: US Food Drug Administration*

**Fruits:** should be washed thoroughly and any bruised or damaged parts must be cut off. If there is any visible mold at all, discard the fruit. Cut into serving or bite-sized pieces for easier serving when thawed later. Do not blanch fruit as it will be mushy when defrosted. Cut fruits usually taste better if frozen in a sugar syrup or dry sugar which coats the fruit and protects it from the enzymes that change the color to brown. Use dry sugar for fruits that easily produce juice such as strawberries and peaches. Those that



juice more slowly need a sugar syrup such as pineapples and apples. Small berries such as cranberries, blueberries, raspberries, blackberries, and currants can be frozen without sugar. To prevent fruits such as apples, peaches or pears from turning brown when exposed to air, dip them in ascorbic acid or lemon juice or add to your sugar syrup.

Syrup	Sugar	Water	Syrup Yield
Light (less sweet)	1 cup	4 cups	4 1/2 cups
Medium	1 3/4 cups	4 cups	5 cups
Heavy	2 3/4 cups	4 cups	5 1/3 cups

*\*Source: US Food Drug Administration*

## II. Canning

Canning is an important, safe method for preserving food if practiced properly. The canning process involves placing foods in jars or similar containers and heating them to a temperature that destroys micro-organisms that cause food to spoil. During this heating process air is driven out of the jar and as it cools a vacuum seal is formed. This vacuum seal prevents air from getting back into the product bringing with it contaminating micro-organisms.

There are two safe ways of processing food, the boiling water bath method and the pressure canner method:

- The boiling water bath method is safe for tomatoes, fruits, jams, jellies, pickles and other preserves. In this method, jars of food are heated completely covered with boiling water (212°F at sea level) and cooked for a specified amount of time.
- Pressure canning is the only safe method of preserving vegetables, meats, poultry and seafood. Jars of food are placed in 2 to 3 inches of water in a special pressure cooker which is heated to a temperature of at least 240° F. This temperature can only be reached using the pressure method. A microorganism called Clostridium botulinum is the main reason why pressure processing is necessary. Though the bacterial cells are killed at boiling temperatures, they can form spores that can withstand these temperatures. The spores grow well in low



acid foods, in the absence of air, such as in canned low acidic foods like meats and vegetables. When the spores begin to grow, they produce the deadly botulinum toxins (poisons).

### **III. Dehydrating**

Most microorganisms also require moisture to grow, so removing the moisture from food is a very effective method of preservation. The key to dehydration is to complete the process faster than the spoilage occurs. Evaporation is usually quickened with the addition of moderate heat, sometimes provided by natural sunlight. The bonus of sunlight are ultraviolet rays, which also serve to kill microbes. Modern methods of dehydration use circulating air that is heated just enough to promote dehydration without "cooking" the food. Dehydration is the method of food preservation used for meat jerky, dried fruit or fruit leathers, and herbs.

### **IV. Pasteurization**

Pasteurization is a mild heat treatment of liquid foods (both packaged and unpackaged) where products are typically heated to below 100 °C. The heat treatment and cooling process are designed to inhibit a phase change of the product. The acidity of the food determines the parameters (time and temperature) of the heat treatment as well as the duration of shelf-life. Parameters also take into account nutritional and sensory qualities that are sensitive to heat.

In acidic foods (pH<4.6), such as fruit juices, the heat treatments are designed to inactivate enzymes and destroy spoilage microbes. Due to the low pH of acidic foods, pathogens are unable to grow. The shelf-life is extended several weeks. In low-acid foods (pH>4.6), such as milk and liquid eggs, the heat treatments are designed to destroy pathogens and spoilage organisms (yeast and molds). It is important to note that not all spoilage organisms are destroyed under pasteurization parameters thus requiring refrigeration. There are three kinds of Pasteurization methods discussed below:

- 1. Flash Pasteurization** - Involves a high-temperature, short-time treatment in which pourable products, such as juices, are heated for 3 to 15 seconds to a temperature that destroys harmful micro-organisms. After heating, the product is cooled and packaged. Most drink boxes and pouches use this

pasteurization method as it allows extended unrefrigerated storage while providing a safe product.

**2. Steam Pasteurization** - This technology uses heat to control or reduce harmful microorganisms in beef. This system passes freshly-slaughtered beef carcasses that are already inspected, washed, and trimmed, through a chamber that exposes the beef to pressurized steam for approximately 6 to 8 seconds. The steam raises the surface temperature of the carcasses to 190° to 200° F (88° to 93°C). The carcasses are then cooled with a cold-water spray. This process has proven to be successful in reducing pathogenic bacteria, such as E. coli O157:H7, Salmonella, and Listeria, without the use of any chemicals. Steam pasteurization is used on nearly 50% of U.S. beef.

**3. Irradiation Pasteurization** - Foods, such as poultry, red meat, spices, and fruits and vegetables, are subjected to small amounts of gamma rays. This process effectively controls vegetative bacteria and parasitic foodborne pathogens and increases the storage time of foods.

## V. Vacuum packing

It is a method of packaging that removes air from the package prior to sealing. This method involves (manually or automatically) placing items in a plastic film package, removing air from inside, and sealing the package. Shrink film is sometimes used to have a tight fit to the contents. The intent of vacuum packing is usually to remove oxygen from the container to extend the shelf life of foods and, with flexible package forms, to reduce the volume of the contents and package. Vacuum packing reduces atmospheric oxygen, limiting the growth of aerobic bacteria, fungi, or other microorganisms and preventing the evaporation of volatile components. It is also commonly used to store dry foods over a long period of time, such as cereals, nuts, cured meats, cheese, smoked fish, coffee, and potato chips (crisps). On a more short term basis, vacuum packing can also be used to store fresh foods, such as vegetables, meats, and liquids, because it inhibits bacterial growth.

## VI. Preservatives / Additives

Food Additives are substances added to food to enhance its flavor or appearance or to preserve it. Food additives have no or less nutritional values. These are added to food for different purposes. Their names are different according to the purpose they are used for. There are three types of Food Additives / preservatives:

- **Natural:** For example, beetroot juices with its bright purple colour is used to colour other foods such as sweets.
- **Nature Identical:** food additives are the man-made copies of substances that occur naturally. For example, benzoic acid is a substance that is found in nature and is also made synthetically. It is used as a preservative.
- **Artificial:** Additives are substances made synthetically and are not found naturally such as Nisin (E-234) which is used in dairy products and puddings, etc.

The complete list of permitted food preservatives / additives can be found on the website of the Halal Development Agency website. (Source: <http://phda.com.pk/index.php/e-code-traceability/>)