No. 8, 1984 Winter Solstice

the Seedhead News

IN HOT PURSUIT OF WILD CHILES

Since taking on the Chiltepine Research Project in August, it has blossomed into a full scale "attack" on solving the mysteries of the biology and ecology of these elusive wild chiles. The scope of this project is wide-ranging. Some of the problems we hope to solve, in addition to the status and distribution of the wild populations, will be: the reasons for slow or low germination of the seeds; the fruit yield, methods of propagating cuttings, and the potential of chiltepines as a cultivated crop, especially in areas where the wild stands are endangered or over-harvested. This information will be used to develop a conservation strategy and to assist in continued plant breeding research.

As previously reported in The Seedhead News, chiltepines (Capsicum annuum var. aviculare) are the wild ancestors of almost all the peppers that we know and love today (C. annuum var. annuum), including the Bell, Jalapeno, Paprika, Pimiento, Red Chiles, and many others. Tabasco (C. frutescens) is the only common pepper that is not a descendant of this wild chile. The Chiltepine's relationship to domestic peppers is very important because of its potential value as a genetic resource in breeding. In addition, it is a plant having historical and cultural importance to the Greater Southwest.

Although the distribution of this variety is quite broad and extends from the southern U.S. to South America, its northwestern most populations are found only in a few isolated areas of southern Arizona. These populations are small and under considerable pressure from grazing and human harvesting. Their status can certainly be considered threatened, and they are on the special plants list for Arizona.

Locating these individual Arizona populations and evaluating their status has been my main concern this fall. They are generally found at forest edges from the 3,000-5,000 foot level in protected, isolated canyons. They occur most often in moist, shady areas covered with dense vegetation.

I have spent many days in the field, hiking through some of the most beautiful areas of Arizona. Many trips have been "fruitless"; a few have been bountiful; but all have yielded valuable information. Identification of exact chiltepine habitat requirements and their associated plant communities has been one goal of my field work. A non-tuber forming Solanum, as yet unidentified to species, has been located at several of the sites and may become a key to predicting future localities.

continued

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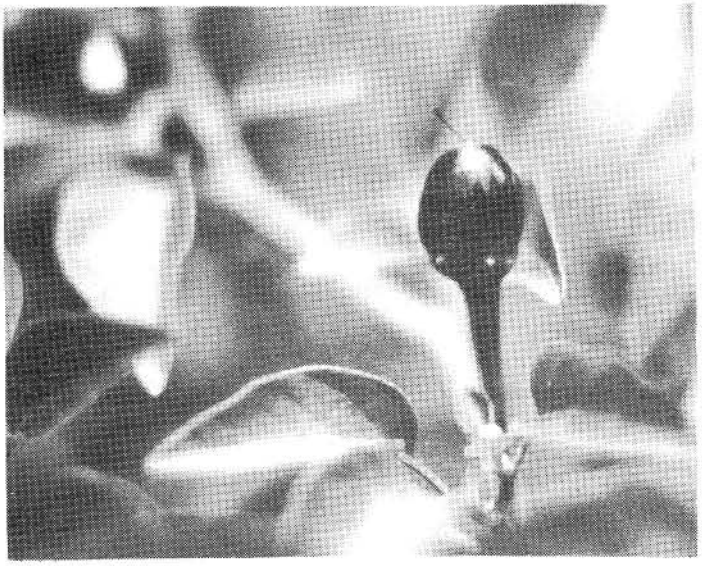
The Baboquivari Mountains, where botanists made the original Arizona chiltepine collections in the late 1800s, is one of the areas of study for this project. Plants are numerous but also easily accessible to humans and cattle (and a mischievous band of coatimundis). The plants are well known to residents of the Papago Reservation and are harvested regularly for their spicy fruits.

The second study population is located in the mountains near Tumacacori. Gary Nabhan reports that archaic Papago referred to little round chiles as "ari tu tum kokori." In the 1970s, Padre Pfeffercorn translated the name "Tumacacori" as "pepper bush; place where the little round pepper is found in abundance."



A ripe chiltepine fruit, ready to be plucked from the bush (larger than actual size). Photo by Wade Sherbrooke.

Although not extremely abundant, chiltepines have been collected by local Tumacacori residents for many, many years. One population in the area is readily accessible to humans, but not to cattle, and will be used for biological and phenological studies over the next two years. Doug Cummings, a Peck Canyon Rancher, and the Tumacacori National Monument personnel, have been most helpful in locating additional stands of chiltepines.

Seeking a third population area for study, I assembled a group of searchers for a supposed 4-5 hour hike into Fresno Canyon. Once inside the canyon, landmarks vanished and the beautiful fauna and flora entranced us. Several miles and hours later, we realized that we were far from our intended destination. However, a single plant was located, thereby documenting a new chiltepine location. This presence also strongly suggests the existence of more plants further up the almost inaccessible canyon. We ended up hiking several hours in the dark. Our return was only seven hours later than expected. Field research can be exciting and adventurous even if within an hour of the city.

In addition to the Arizona field work, three chiltepine searches have been made in Mexico. The first trip, in August, was to the area around Moctezuma, Sonora. Although the weather cooperated beautifully, the vehicle did not, and the trip had to be aborted. However, the incredibly helpful local people, such as David Gaxiola, who owns the local bus station and acted as our guide and interpreter for an entire day, allowed us to meet Trinial Marquez, an experimental chiltepine grower on the communal farm where he lives.

Sonoran agronomic extension agents have developed a new interest in the last two years in cultivating wild chiltepines as a cash crop here. The agents have helped Marquez establish a 10,000 seedling propagation area. Several hundred plants had been transplanted into the field and were doing well. Marquez said that he would continue to cultivate them only if they were marketable.

After looking at the field, Marquez took us to the wild stand where he had collected fruit for many years and from which the seed stock had been acquired. In this area, heavily grazed by cattle, the plants grow only under the protection of mesquite or hackberry. They are very difficult to see and we would never have located them without his help. In fact, we would never even have considered looking on the flat plain among the organ pipe cactus and the boat-spined acacia. It is a very different habitat from the Arizona locations.

continued

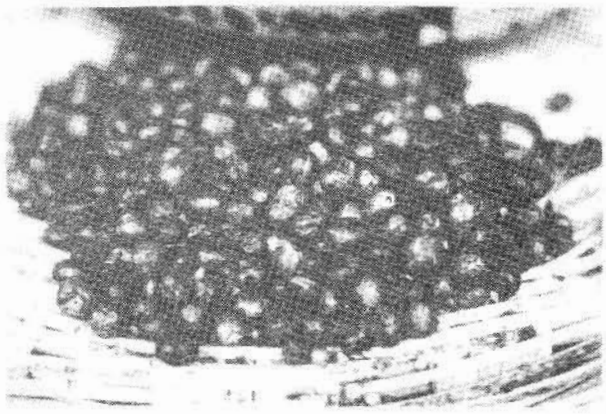
When we returned to the ejido in November, Marquez had some bad news for us. The field harvest, after being divided between the ejido families, had yielded him only 1 kilo of fruit. The crop had been virtually wiped out by a larva which had fed upon the developing fruits, causing them to rot. He was very discouraged about the project and said that the word of tending the field was "all for nothing."

About two weeks after harvesting the field, Marquez and his family harvested the wild population and collected 24 kilos of fruit. Such intense harvesting badly damages the wild populations. Obviously, study is needed regarding the pests and diseases attracted to the cultivated plants.

The second Mexican trip was to Onavas, Sonora. I accompanied Laura Merrick (see the Seedhead News, Fall 1984) in order to observe her field work on Cucurbit hybridization. The trip turned into a chile bonanza. A local farmer was cultivating a plot of long red chiles that he said were very hot due to outcrossing with wild chiles. We collected samples of the cultivated fruits and flowers and located a stand of wild chiles just a few yards away. Some of these fruits will be analyzed through electrophoresis, a chemical "fingerprinting" process, at New Mexico State University to determine the relationship between the wild and domestic chiles. In addition, Laura's work suggested many new ideas to me for chiltepine research.

The remaining research this fall has been less thrilling, but just as interesting, and is progressing rapidly. Many seed accessions and herbarium specimens have been made that are helping to evaluate the present taxonomic classification of chiltepines. Seed cleaning and counting equipment has been located. (Approximately 250,000 seeds will be used for the experiments.) The University of Arizona and the Arizona Crop Improvement Association laboratory facilities have been made available.

If anyone is interested in assisting with this project, there are many tasks to be done: general office work (letter writing and cataloging data, and bibliographical material); library literature search; oral and written Spanish interpretation; herbarium specimen mounting; seed germination testing; planting; transplanting; growing out seed lots; weeding; and field work involving population mapping and tagging. I am willing to train any volunteers. Even short periods of donated time can be utilized. Backyard growing of chiltepines is also a possibility for local residents. Information regarding currently growing plants in people's yards (age and origin) would also be of interest. Please contact me through Native Seeds/SEARCH or The University of Arizona Department of Plant Sciences.



Dried chiltepines are popular items in U.S. specialty food stores. Photo by Gary Nabhan.

Happy Chile Eating!
Cindy Baker

NATIVE SEEDS/SEARCH IS IN FOCUS

In the January 1985 Audubon magazine, Native Seed/SEARCH's work with Indian crops is featured. NS/S Board of Advisors member Dr. Noel Vietmeyer penned "Saving the Bounty of a Harsh and Meager Land" for Audubon, Vol. 87, No. 1: 100-107. Tucson photographer Terrence Moore contributed seven color photos. Copies are available for $3 each to Tucson residents, at the Tucson Audubon Society bookstore, 26 North Tucson Boulevard, 10 a.m. to 3 p.m. Thanks, Noel!

I'ITOIS MYSTERY ONION

Usually, when Native Seeds/SEARCHers collect a cultivated plant, we recognize its identity and have an idea of its scientific name. Not so with I'itoi's onion, a scallion-like Allium from the Papagos. Over the years, we have made three collections of onions known by this name. They remain an enigma.

Papago folklore tells us that there is a special onion which is native to the Baboquivari Mountains, where the O'odham diety I'itoi is said to reside. It is not the common desert onion, Allium macropetalum, also found in this range, since the Papago call it by another name. I'ito's onion, we are told, was harvested by the gunny sacks in decades past by those who climbed into the Baboquivari canyons and foothills.

Beginning twenty or thirty years ago, Papago families claim that they brought this onion down from the mountains to grow in their gardens. Their gathering trips to the Baboquivaris were becoming less frequent. NS/S has been trying to arrange to go with a knowledgeable guide to the mountain habitat of this plant, but have yet to see it in the wild.

All three NS/S collections grow well in Tucson from multiplier bulblets. Two of these three grow much larger and flower more readily, but have produced just a little seed, as yet untested. The third, smaller one, multiplies more rapidly but has not produced seed. Since floral and seed traits are used to help identify Allium species, the lack of these parts has kept taxonomists from being able to confirm a positive identification.

Based on bulb size, however, USDA scientists guessed that the examples we sent them must be cultivated Allium cepa (scallions) or A. ampeloprasum (shallots), both of Old World origin, instead of a truly wild plant. Yet, could the Papago cultivation of a native Allium have significantly changed it to look like an analog of Old World onions? We lack an answer.

In the meantime, certain Papago individuals have told us that they can smell a difference between the two types we have had. It is the smaller, more prolific one that is I'itoi's, a 60-year-old woman said.

We have already distributed thousands of multiplier "starters" of these onions on the Papago Indian Reservation, and in the Gila River Indian Community. Where we have seen them tried, they produce offshoot scallions most of the year, even when other onions go dormant. Anyone trying those on our seed listing should let us know if any of theirs comes to flower and seed.

Mahina Drees

BOOK REVIEWS

AMARANTH: MODERN PROSPECTS FOR AN ANCIENT CROP

Written by an ad hoc panel, BOST ID, National Research Council. 1984. Published by the U.S. National Academy of Sciences, 2101 Constitution Avenue, Washington, D.C. 20418. 80 p. Free, but intended primarily for readers in developing countries.

In Pre-Columbian times, grain amaranth was one of the basic foods of the New World. With the Spanish conquest of Mexico and the collapse of the Indian cultures, however, amaranth fell into disuse. Today, as developing nations search for hardy, high yielding crop plants to help meet their people's nutritional needs, amaranths are again regaining their importance.

The seeds of amaranth are unique for a cereal grain in that they contain 16% protein which is high in lysine. Thus, amaranth can be combined with corn, rice or wheat to provide a complete protein. The bran is high in minerals and vitamins, and the seeds contain 20% edible oil.

continued

Once established, the plant itself is very drought tolerant and is one of the few crop plant species with C-4 photosynthesis not belonging to the grass family. This enables the amaranth plants to make more efficient use of carbon dioxide from the atmosphere to produce more sugars per unit of water lost.

This booklet is packed full of interesting facts on vegetable and grain amaranths, with illustrative botanical drawings and interesting photographs--including several striking color photos of the seedheads and grain types. Charts were used to supply comparative information on nutritional composition of different amaranth species. Students interested in studying amaranth may learn of research needs from the last chapter. Further readings and research contacts are available in the appendices.

Esther L. Moore

THE DIVERSITY OF CROP PLANTS

By J. G. Hawkes. 1983. Published by Harvard University Press. 79 Garden St., Cambridge, MA 02138-9983. 184 p. $20.

As a teacher of methods of genetic resource collection, Hawkes is highly regarded. This handsome hardback is a distillation of his lectures on several topics: the origins of cultivated plants; why genetic diversity should be conserved; and how germplasm is collected, stored and evaluated. More detailed treatments of these topics have, of course, been written (by Jack Harlan, Otto Fraenkel, and Erna Bennett, to name just a few).

This book's strength lies in its introduction to sampling strategies for collecting genetic resources, particularly those of wild and weedy plants. In other chapters, he uses a limited number of case studies to illustrate general topics. Overall, graphics are interesting, but examples given are somewhat out of date.

Gary Nabhan

SEED SAVERS IN THEIR OWN RIGHT

Albert Cooley retired from commercial painting in Phoenix over a decade ago, not to quit work, but to begin again with farming. Having grown up in the Pima Indian farming community of Komatke, he wanted to grow some of the same crops he knew as a child. He now lives in Lower Santan near the same Gila River that gave his ancestors irrigation water. And like his O'odham ancestors, he cultivates an astonishing diversity of native crops, continuing an ancient Southwestern farming tradition.

Cooley plants 60-day flour corn in March, and again with all of his warm season seeds between July 10 and the August 1. What other kinds of seeds? White and brown tepary beans. Mottled limas. Blackeyes. Bottlegourds. Indian watermelons. Two or three kinds of chiles. Muskmelons. Cushaw squash. Tomatoes. And eggplants.

His "garden" spans almost two acres. Without fertilizer or pesticides, he practices a low-input agriculture. Often, the beans, which are presoaked before planting, take only two irrigations, and all the late summer crops take no more than four.

The results? Wagonloads of corn, and bushels of beans. With word of mouth advertising of teparies for 55 cents a pound and limas for 65 cents a pound, he attracts native food lovers from Papago villages a 100 miles away. His customers are almost all Pima and Papago, who now have few other sources of these indigenous foodstuffs.

"What do you think about being one of the few commercial farmers still growing these things among your people?" we asked Albert.

"I guess it's because I'm lazier than they are," he said, tongue in cheek. Perhaps he was telling us in his own way that the pleasure of growing these crops is not like work to him.

From an interview by G. Nabhan and C. Miksicek

WILD BEANS AND USEFUL GENES

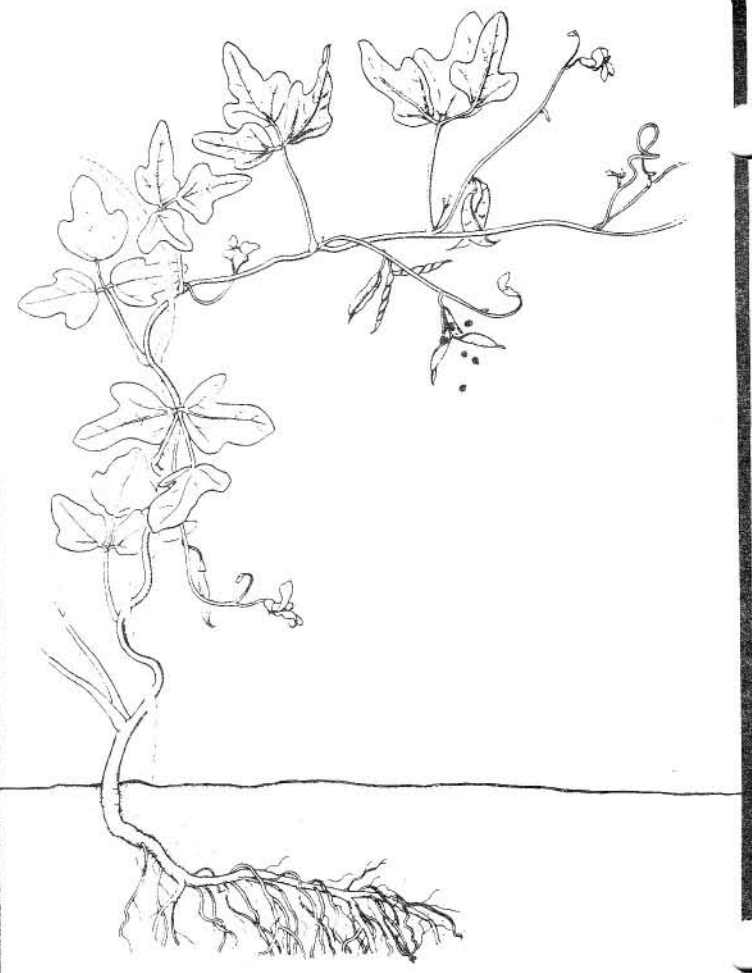
Why collect and conserve seed of wild desert relatives of crops? Perhaps a story best answers this question.

Botanist Annetta Carter has been routinely collecting herbarium specimens of the flora of Baja California for three decades. Carter is affiliated with the University of California, Berkeley herbarium and also a Native Seeds/SEARCH associate member. She has made particular contributions to the knowledge of legumes on this desert peninsula.

Given this, it is not surprising that she responded to a request from Daniel Debouck and CIAT, the international bean breeding center in Colombia, to collect seed of a wild desert bean, Phaseolus filiformis. In 1977, she gathered seed and several dried specimens of this plant in Canon de San Telmo west of Loreto, in the Sierra de la Giganta, Baja California Norte, Mexico. There, this mitten-leaved vine was climbing over rocks in an arroyo, with acacias, ironwood and poisonous yerba de la flecha. This collection became Carter's 5930.

Debouck passed a few of these seed on to Gembloux Belgium, where an elderly cotton breeder had begun a new career, attempting to sort out the relationships between wild and cultivated beans. This geneticist, Robert Marechal, used P. filiformis #5930 as a pollen source for crosses with common beans, limas, teparies, and two other kinds of wild beans.

To his surprise, he secured interspecific hybrids with two different cultivars of common cultivated beans, P. vulgaris. From years of working in Africa, Marechal knew that such cultivated beans suffer greatly from golden or yellow mosaic virus. This disease also devastates legume crops in South America. To his further surprise, Marechal learned that P. filiformis had resistance to this disease, as well as to several other maladies.



Phaseolus filiformis Paul Mirocha ©84

While Marechal and his colleague Baudoin have run into sterility problems in subsequent generations derived from these hybrids, there remains hope that successful transfer of this resistance can eventually be accomplished.

This fall, Native Seeds/SEARCH collected more germplasm samples of P. filiformis and thirteen other wild species in cooperation with Mexico's INIA, the USDA, and The University of Arizona. More than fifty new collections of wild relatives of beans, squash, chiles, cassava, potatoes, mustards, and berries are being delivered to gene banks as a result of these efforts. It may be years before we realize the hidden value in any of these plants. It may take even a longer time before these traits help farmers producing our food. But the journey has begun.

Gary Nabhan

NATIVE FOODS ANALYSED

I once learned of a Papago man who purportedly was over 100 years old. The people who told me about him said he would only eat "the old kind of foods"--wild seeds and fruits gathered from the desert and the ancient varieties of cultivated corn, beans and squash. He was living proof to the Desert People that the traditional native foods are more healthful than the imported, refined food products which are now more easily obtainable.

What is the nutritive content of these traditional native foods? This was the topic of a master's thesis by Radziah Bt. Ariffin, of the Nutrition and Food Sciences Department of The University of Arizona. Her thesis was titled "Proximate Analysis of Sonoran Desert Food Plants."

Proximate composition is done by analyzing moisture, protein, fat, total carbohydrate, crude fiber and ash in food. She analyzed edible portions of 50 plants considered to be major food resources. Many of the foods were from the SEARCH seed listing. All were provided by SEARCH.

The proximate compositions of cultivated foods from Papago and Mountain Pima seeds such as corn, beans and squash ranged widely, though they were similar to previously published compositions of varieties analyzed from other regions. What is surprising is that several of the cultivated and wild harvested foods known only from this region appear to contribute significantly to the diet of native peoples here.

One food of particular interest is Warihio Indian grain amaranth. It contained 14.7% protein and 7.5% crude fat--both higher than either corn or wheat. Crude fiber was 7.8%--three to four times that of common cereals.

Saguaro cactus seeds and acorns both contained more than 20% crude fat. In addition, the Quercus emoryi acorn had 21% protein. Hopi sunflowers were 33.3% crude fat and cushaw squash seeds were rich in oils, as well as high in protein and crude fiber. No wonder these foods are considered high on the list for children and nursing mothers. Other wild foods were also significantly higher in ash (minerals) and fat (edible oil).

In her thesis, Ms. Arriffin documented how the same species of plants obtained from different locations give slightly different values in proximate composition, probably due to genetic variations and agricultural conditions. The arid environment does not decrease proximate composition of corn, wheat and legumes. Protein and oil are slightly higher than normal values. Less well known plants which were traditionally harvested contain high amounts of protein and fat and contribute significantly to recommended daily allowances for minerals as well.

Karen Reichhardt

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INTERNSHIP NEWS

Jill Thompson is a recent M.Sc. graduate in Archaeobotany at the Institute of Archaeology, London University. She came for three weeks this fall to be the first intern with Native Seeds/SEARCH. Her internship proved a fantastic success! She was able to carry out several important tasks on her own initiative, and no wonder. Her specialty is ethnobotany--in particular seed and charcoal identification of archaeological remains. She ha spent nearly two years working with Sr Lankan archaeologists on the excavation of a fifth century palace and water gardens at Sigirya.

Jill Thompson, our dedicated intern.

While here, Jill germinated an old variety of cotton for comparison with an ancient cotton cache; collected wild chiltepines; prepared a revised annotated bibliography on uses of wild gourds; helped accession SEARCH's fall corn collection; packaged seeds and attended the SEARCH booth at the Arizona-Sonora Desert Museum Harvest Bazaar; and assisted in construction of bird-proof wire cages for SEARCH demonstration at the Tucson Botanical Gardens.

Besides all this work, Jill cheerfully pitched in with bouncing babies, and cooking delicious Asian cuisine while staying at Karen and Gary's house, This was certainly more than she bargained for. Thanks, Jill! You were great.

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