

# DRIED VEGETABLES





## *Vegetables Processing Toolkits*



### **DRIED VEGETABLES**

#### **1.- Dried Vegetable Processing - General Information**

The vegetable dehydration technique is reasonably simple and consists of exposing the food to the sun or to place it in appropriate dryers for removing a high water amount contained in the product. The dehydration preserves the vegetable because it reduces its moisture content, therefore avoiding or limiting the microorganism growths and chemical reactions. The removal of the water facilitates the transport, the storage and the management of the final product, no matter it is assigned to direct consumption or as ingredient in elaborating other nutritive products.

The dehydration technique concentrates mineral salts and other components such as the sugars found in the vegetables, besides enhancing their flavor. When accomplishing this technique, some losses of vitamins rather occurs because they are sensitive to the heat.

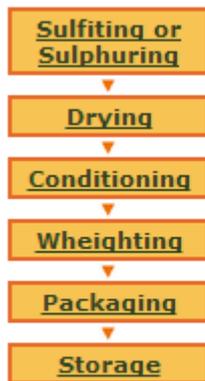
The dehydrated high-qualified vegetables should present the following characteristics: low moisture content, around 5%; absence of defects caused by the use of inappropriate raw material; a fast and satisfactory re-hydration, by assuming the shape and original appearance of the product before its drying.

The main deterioration factors in the dehydrated vegetables are: lipid oxidation reactions; non-enzymatic darkening; oxidation of vitamins (C and B) and pigments, such as chlorophyll and carotenes. The microbiological, sensorial and physiochemical analyses should be extensively used for the warranty of the quality in the dehydrated final product.



## 2.- Processing Details for Dried Vegetable

### Dried Vegetable Processing Details



### 2.1.-Sulfiting or Sulphuring

The main deterioration factors in the dehydrated vegetables are: lipid oxidation reactions; non-enzymatic darkening; oxidation of vitamins (C and B) and pigments, such as chlorophyll and carotenes. The microbiological, sensorial and physiochemical analyses should be extensively used for the warranty of the quality in the dehydrated final product.

Sulphuration should be accomplished within hermetic chambers in order the distribution of gas on the vegetable surface to be the most uniform as possible. The residual content of the free SO<sub>2</sub> should not surpass 100 ppm or 100mg/kg product (w.b.). For immersion into sulfite solution, the vegetables are dipped into sodium bisulfite solution from 1 to 2%.

### 2.2.-Drying

The drying of the vegetables may be accomplished either by direct exposure to the sun or indirect heating systems, by using the air as simultaneous- action element for transportation of the heat and the water vapor removed from the vegetable. The drying temperature ranges from 40 to 70°C and the drying time may range from 2 to 24 hours, as depending on the way the material is arranged for drying.

The drying by direct exposure to the sun is still widely practiced. However, its use is limited to the regions with hot and dry climate and high insolation. Drying is divided into two stages: in the first one, the vegetables are uniformly distributed on a tray, and are exposed to the sun until losing from 50 to 70% moisture. In the second one, the vegetables are taken to the shadow in order to avoid dryness and loss of the characteristic aroma and flavor.

In the indirect system, the heat is transmitted to the vegetable through the hot air that circulates tangentially to the product under a horizontal or transverse flow. The time and drying temperature depend on the type and shape of the raw material, air relative humidity, air speed within the cabinet and the characteristics of the equipment. For small and medium enterprises, the most suitable dryers are the cabinets and the continuous belts, as the first ones presenting lower cost.

## **2.3.-Conditioning**

Many times the location inside the dryer or even the size and shape of the vegetal parts hinder the water loss from occurring equally during drying. The conditioning allows for an uniform distribution of this residual moisture.

This procedure consists of conditioning the product into a recipient, by occupying only two thirds of its volume, and sealing it. The product should remain under conditioning during two to five days. In this period, it must be moved at regular intervals. The excess moisture contained in a part of the vegetable will be absorbed by the drier part, so reaching the equilibrium.

## **2.4.-Weighting**

When the conditioning phase is over, the weighting and calculation of the total product obtained from the dehydration process are accomplished. Some care should be taken to avoid shortage of products in the package. The total amount of product in each package will depend on the chosen package, that is glass pot, plastic pot or plastic package.

## **2.5.-Packaging**

The dehydrated vegetables contain a low moisture content. The packaging should preserve the characteristics of that product it contains. It should not allow for the absorption of external moisture.

The vegetables should be packed at small quantities inside polypropylene 25mm - thick bags that are tightly sealed. Before sealing, the air must be removed from the packaging. The vacuum packaging improves the conservation of quality in the dehydrated vegetables.

The undulated cardboard boxes are recommended to secondary packaging. In these recipients, the gel silica that is a chemical product able to absorbing the air humidity is usually introduced in those recipients, therefore prolonging the storage time.

## **2.6.-Storage**

The dehydrated vegetables should be stored in fresh places that are protected against light and air humidity. The light changes the vegetable color, besides causing the loss of the vitamins A and C. The heating reduces the life time of the product.

## **3.- Dehydrated products**

### **Dehydrated Onion**

At the end of the dehydration process, this product shows a yellow to dark yellow coloration. This is due to the sugar-caramelizing reaction, when the vegetable is subjected to higher temperatures. It should be shown under the shape of small cubes. The moisture content should be lower than 12% (w.b.).

### **Dehydrated Garlic**

At the end of the dehydration process, this product exhibits a yellow to yellow dark coloration. This is due to the sugar-caramelizing reaction, when the vegetable is subjected to higher temperatures. The product should be shown under the shape of small cubes or fine slices. The moisture content should be lower than 12% (w.b.).

## Dehydrated Green Pepper

At the end of the dehydration process, this product presents dark green coloration. It should be shown under the shape of small cubes. The moisture content should be lower than 12% (w.b.)

## Dehydrated Carrot

At the end of the dehydration process, this product shows an orange coloration. A characteristic wilted aspect is observed. It may be shown under the shape of small cubes or roundels. The moisture content should be lower than 12% (w.b.).

## Mix for soup

This product is constituted by a mix of the other four industrialized products, and it serves as basis for the constitution of a soup. So, the mix should contain the vegetables at the following proportions :

- 31,8% of dehydrated onion
- 31,8% of dehydrated carrot
- 31,8% of dehydrated green pepper
- 4,60% of dehydrated garlic

## Packaging

Those products should be packed, by using glass pots, plastic polypropylene packaging, or PEHD pots. The plastic packaging may be used either under the form of packages and pots'. The most suitable packaging for roundel carrot is the polypropylene bag.

## 4.- Vegetable Soup

The mix for soup is a product used as ingredient to compose a completely dehydrated soup. To do so, it would be necessary that the proposed mix to be added with the ingredients listed below, at the following proportions:

Ingredient	Weight (g)	%
Mix for soup	11	11%
Tomate	3,5	4%
Garden Parsley	0,25	0%
Meat	8,5	9%
Black pepper	0,25	0%
Corn starch	6,5	7%
Maltodextrin	3,5	4%
Meat extract	2	2%
MSG	3,5	4%
Soy Texturized Protein	4	4%
Vegetal fat	2	2%
Salt	5	5%
Macaroni	50	50%

