

AIC *On Line* **ACE AIC Market Briefs: Papain**

Papain is an enzyme which is extracted from the milky juice of the unripe papaya fruit. The enzyme has similar properties to some protein-digesting enzymes found in the stomachs of animals. It is used locally and throughout the world as a meat tenderizer. The usual grade used in food dissolves about 35 times its own weight of lean meat. It is deactivated by cooking.

Papain has other uses as well. It is used to clot milk and to keep beer clear. It is estimated that 80 percent of beer made in the U.S. is treated with papain. It is used in pet food to increase palatability and reduce viscosity, and as a detergent to remove stains. It also has several medical uses, including preventing cornea scar malformation, treatment of jellyfish and insect stings, treating edemas, inflammatory processes and in the acceleration of wound healing. In the leather industry, it is used to remove the hair from animal hides before tanning. A new use has been found as an ingredient in cleansing fluids for soft contact lenses. In very low concentrations, papain is also used in indigestion remedies. Chymopapain, another enzyme derived from the same source, is used in medicine to dissolve discs in lumbar spine injuries.

Market Overview

Although papain is fairly difficult to handle, needs cold storage facilities and has a shelf-life of 3-6 months, it is a highly valued commodity with a growing market. It is currently exported by Tanzania, Uganda, Zaire, South Africa, Sri Lanka, Thailand, and India in varying degrees of refinement. Once papain is exported from one of these source countries, it is often re-processed in the importing country. This is the case in Europe, the U.S., and Japan, where there are companies which add value to the papain by changing it to suit the customers' needs.

There are no trade statistics available for papain. All enzymes are lumped in the same category. The U.S. enzyme import market was worth US\$193 million in 1995, a drop-off of almost 10 percent from the previous year. The European import market was worth \$438 million in 1994, with France, Germany, Italy and the UK being the largest importers. Other European countries were the biggest suppliers of enzymes.

Prices for papain tend to be variable, depending upon availability of the product, strength, and form (powder, liquid). Prices paid for papain from South Asia or Africa are often lower than those offered for sale by U.S. and European companies. After a large rise in prices due to a shortage in 1993, prices have come down considerably. Two UK firms reported in 1995 that they were buying papain for \$20-\$25 per kg.

The Indian domestic market shouldn't be ignored either. Enzymes are more and more in demand for brewing, food processing, and other applications.

Production

Papain is collected by making cuts on green, unripe papaya fruits. A white liquid, the latex, which coagulates rapidly, is drained from the cuts. The yield of papain depends on the growing conditions of the tree. Monsoons or drought have an effect on the quality of papain and the best ambient temperature is between 18 and 22 degrees Celsius.

In addition to the heat liability of papain, its high enzymatic activity makes it a difficult product to handle. People who harvest and handle papain should wear protective gloves to prevent wounds.

Processing, Packaging, and Shipment

Papain is exported in latex, liquid, and powdered form. It is usually transported by sea in drums. Papain is very sensitive to temperature, and has a relatively short shelf-life. If stored under the correct temperature, papain is usable for 3-9 months. However, it must be noted that papain loses much of its potency after 6 months.

Quest International in Florida owns a plantation in India so that it can control the production and transportation to the U.S. According to a representative of Quest, papain powder stored below 20 C will maintain its activity for six months. Papain liquids should be stored below 4 C to maintain activity for 3 months. After the initial 3 months of storage, a 2-5 percent drop in activity can occur per month.

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