Speaking of Science

Amaranth: A Comeback for the Food of the Aztecs?

Getting enough high-quality protein from their diets is a problem for many of the world's people, especially those who rarely eat meat and animal products and must therefore get most of their nourishment from grains and vegetables. Even when their calorie supply is adequate these people may suffer from malnutrition because most cereal proteins do not supply all the amino acids the body needs. One way to attack this problem is to try to breed new strains of cereals, new maize strains, for example, with proteins of enhanced nutritional value.

But another approach is to look for alternative food crops, nutritious plants not now being exploited as food sources but having the potential for development. Some of these are in no way new; they may have been eaten, even domesticated and cultivated by "primitive" peoples, but for one reason or another they never developed into modern agricultural staples. The amaranths are among the potential food plants that have fallen by the wayside.

Five hundred years ago, amaranth grain was a staple of the Aztec diet and an integral part of their religious rites. The Aztecs made idols out of a paste composed of ground, toasted amaranth seeds mixed with the blood of the human sacrifice victims. During the religious festivals, the idols were broken into pieces that were consumed by the faithful, a practice that the Spanish conquistadors considered a perverse parody of the Catholic Eucharist. When the Spaniards subjugated the Aztecs in 1519, they banned the Aztec religion and with it the cultivation of amaranth.

Today amaranth is grown for food in just a few areas of Mexico, where the peasants use it to make a candy, but even this practice is declining. Cultivation has also spread to a few other parts of the world, including sections of India, but most farmers think of plants of the genus *Amaranthus* as weeds and nuisances, not as a source of food.

Some observers, however, maintain that this image does not do justice to the merits of amaranth. The National Academy of Sciences lists it among 23 food plants that could be used to improve the nutrition and the quality of life of people in tropical countries. In addition, Robert Rodale of Rodale Press has been promoting the cultivation of amaranth in his magazine *Organic Gardening and Farming*. He says that he is not interested in commercializing the plant but merely likes the challenge of trying to add a new staple crop to the dozen or so now cultivated.

By all accounts, the principal merit of amaranth is that both the grain and the leaves are sources of protein of unusually high quality. The proteins of most cereals, including corn and wheat, are considered incomplete because they lack sufficient lysine for good nutrition. (Lysine is one of the essential amino acids that must be supplied in the diet because the body cannot make enough for its needs.) But amaranth protein contains a much higher percentage of the amino acid than those of the other cereals; and thus amaranth is a prime candidate for cultivation by the small farmers of the less developed countries where protein deficiencies are often major nutritional problems.

Amaranth grain and leaves are not only nutritious, they are also tasty, according to Rodale. The fact that both the greens and the grain are edible seems almost too good to be true, but whole diets can apparently be planned around amaranth products. The greens can be concocted into such gourmet dishes as amaranth lasagne, amaranth foo yong, and perhaps with a thought to good politics, steamed amaranth with peanut butter. The grain can be cooked into a gruel, parched and milled to produce a flour, or popped. Popped amaranth combined with molasses forms a confection that the Mexicans call "alegria."

Most species of amaranths grow—literally—like weeds. Pigweed is an amaranth found throughout the United States. A few species have been domesticated and cultivated for their foliage (some for eating and others for use as ornamental plants) or for their grain. But there has been little organized research directed at improving the domesticated strains or finding the best conditions for growing them. Rodale, in addition to supporting more conventional efforts to supply this information, is currently sponsoring a research program in which the readers of his magazine are trying to find out how well one of the domesticated amaranths grows in the different climatic and agronomic conditions around the United States.

This year, some 14,000 of the subscribers to the magazine received free packets of seed with instructions on how to collect and record the appropriate data on climatic conditions, growth rates, yields, and so forth. The results of this program are not yet in, but smaller studies in previous years indicate that amaranths grow best in warmer climates and that they are resistant to dry conditions, a big advantage in a world that seems to be running short of water.

Although the amaranths may be potentially valuable food sources, there are problems, especially concerning the grain, that might limit their cultivation on a wide scale. One is that the domesticated strains can hybridize with their weedy relatives, which are ubiquitous, and thus produce seeds of low quality. There are techniques for developing strains that cannot hybridize in this manner, but they have not yet been tried on grain amaranth. Another problem is that amaranth seeds are quite small and must be harvested by hand. It is for this reason that Rodale is concentrating his efforts on gardeners and small farmers who do not depend on mechanization.

In any event, the requirement for hand-harvesting need not hinder the fostering of amaranth cultivation as an appropriate technology for use in the less developed countries. Some observers, such as John Robson of the Medical University of South Carolina, are coming to the view that it is a mistake to replace traditional forms of agriculture with high-technology Western practices in these countries. Robson, who introduced Rodale to amaranth about 4 years ago, once helped to convert some areas of Africa to Western agriculture at the expense of indigenous food plants. He now thinks that it would be better to maintain and improve the variety of food sources already present in the less developed countries rather than totally replace them with Western crops. When these crops fail, as they may from lack of water or fertilizer, the people starve if they have no alternative to fall back on. Robson makes the point that many potential food crops, in addition to amaranth, could be improved and cultivated; the Aztecs are not the only people whose agricultural practices might be worth developing.—JEAN L. MARX