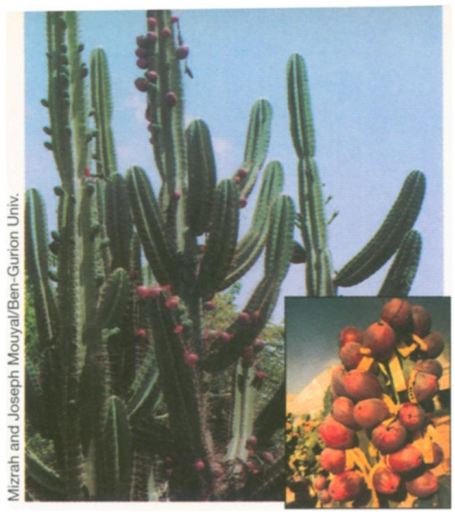
Black-Eyed Peas Go to Mars?

Tales of new destinies for plants

By TINA ADLER



Mizrah and Joseph Mouyal/Ben-Gurion Univ.

*An Israeli-grown apple cactus (*C. peruvianus*) and its fruit (inset).*

A banquet served at an Indiana airport hotel for people at an agriculture conference might well include chicken and a vegetable, or some variation thereof.

Well, how's this for variation?

Amaranth (a high-protein grain) rolls
Salad with arugula and hull-less pumpkin seeds
Shiitake mushroom and
quinoa (a high-protein grain) soup
Smoked ostrich, tempeh (a soybean patty),
and Indiana crayfish
Pearl-millet-fed duck, garnished with
carambola (a star-shaped fruit)
Buckwheat groats with pasta
Tomatillo (a Mexican fruit) with basil
Pistachio ice cream with kiwifruit and
raspberry sauce

Scientists, farmers, and food company executives attending the Third National Symposium for New Crops in October dined on this feast, prepared by chefs from Purdue University in West Lafayette, Ind., and the Adam's Mark Hotel in Indianapolis. They and conference organizers, including representatives of government, industry, and academia, hope that someday such exotic fare will become commonplace.

They also hope that other new crops will provide the ingredients for paper, solvents, fuels, resins, construction materials, potting soil, chicken feed, and more.

Berthal Reynolds/Louisiana State Univ.

The tubers, known as groundnuts, and beans of A. americana.

The term "new crops" refers to plants that some groups of farmers or consumers would consider novel, even though other communities might have used them since ancient times. Mexicans grow, eat, and market lots of cactus fruit, for example, and Native Americans once dined on tubers called groundnuts. But most of the world has never seen either.

Researchers are taking these and other wild or native plants and breeding them to develop strains with the characteristics growers require: resistance to disease, drought, and pests; hardiness in cold climates; and high yield.

Getting a new crop to market can easily require 10 years or more of research, development, and promotion. Some crops, such as kenaf (*Hibiscus cannabinus*), a native of Africa that can be grown as an alternative to wood, remain uncommon in the United States despite 30 years of work by government and industry (SN: 8/1/87, p.72). But new crops are often well worth the wait, their proponents say.

Many nutritious fruits and vegetables, grasses that control soil erosion, fast-growing trees, and plants that do well on dry soil remain underutilized, contends conference speaker Noel D. Vietmeyer of the National Research Council in Washington, D.C. Plants present an environmentally friendly, more rapidly renewable, and more energy-efficient alternative to the fossil fuels and wood used in manufacturing and construction, participants argue.

Some companies today use cellulose waste fibers, particularly straw, instead of wood to make their building materials. More will do so in the future, says David R. Lorenz of the Institute for Local Self-Reliance in Minneapolis. When put under high heat and pressure, straw forms boards suitable for construction.

Many agricultural states now forbid farmers to burn straw in fields. As a result, straw disposal costs have risen from almost nothing in 1992 to roughly $40 per ton, Lorenz asserts in an institute report on cellulose waste published in June. At the same time, lumber prices continue to climb. So putting straw to work has become economically feasible.

Boards made from straw hold up quite well, he says. Europeans have used them for about 40 years, and London's Heathrow Airport has strawboard ceilings.

New-crop experts would like to see U.S. manufacturers follow in the footsteps of Brazilians, among others, and use fiber from kenaf, sunn (*Crotalaria juncea*), and other plants to make paper. Only one U.S. paper company uses kenaf, says Lorenz. Kenaf and sunn produce more fiber per year than trees, and they tolerate poor, dry soil.

However, wood prices will need to rise even further before those plants' papermaking prospects improve, Lorenz and others acknowledge.

Meanwhile, kenaf and sunn may replace some of the sphagnum peat moss that now constitutes the bulk of commercial potting soil. Many ornamental and vegetable plants grow as well in a mixture of 70 percent kenaf and 30 percent peat moss as they do in standard potting soil, Nancy A. Reichert and Brian S. Baldwin of Mississippi State University in Mississippi State reported at the new crops conference. Kenaf costs less and is more readily available than peat.

Sunn may work even better than kenaf in potting soil, says Charles G. Cook of the Agricultural Research Service in Weslaco, Texas. Kenaf has too much boron for some plants, such as poinsettias, he says. Sunn, a legume, fixes nitrogen and appears to ward off nematodes. Indeed, farmers usually grow it to improve their soil, he notes.

Inhospitable land, such as the desert, will support agriculture, if new-crop experts have their way. In Israel, Yosef Mizrahi is coaxing cacti to bear commercial-quality fruit. Although many tasty species of cactus fruit exist, only the cactus pear (*Opuntia ficus-indica*) sells worldwide, he laments. A few countries, including Mexico, Colombia, and Vietnam, sell limited quantities of other species.

Mizrahi and his colleagues at Ben-Gurion University of the Negev in Beer-

sheba are testing the crawling cactus *Selenicereus megalanthus* and two species of *Hylocereus.* The most promising species, because of its good growth rates and early yields, is *Cereus peruvianus,* he reported at the conference. However, the fruit of *C. peruvianus* varies considerably from plant to plant. It can taste either sweet or sour, and the color of its smooth skin ranges from yellow to bright red.

U.S. researchers and companies are trying to commercialize crops ignored or long forgotten by much of the world. Frieda's, an exotic produce marketing company in Los Alamitos, Calif., recently began selling a line of North and South American Indian fruits and vegetables under the trademark "Lost Crops." These include coquito nuts, which resemble small coconuts; oca, a slightly acidic tuber; feijoas, a fruit that tastes like a cross between a pineapple and spearmint; and many types of beans.

One of Frieda's vegetables, *Apios americanas*, produces edible beans and a tuber, known as a groundnut, that has a nutty flavor and packs three times the protein of most potatoes. Groundnuts, which grow along creek beds, reportedly kept the Pilgrims alive their first few winters in New England and nourished Native Americans long before then.

Scientists in Louisiana began breeding *A. americanas* for large, uniform tubers in 1985. Last year, they sold the crop for the first time to Frieda's, says Jacqueline Carlisi-Dunlop of the University of Southwestern Louisiana in Lafayette. A cold-sensitive perennial, the plants have no insect predators in Louisiana so far.

In their search for additional jobs for underutilized plants, new-crop enthusiasts have come up with a natural fungicide and better eggs.

From rapeseed (*Brassica*), companies already produce canola oil for cooking and a less refined oil for manufacturing nylon, plastics, and other products. The rapeseed meal remains unused.

Sulfur-rich compounds known as glucosinolates make the meal a poor animal feed. However, they may make it a good fungicide, explains Harbans L. Bhardwaj of Virginia State University in Petersburg.

Bhardwaj and his colleagues demonstrated that 27 to 35 percent of peanut plants grown on soil treated with rapeseed meal had symptoms of black rot, a common fungal disease, compared to 50 percent of plants grown in untreated soil. Although the enriched soil doesn't match the disease rate of only 10 to 12 percent in chemically treated plants, Bhardwaj suspects that adding rapeseed meal to fields may enable farmers to use less of the chemical fungicide, which can prove harmful to people.

Efforts to expand the market for pearl millet (*Pennisetum glaucum*), a drought-resistant grain that requires little fertilizer, have resulted in more healthful eggs, researchers report. Many consumers avoid eggs, which they view as cholesterol carriers. So some farmers feed their hens fish oil or flax to boost the eggs' concentration of omega-3 fatty acids, which studies suggest may protect people against heart disease.

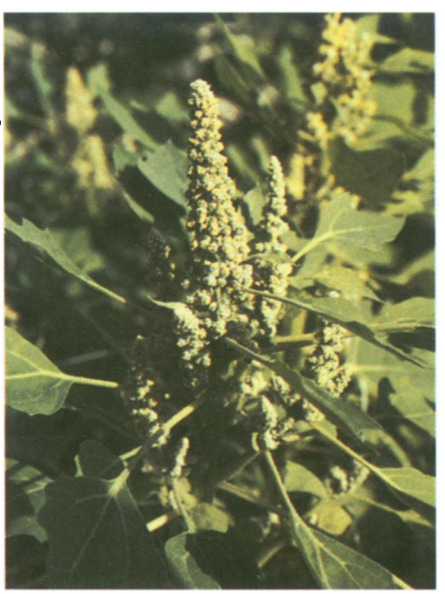
Recently, scientists fed hens pearl millet, which also has a high concentration of omega-3 fatty acids. The subsequent eggs had almost 50 percent more of the beneficial fatty acids than did eggs of chickens fed corn, Victoria P. Collins of the University of Kentucky in Lexington and her colleagues report in the August POULTRY SCIENCE.

That's less of an increase than flax and fish oil produce, but flax has a shorter shelf life than millet, and fish oil can make eggs taste fishy. Farmers may want to feed chickens a mixture of millet and flax, Collins suggests.

At Texas A&M University in College Station, a carrot cultivation program and a sense of school spirit led to a more nutritious product. When scientists there unintentionally grew a few maroon-colored carrots from a batch of Brazilian seeds, they couldn't resist cultivating the new hue. After all, the university's colors are maroon and white.

They created a strain of maroon carrots to sell to the local community, says researcher Leonard M. Pike. The new carrots not only look good, however; they have about twice the beta carotene of their orange relatives and they taste sweeter, Pike and his colleagues discovered.

The scientists got serious about their carrot and produced six varieties. They hope to begin selling seeds of one variety to commercial and home gardeners next fall, 7 years after their initial find. Pike expects the seeds to sell well. "Everybody wants them yesterday," he says.



Greg Schlick/NASA

Quinoa, the future food of astronauts?

When people think of astronaut food, they think of freeze-dried stuff and Tang, the powdered orange drink. But such fare as fresh lettuce and black-eyed peas may eventually replace those images.

On short missions, astronauts carry produce from home. But if they venture to Mars or beyond, they'll need to grow their own vegetables. In addition to supplying food for the table, plants would help both to supply oxygen and to remove carbon dioxide from the astronauts' dwellings.

Since 1980, NASA researchers have produced hydroponic wheat, soybeans, peanuts, rice, potatoes, lettuce, canola, and black-eyed peas under conditions that astronauts could replicate in, say, a space vehicle or a lunar or Martian greenhouse.

Hydroponic plants—grown in nutrient-enriched water—have unusual nutrient and fiber compositions, sometimes better and sometimes worse than field-grown crops, scientists working for NASA reported at the new crops conference. Hydroponic rice, for example, has almost twice the protein of regular rice, says S. Suzanne Nielsen of Purdue. In fields, nitrogen, which plants convert to protein, latches onto soil particles and plant roots. So plants grown only in water have better access to the nutrient.

Billy Porter III/Virginia State Univ.

*Rapeseed (*B. napus*), when processed, wards off nematodes.*

On the downside, the leaves and stems of many hydroponic plants accumulate nitrogen in the form of nitrates, which can form carcinogenic by-products. However, plant physiologists are tinkering with growing conditions to create plants low in nitrates, she says. Indeed, varying the lighting and nutrient solutions can alter the plants' protein, fat, and carbohydrate concentrations, the scientists find.

NASA recently added quinoa (*Chenopodium quinoa)* to its list of potential plants bound for space. Considered sacred by the Inca, the plant produces edible leaves and seeds with a nutty flavor. Quinoa appeared in LADIES' HOME JOURNAL and HOUSE BEAUTIFUL recipes this spring, so quibblers could make a case for ranking it as mainstream. But most people have never tasted quinoa, nor can they pronounce its name correctly (keen-wah).

So even if new crops don't take off on Earth, at least one is likely to take off into space. □