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PROCESS FOR PRODUCING COMPRESSED, DEHYDRATED CELLULAR FOODS

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ABSTRACT OF THE DISCLOSURE

A process in which morsels of a freeze-dried cellular food are first rehydrated to a moisture content of about 5% to 13%, compressed together while maintaining the surface moisture of the morsels and the pressure sufficiently high to cause the morsels to adhere during said compression and dehydrated to a moisture content below about 3%, the degree of compression being such that the density of the dehydrated product is in the range of about 0.5 to 0.9 gram per cc.

This invention relates to the production of compressed food products from highly porous low density dried foods, particularly freeze-dried foods.

Freeze drying of foods is well known to give a high quality product. This quality results from two characteristics of the freeze-drying process: (a) Products to be dehydrated are first frozen and then are introduced into a chamber which can be evacuated. All drying occurs while any water remaining in the substance is in the frozen state. Loss of water occurs by sublimation, wherein the water or moisture content of the material is transformed directly from the solid state (ice) to the vapor phase under such conditions of temperature and pressure that the ice in the product never has an opportunity to melt. Thus the material being dried is never subjected to high temperatures such as are frequently used in other forms of drying; (b) Also, since the water content of the material is not allowed to liquefy during the process, the products being dried are not able to shrink and the structural characteristics are preserved in essentially their original state.

Because of the advantages mentioned above, freeze drying is a preferred method of dehydration for many foods and other substances. The appearance of the dried end-product is essentially the same as that of the starting material, which also adds to the attractiveness of the method of dehydration. Rehydration of freeze-dried material is usually much faster than that resulting from other dehydration methods because shrinkage and case-hardening which frequently occur in other drying methods cannot occur in freeze-dried products. The resulting porous structure of freeze dried foods typically consists of a sponge-like or honeycomb-like structure which water can penetrate very readily when it is desired to rehydrate the product.

Freeze drying offers a means of preservation of substances such as foods without the necessity for sterilization and hermetic sealing as in canning and without the necessity for maintaining products under refrigeration or in frozen storage conditions. For many food substances, the eating qualities of the rehydrated foods are approximately the same as the quality of conventional, commercially frozen foods such as are available on the retail market throughout the United States and in other parts of the world. Frequently, the eating qualities of rehydrated freeze-dried foods are better or more nearly like those of the unpreserved foods than are conventional, commercially canned food products.

Like other dried foods, freeze-dried products are advantageous in applications where the low shipping weight (through absence of water) is important. However, the volume occupied by freeze dehydrated materials is essentially the same as that of the original fresh or cooked product, even though its weight may have been reduced to as little as 10% of the original weight, depending on the moisture content of the starting material (which is generally above about 60%). In addition, the freeze dried foods are very fragile and easily broken unless special precautions are taken in packaging.

It is accordingly an object of this invention to provide a method for producing a novel dried food product having the high eating quality (on rehydration) of freeze-dried foods, but occupying considerably less volume and being more resistant to breakage.

Another object of this invention is the provision of a novel method for the production of new compressed readily rehydratable porous products from a wide variety of foods, e.g. vegetables such as leafy vegetables and legumes, grains, muscle meats, etc.

One aspect of this invention relates to our discovery that freeze-dried food morsels can be partially rehydrated; then compressed to a fraction of their previous bulk and to a compact condition in which the morsels are considerably distorted from their original shapes; then, while so distorted and compact, re-dehydrated to a low moisture content to produce a product which on full rehydration is substantially the same as that obtained on full rehydration of the original freeze-dried food morsels.

The proportions of water employed in the partial rehydration step are generally such as to raise the water content of the freeze-dried food into the range of about 5 to 13%. The exact proportions will depend on the type of food and the other conditions of treatment, as discussed below, but propodtions in the lower portion of this range are prefered.

We have found that for the dehydration step, after the partial rehydration, one need not use expensive and cumbersome freeze-drying procedures, but may employ ordinary methods such as vacuum drying to attain a low water content (e.g. a water content of about 3% or less). Surprisingly, the use of such ordinary drying methods at this stage does not affect the quality of the product after full rehydration.

We have found it advantageous to regulate the conditions of treatment so as to produce a compressed bar in which the morsels are bonded firmly to each others at their surfaces, the bonds between morsels being sufficiently strong to permit handling of the composite product without separation into its components morsels or other fragments. Despite the bonding, the re-dehydration proceeds rapidly without affecting the quality of the product that is eventually obtained on full rehydration of the bonded composite. Also, the bonding makes it possible to redehydrate in an economical manner without the use of any special containers or other devices to maintain the distorted morsels in the interfitting positions to which they have been forced during the compression step. Failure to keep the morsels in these positions will cause a considerable increase in the bulk density.

We have also found that in the partial rehydration step it is advantageous to supply a relatively large amount of moisture to the zones adjacent to the surfaces of the morsels, while keeping the interiors of the morsels at a lower moisture content. In this manner we can attain the desired bonding without the disadvantages which follow from the use of a relatively high moisture content throughout the food, such as the increased cost of dehydrating a product containing the additional water and the adverse effects of too much moisture on the quality