Appendix C

Selected New Food Crops and Other Industrial Products

Table C-l—Selected Potential New Food Crops

Grains	Beans	Fruits	Tubers	Vegetables
Amaranth	Adzuki	Atemoya	Cassava	Canola oil
Blue corn	Black turtle	Carombola	Cocoyam	Chayote
Quinoa	Chickpeas	Lingonberry	Groundnut	Jimaca
Triticale	Edible soybeans	Mayhaw	Sweet potato	Tomatillo
White lupin	Mung	Papaya	Taro	
Wild rice		Persimmon		

SOURCE: Office of Technology Assessment, 1991.

Biopharmaceuticals

U.S. research on plants as sources of medicinal appears to be limited. Most major drug companies and the National Cancer Institute have either reduced or eliminated plant screening for drug potential. One successful plant-derived drug is anticancer alkaloids found in the Madagascar periwinkle by Eli Lilly & Co. (9). The National Cancer Institute is currently interested in testing taxol recovered from the bark of the Pacific yew for anticancer activity (5).

Difficulties in screening and characterizing compounds have impeded research on biopharmaceuticals. It maybe cheaper to synthesize the simple compounds than to extract and purify them from plants. Highly complex compounds are more difficult to synthesize, and in these cases plant extraction might be competitive. Cell culturing is another alternative (9).

The United States does import plant-derived pharmaceuticals, including cinchona bark (quinine), belladonna, coca leaves, and opium for medicinal use. Additionally, the United States exports some plants that are used as medicines in other countries. Ginseng *(Panax* ginseng) is an example. It grows wild in deciduous hardwood forests and is cultivated, with 90 percent of the domestic production in Marathon County, Wisconsin. Average per-acre yields are 3 tons of green ginseng root, which dries to about 1 ton. Ginseng is risky to produce, highly susceptible to fungi, and takes 6 to 7 years to mature. Planting costs, seedbed preparation, weeding, and harvesting cost nearly $20,000 per acre. Prices of cultivated ginseng have averaged around $50 per pound (1980-83) (3).

Potential medicinal plants include Coleus barbatus, a perennial from India. The diterpene forskolin, currently used in research and potentially a hypertensive, has been isolated from the root tubers. Attempts to grow this plant in Michigan have been successful, but quality is highly variable (10).

Biopesticides

Currently, plant-derived insecticides and synthetic analogs are available for use. Some examples include pyrethrum, rotenone, nicotine, and hellebore. Pyrethrum is obtained from flowers grown in Kenya, Tanzania, and Ecuador. Synthetic analogs, which are **more** stable and effective in the field, have replaced much of the use of pyrethrum. Rotenone comes from roots of *Leguminosae* species and is used to control animal ectoparasites and in home and garden uses. Nicotine is not widely used because of high production costs, toxicity and limited effectiveness (2). Powder from the roots of hellebore are used to kill lice and caterpillars. Other plants suggested as potential producers of insecticides include:

1. Sweetflag *(Acorus* calamus), a semiaquatic **perennial** that can be grown on dry land. An American variety grows in the Southeastern United States. Essential oils obtained from the roots of European and Indian varieties produce B-asarone and asarylaldehyde, which attract and sterilize fruit flies, and can be used as a fumigant for stored grains (4).
2. Big sagebrush *(Artemesia* tridentata), a perennial that grows in the deserts of the Western United States. Active ingredients include the antifeedant deacetoxymatricarin, which acts against the Colorado potato beetle among other insects (4).
3. *Heliopsis* longipes, a perennial herb native to Mexico. Active ingredients are found in the root and include affinin which acts against mosquitoes and houseflies (4).
4. Mamey apple *(Mammea* Americana), a tree native to the West Indies and which can be grown in Florida. The principal active ingredients are mammein and its derivatives, which are obtained in the seeds and fruit pulp. It can be used against fleas, ticks, and lice (4).

5. Sweet basil *(Ocimun* basilicum), currently used as an herb or spice and easily grown in the United States. The oil contains many compounds that are active against the larva of mites, aphids, and mosquitoes (4).
6. Mexican marigold ***(Tagetes*** minuta), an annual native to South America which can be grown in the United States. Active ingredients include 5-ocimenone and a-terthienyl, which are found in many parts of the plant and act as nematocides to kill mosquito larvae. Approximately 50 to 60 percent of the oil is tagetone, which acts as a juvenilizing hormone (4).
7. Neem *(Azadirachta* indica), a tree native to India. It thrives in hot dry areas and is salt tolerant. It is easy to care for and fruits in about 5 years. One tree can produce 30 to 50 kg of seeds per year. Thirty kg of seeds yield about 6 kg of oil and 24 kg of meal. Active ingredients include azadirachtin contained in the seed oil, which acts as a growth regulator and feeding deterrent against many beetles. Neem is a broad-spectrum insecticide; only small amounts of the active ingredients are required. Research on neem is being conducted at the USDA Horticulture Research Station in Miami. Recently, the horticulture products division of WR Grace & Co. acquired trademarks and patents for the technology used to produce insecticides from neem and will market an insecticide under the name of Margosan-O (1,4,6,7).

To be commercially viable, an insecticide needs to be effective against a wide range of insects.

Active ingredients derived from plants could also be used as herbicides. A potential plant with herbicidal properties is Dyer's Woad *(Isates* tinctoria). This plant grows in the Western United States. The seed pods contain a chemical that is toxic to the roots of grasses (8).

Appendix C References

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