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# Producing Onion Powder for Sale and to Extend the Season

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ECHO recently received a letter from Sister Luisa Campos in the Dominican Republic asking us for information on how to process onions into powder. This processing would be for long-term storage and for the economic advantage of selling the processed onions at a greater price when fresh onions are no longer available.

For example, Tom Post with the Christian Reformed World Relief Committee told us of an innovative farmer in Belize who found a way to grow one particular cultivar of onion in an area where onions were not a commercial crop. He made more on his small plot of onions than the rest of his farm. But the next year he could not sell his crop because the local stores found that the bulbs soon rotted. The project ended. Perhaps in a situation like that, if there had been a market for onion powder, the farmer could still have succeeded.

We researched this topic and found a very helpful article published by GTZ in the March 1983 issue of their publication, *GATE*. The article, entitled "Appropriate technology for dehydration of vegetables and fruits" by T.H. Jackson, outlines the principles behind dehydrating all sorts of fruits and vegetables but goes in depth into the processing of onions. The article is written from a village industry perspective and employs a great deal of appropriate technology principles. (The article was found on a very helpful CD-ROM, *The Humanity Development Library*, containing over 1200 books, reports, and magazines, including ECHO's book *Amaranth to Zai Holes: ideas for growing food under difficult conditions*. The CD-ROM is available from ECHO to overseas development workers for \$12.00, including airmail postage overseas.)

We also received some helpful advice about onion processing from the United Kingdom-based Intermediate Technology Development Group (ITDG), an independent charity providing resources on technologies suitable for rural communities in developing countries.

We gleaned information from each of these sources to summarize a method of processing onions into powder. Then we asked ECHO appropriate technology intern Jason Dahlman to try out some of these methods on onion and garlic. His experience is incorporated into the rest of this article.

**1) Preparation.** Production of onions should be timed, if possible, so that the harvest coincides with a season of warm, dry weather. Ideally, preparation should start early in the morning, so that drying can begin the same day. Use clean onions

of good quality and free of blemishes. Wash the onions in drinking-quality water (i.e. boiled or chlorinated), then remove the outer skin, growing tip, and roots. Peel the onions and slice thinly to an approximate thickness of 4 to 5 mm (0.16-0.20 in).

Jason used both white and yellow onions throughout the process and found no noticeable difference between the two. He found that slices must be separated into rings to dry properly.

The articles we read recommend blanching the sliced onions. Blanching is not actually necessary when drying onions, but it is suggested because the heat should destroy enzymes in the onions that would otherwise cause them to turn brown in color. One way to blanch onions is to wrap the slices in a muslin cloth, place them in a wire basket with a tight fitting lid, and suspend the basket over a pot of boiling water for 3-5 minutes. Steam will also kill some microorganisms that could cause spoilage.

In Jason's experiment the steam blanching process resulted in sticky onions and garlic which were more difficult to utilize. Perhaps more practice with various blanching methods (such as a quick immersion in boiling water instead of steam) and times would minimize the stickiness. ECHO appropriate technology specialist Charlie Forst suggests that instead of blanching, a citric acid or ascorbic acid treatment may be used to prevent browning. Citric acid is widely available as a flavoring powder or food preservative and is sometimes sold as "lemon powder." Ascorbic acid powder is widely available in the US as a powder used in canning or jam making. Mix 1 teaspoon (5 ml) of powdered citric acid or ascorbic acid per each 2 cups (1.1 liters) water. Dip the onion slices in the solution for just a minute or two. Remove and proceed with the drying process.

**2) Drying.** The simplest and cheapest method of drying onions, according to T.H. Jackson, is to sun dry them by spreading the slices on trays made of a wooden frame, for example 50 cm by 80 cm, with a base of nylon mesh (approximately 1.5 mm mesh size). Use poles to elevate the frame to table height, both to allow for air circulation and to avoid contamination. For the first day, turn the onions every hour. After that, turn them a few times throughout the day. Allow the onions to dry to a moisture content of about 10%. When the onions are dried to the correct level, they become brittle and will easily snap when bent. In a semiarid climate with warm, dry weather (ideal for drying onions), this should take between 3 to 5 days. In the moist tropics, drying onions to the right moisture content is more difficult.

One improvement over open air drying is to raise the ambient air temperature by enclosing the trays in a solar dehydrator and/or using a wind driven extractor fan. One very simple type of solar collector which can help decrease drying time is a sheet of corrugated iron painted black on the side exposed to the sun. The corrugations help to give ventilation. The iron can be placed either under or over the tray; the latter may help protect against flies and damage from sunlight. A similar effect could be produced by mounting a tray underneath the roofing metal on a metal roof in a warm climate. An additional advantage to drying in a dark location is that the color of the finished product will likely be lighter, which would be considered higher quality by consumers.

Using a solar dehydrator method may reduce drying time to as little as three to nine hours.

At 10% moisture, onions have a reasonably long storage life, but to make onion flakes or powder it is recommended that they be dried further, to no more than 6% moisture content. This 6% moisture content is also recommended for safe hygiene. Export specifications for some dried onion products require this moisture level. To achieve 6% moisture, blow or draw heated air through a bed of the dehydrated onion slices. With air between 50-55°C (122-131°F), it will probably take about eight hours to reach the desired moisture level. Only a small airflow is needed for this process, so a solar-energy-powered fan is quite feasible. [Ed.: While we don't have a simple test for a 6% moisture level, using these drying methods will presumably achieve a moisture level that is close to 6%. If one is marketing locally at test is presumably not needed as long as the product is satisfactory.]



Several simple designs for solar dryers are described in a booklet by Intermediate Technology. The booklet, *Drying*, is number six in a series of Food Cycle

Technology Source Books (see *Amaranth to Zai Holes*, p. 279). This booklet is available from ECHO's bookstore for \$15.50 plus \$4.00 surface shipping and handling. It is also available from Intermediate Technology at Myson House, Railway Terrace, Rugby, CV21 3HT, UK.

Jason found that the humid climate at ECHO during the week he did his experiments made open air drying ineffective, especially for the onions. Even though he did the work during our dry season, neither onions nor garlic dried enough to make powder. In contrast, garlic dried well in a solar dryer with no fan. It dried even better in a solar oven designed to roast or bake foods. He had problems with onions drying too slowly in the solar dryer he used and drying too quickly (searing on the outside preventing drying inside) in the solar oven. We suspect, however, that further experimentation with solar dryer models and drying times could result in onions drying effectively here at ECHO.

A standard kitchen oven on low heat works well for drying vegetables. Simple electric dryers are available in the US and other Western nations as well. Jason found that it was very easy to dry onion in ECHO's electric dryer. Perhaps the cost of such a dryer is economical enough to warrant investigation by projects with a little investment money. Costs typically range from US\$50 TO \$350 for home models. Lehman's Hardware and Appliances sells nice kitchen models for US\$165.00 (with 8 square feet of drying rack space on stacked racks) or US\$197.00 (for a model with 14 square feet of rack). Contact Lehman's at One Lehman Circle, PO Box 41, Kidron Ohio 44636, USA; phone: 330-857-5757; fax: 330-857-5785; e-mail: info@lehmans.com; www.lehmans.com. (<http://www.lehmans.com/>)

**3) Powdering.** After drying, the product may be broken up into small, uniform sized pieces using a "kibbling" machine. This may be a special slicing machine or a mill set to produce large bits rather than fine powder. The larger onion flakes can then be separated from the finer material with a sieve and packaged for sale as flakes. The advantage of a kibbling machine is that the onion flakes produced with it generally

command a higher price than does onion powder. However, the machine would also require a capital investment of anywhere from US\$50 to \$175 for a hand mill or much more for a custom-made, powered machine. If the finished product is to be marketed locally, the kibbling operation can be omitted. You can instead choose to powder the onions directly after drying.

To powder the onion slices, use a mortar and pestle, rolling pin, or a stone mill for small-scale operations. Powered mills (plate mills [“burr mills”] or hammer mills) are recommended for larger operations. Further reduce the finer material down to a less than 6% moisture content in the air dryers and then mill the product. Ideally, the ratio of raw onion to processed dried onion is 10:1 (The article did not specify if this is a weight or volume ratio, but presumably it is by weight).

**4) Packaging.** Sealed packaging is important to prevent powdered onion from clumping or spoiling due to regained moisture. Use sealed glass jars or good quality sealed plastic bags for best storage of dried, powdered onion, since the tendency of onion powder to cake is increased by moisture. Very strict attention to cleanliness is essential to prevent contamination of the onion powder.

If you are interested in the production of onion powder for sale, make sure you run small-scale onion processing trials before you attempt commercial production. You also might want to inquire about opportunities for training in packaging and marketing.

A final item to keep in mind if you intend to process onions as a business: Dr. Leslie Currah of Currah Consultancy, United Kingdom, mentioned that onion powder can be quite flammable. This could pose a danger when large amounts are stored or when clouds of dust are flying around in the powdering area.