Treatment to Reduce Cyanide Content of Cassava Flour

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In *Cassava Cyanide Diseases News* (CCDN), Issue 4, December 2004, Dr. J. Howard Bradbury wrote about a method of processing cassava that could substantially reduce the cyanide content of flour.

With the traditional practice of sun drying cassava, a large amount of linamarin [the chemical name of the substance that produces cyanide when it breaks down] remains in the flour, and 25 to 50% of the cyanide is retained. Cassava roots contain about 63% moisture, while cassava flour contains less than 10% moisture. This means that the cyanide is much more concentrated in cassava flour than in cassava roots. The concentration of cyanide in cassava roots, even those that are processed, must be low (12 to 16 ppm) in order for the resulting flour to meet the WHO standard of 10 ppm [10 mg per kg].

Bradbury wrote, "In practice, the WHO safe standard of 10 ppm can only be achieved by sun drying roots of sweet cassava [i.e. not bitter cassava]. The average cyanide level in cassava flour in Indonesia, Ghana and in Mozambique in a good year is about 45 ppm. In a year of low rainfall the average cyanide content of flour in Mozambique exceeds 100 ppm, which causes acute intoxication and konzo."

A technique called heap fermentation can help. It involves piling peeled roots in a small heap for about four days, resulting in some fermentation and loss of cyanide. Then the roots are sun dried, crushed and sieved. The resulting flour has a cyanide content roughly half of that produced by sun drying cassava.

Bradbury continued, **"We have developed a new simple wetting method that reduces the cyanide content of flour to about one third of its previous level."**

"The method involves mixing thoroughly a sample of cassava flour with water in the ratio of four parts flour to five parts water. All the water is absorbed rapidly by the flour and the mixture is left in an open vessel at about 30°C for about 5 hours. The water rapidly swells the flour and allows linamarase to hydrolyze much of the linamarin with evolution of [cyanide] gas. After about 5 hours the damp flour is used for cooking." [Ed (MLP): That probably needs an explanation. In living organisms, the names of enzymes that break down a particular chemical often end in "ase." So the enzyme that breaks down the sugar lactose that we ingest when we drink milk is called "lactase." Linamarin in cassava is not in itself toxic, but it becomes toxic if the enzyme that breaks it down, linamarase, comes into contact with it. Linamarase is stored in a separate part of the cells of cassava to keep it away from the linamarin. When an animal crushes the cells upon eating the cassava, the

enzyme and linamarin are in contact and the animal may die. It is a form of protection for the plant. The process of making flour no doubt releases the enzyme but the enzyme is only active when it is dissolved in water. That is why the wetting procedure is so effective.]

Quoting Bradbury again: "The method works only when there is sufficient linamarase present in the flour. For example, if the linamarase has been inactivated by prior drying of the root at 100°C, then there is no loss of [linamarin] using the wetting method."

Bradbury concluded, "The method is designed so that the flour needed for cooking in the evening is thoroughly mixed with water in the morning and used that same evening. Further work is in progress in Mozambique on the possible application of this promising new wetting method."