

PLANT EXPLORING IN CHINA

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ABSTRACT - - Plant exploration is one of many methods available to plant scientists for selecting plants that will be useful for introduction into the urban environment. In September, 1993, Mr. Paul Meyer, Morris Arboretum of the University of Pennsylvania, Mr. Kris Bachtell, The Morton Arboretum, and Mr. Peter W. Bristol, The Holden Arboretum, spent five weeks in Heilongjiang Province, Peoples Republic of China, collecting seeds from trees, shrubs and a few perennial plants. The purpose of the trip was to study the potentially ornamental flora, collect seeds and document the collections. Plants grown from the collected seeds will be observed for climatic hardiness, insect and disease resistance, horticultural merit or inclusion into hybridization programs. The trip was successful, adding seventy-seven (77) accessions to The Holden Arboretum's collection. Cooperative agreements have been made with the host institution, The Heilongjiang Academy of Forestry, to share seeds, scientific information and when appropriate, personnel.

INTRODUCTION

As professionals who study trees, we are often relied on for advice for correcting urban tree problems or for recommending appropriate trees for urban streets. Common sense and knowledge of a tree's characteristics and best growing environment help us to make the best decision. However, there are limited plant resources. We are constantly seeking new trees and shrubs. One method in our search is to collect plants in their native habitat.

In China there is a new beginning; a sunrise on the horizon for a better day. When you think of China, what comes to your mind: ancient eroded mountains, rice fields, pagodas, lion sculptures, or maybe Chinese garden designs with their carefully placed symbolic stones or Tianamen Square with Chairman Mao's painting mounted on the nearby Palace Wall? There is another part of China that I would like to share with you: its magnificent flora as seen through the eyes of a seed collector.

Gathering seeds for preservation of germplasm requires the plant explorer to adequately prepare. Determining priorities for areas in which to collect is usually the first step. We research climates and vegetation that grow at similar latitudes. From

former expeditions many foreign plants have a history as to their success in various U.S. climates. For example, Philadelphia and Beijing both occur at 40° N. and subsequently many plants found growing in the Beijing area have proven to grow well in Philadelphia.

For the trip scheduled for five weeks in September in 1993, we chose the objective of Heilongjiang Province that lies between the 43° and 53° N. While there, we visited three sites, radiating from our headquarters in Harbin, 80 miles to Pingshan, then 275 miles to Jiangshanjiao and lastly 180 miles to Fenlin.

Seed collecting can no longer be done by one institution or one individual as was common at the turn of the century. The organization called the North American China Plant Exploration Consortium or NACPEC for short, sponsored this trip. The consortium comprises seven (7) gardens: U.S. National Arboretum, The Morris Arboretum of the University of Pennsylvania, The Holden Arboretum, The Morton Arboretum, The Arnold Arboretum of Harvard University, Longwood Gardens and The University of British Columbia Botanic Garden. Paul Meyer, Morris Arboretum, Kris Bachtell, Morton Arboretum and I, from The Holden Arboretum participated on this trip. Our Chinese host was The Heilongjiang Academy of Forestry represented by Professor Jin, Tieshan, Vice-Director, who arranged for our visit and organized the details of our stay.

In addition to site selection, we established objectives to fulfill the purpose of the trip and wrote a target species list. One objective for this trip was to collect germplasm that might have ornamental merit. We were to search out plants that may be more tolerant of cold and heat extremes, plants that are more tolerant of special microclimates such as urban conditions or salt spray, plants that might exhibit disease or insect resistance and plants that are highly ornamental such as those that might have better flowers, fruit or bark and habit characteristics. We sought plants that could be used in breeding programs and germplasm that would increase the diversity of our gardens. Very rarely are new species or varieties found.

Each participant shared in the preparation for the trip. The Holden Arboretum was responsible for supplies. Several weeks before our departure, I bundled up thirty-five (35) boxes of herbarium presses and all of the cleaning and packing supplies needed for seed collecting and shipped them via air express to China. It was my hope that, upon our arrival into China, I would find that our boxes of supplies had arrived safely, had been cleared by Customs, and be waiting *for us* at the Academy of Forestry. However, such was not the case: it took me two and a half (2.5) days visiting five (5) different bureaucracies, at least five (5) different times each to retrieve our boxes out of customs.

PINGSHAN

our first trip was to Pingshan or flat mountain, that is approximately eighty (80) miles southeast of Harbin. When we

traveled outside the city the roads were tree-lined, often with three (3) rows of hybrid poplars, *Populus simonii* x *P. nigra*, that will be harvested in thirty (30) years. The plants we saw at Pingshan were familiar and will help illustrate the objectives that I mentioned earlier.

Crataegus oinnatifida, Chinese hawthorn, is a species of economic importance.

Malus baccata, Siberian crabapple, has fruit and foliage that are disease and insect free which is why it is used in crabapple breeding. The small fruit is advantageous for home landscapes.

Viburnums are an important species for our collections. Viburnum saraentii, Sargent's viburnum, is a multi-use, ornamental shrub with attractive fruits, fall color and flowers.

Sorbaria sorbifolia Ural false spirea, is valuable for erosion control and roadside edges. This plant forms large thickets, with white flowers in mid to late summer.

Typically, elms have yellow fall color. In Asia, however, there are species that have a brilliant red, fall color. Some even have the same foliage color when the leaves emerge in the spring. Ulmus macrocarpa, large-seeded elm, is an excellent example.

Bark is an important observation in the fall and was part of our criteria for selecting plants for horticultural interest.

Two (2) common trees were quite striking in the landscape:

Populus davidiana Chinese aspen, with gray bark; and Betula platyphylla, Manchurian birch, with white bark.

A common canopy tree is Quercus mongolica which reaches heights of 60 - 80 feet. It frequently grows in upland, drier sites. The wood is valuable for lumber as well as the production of wood ear mushrooms.

We have long, busy days when seed collecting. Usually we start at about 6:30-7:00 AM, with breakfast. Soon after, we're in the field collecting. As much as we would prefer, not all seeds are located within easy reach. Since we are especially interested in trees, Kris (our expert tree-climber) would climb high into the trees to find the fruiting branches.. As the seeds are gathered and packaged in the field, they are carefully labelled with preliminary identification. Details such as the plants' height, spread, location, aspect, elevation, type of soil and associated plants are recorded in a collection book. The importance of record-keeping cannot be underestimated. When we return to our home institutions, we refer to this information in order to establish the best growing conditions for propagation and long-term health of the plant. Herbarium voucher specimens and photography are important in verifying the plants' identification.

Our field work usually ends at about 3:00 or 4:00 P.M. and we begin our seed and herbarium processing. At the beginning of the trip this processing is done relatively quickly, but it becomes more time consuming as the trip progresses. Papers and blotters for the herbarium specimens need to be changed daily. The faster herbarium specimens dry, the better the color of the flower and foliage.

All seeds have to be cleaned of pulp. Fleshy seeds are often fermented to speed the removal of the outer coating. Sometimes we have to use heavy plastic bags so we can pound the flesh off the fruit. We must have clean seeds to pass USDA requirements for entry into the United States. Our day ends at approximately 9:00 or 10:00 in the evening.

On our last day in Pingshan, our host, Professor Jin, received a letter from authorities in Beijing. Professor Jin had written to them about six (6) months before our arrival requesting permission for us to collect. His request for permission was denied based upon new government regulations. Professor Jin told us we were no longer allowed to collect and that any materials we had collected to date would be confiscated. However, we could continue to visit, study and photograph plants.

We returned to Harbin where we spent four (4) days negotiating with Professor Jin who, with his associates, bargained with the local authorities. As a result of the negotiations, an agreement with The Academy of Forestry was reached to share seeds, information, publications, and possibly exchange personnel if funds allowed. We would be allowed to collect in areas in which Professor Jin had authority.

JIANGSHANJIAO

Jiangshanjiao, an area under Professor Jin's authority, was one that we had on our target list. It is located next to a large lake named Jing Po, which was formed by a volcano eight thousand years ago. To get there, we traveled southeast on the road from Harbin to the Russian border. In order to improve access to the Russian border, the Chinese are re-building this road into a major highway. In construction zones, the road is diverted through rice fields and woods along bumpy, rutted tracks. When we arrived at the Research Station at Jiangshanjiao, we had to change a flat tire; and for two (2) days, we repeated the tire-changing procedure.

Where do we collect? At this particular site we collected along woodland edges and logging roads. One of our first exciting finds was the diversity of maples. We are very interested in studying and growing maples at The Holden Arboretum. Within one area of one hundred (100) square feet, we found six (6) different maples that were on our target species list.

Acer triflorum, three-flowered Maple, is a small tree with tan, peeling bark and brilliant red color. Another trifoliate maple is Acer mandshuricum, with similar fall color, but smooth bark. It was very thrilling to see both trees growing in the same general area.

The third maple we found, Acer tegmentosum, is one of the striped-bark maples with lovely yellow fall color and is closely related to our local Moosewood, Acer pensylvanicum.

Another is Acer mono, which I have collected in the past and is growing at The Holden Arboretum. Originally, I believed its maximum height was about 30-35 feet; however, we saw trees approaching about sixty (60) feet in height.

Another that we found was Acer ukurunduense, an understory

plant. This plant has bright red twigs and electrifying orange-red foliage and is very reminiscent of our own Mountain Maple, Acer spicatum.

Lastly, was Acer ginnala, a shrubby maple, a common pioneer species, which is invasive in our environment.

Like the maples, there were several species of birches. The Manchurian birch is a very common plant found growing in logged-over sites. They are left growing for about years and then they are cut and used for chopsticks. The dahurian birch, Betula davurica, which has gray, peeling bark. Another, Betula costata, has orange, peeling bark. Most ribbed birches, at least the ones I previously collected in Korea, are white. This particular clone looks quite promising as an ornamental.

Since I am discussing plants with ornamental bark, there is another species that has attractive bark. Maackia amurensis has reddish-brown, curling bark. We are also interested in this for urban sites. We found this plant growing in diverse environmental conditions: along the lake edge, in parking lots, along woodland edges, and in many soil types. Since this plant belongs to the legume family, it may have nitrogen-fixing nodules.

One special find was Viburnum burejaeticum, Manchurian viburnum, in red fall fruit. Harold Pellett, in Minnesota is presently hybridizing this with the native Viburnum lantana, wayfaring tree, to produce a more compact, hardy ornamental tree.

Vines can be attractive additions to a garden, but caution is needed to prevent an introduction of an invasive species. Vitis amurensis, has striking fall color and the blue-black fruits are quite edible.

We collected a few perennials. One plant of interest is a peony, Paeonia obovata, which is quite attractive with its fruits having red spreading follicles with black seeds.

Also, we collected a very striking Monkshood; in some cases it got up to five or six feet tall with huge clusters of rich blue flowers.

Typically, a woodland canopy of tall trees include: Abies holophylla, the Manchurian fir; Pinus koraiensis, the Korean pine; Populus davidiana, the Chinese aspen; and Jualans mandshurica, the Manchurian walnut.

Korean pine is an important lumber tree. In its native habitat it provides a view similar to a view of white pines in Michigan. The Holden Arboretum is using the Korean pine as a substitute for white pine in landscape plantings.

Another species that looks potentially promising as an ornamental is the Korean spruce, Pinus koraiensis, which some taxonomists lump with Picea koyama. Like the Colorado spruce, it has foliage colors from bluish to green.

The Khingin fir, Abies nephrolepis, is a plant that grows at higher elevations and will probably not tolerate our summer heat as well as the Manchurian fir. However, we will be observing and evaluating this plant over time.

Another important forest tree in the area is the larch. The Siberian larch, Larix olgensis or Larix gmelini var. olgensis, is variable in habit from upright branches with drooping branchlets, to horizontal branches and narrow in form. By growing large

populations, we have an opportunity to select better specimens than we've had in the past. It is interesting to note that Bean says this species "is chiefly remarkable for its stunted habit." Yet, we saw it in the wild getting sixty, seventy or eighty feet tall.

On the edge of Jing Po Lake, we discovered a whole different habitat that is drier. Growing here we found Junioerus risida, Securinaea suffruticosa, and Rhododendron mucronulatum.

FENLING

Our last expedition was to the north called Fenling Nature Preserve located at 48° N. We spent only one day there because this area is not under the jurisdiction of Professor Jin. We could do no collecting. The Russian border is about sixty-five (65) miles away.

In Fenling, the flora is primarily a mature stand of conifers with some deciduous plants. We measured a few large trees and found one Manchurian birch measured thirty (30) inches across. We speculated about the chances of seeing this specimen again if we were to come back to this area in another ten years.

Acer mono usually has yellow autumn color. Here we saw one with brilliant red foliage. Our host noted that it was an unusual variant and he offered to collect seed from it.

Seventy-five percent (75%) of the forest is comprised of Korean pine. The local people collect cones to extract the large nuts which are cracked for the tasty seed..

Every trip must come to an end. I would like to share a quote with you from the famous landscape artist, Thomas Cole, who once said, "Overall, rocks, wood and water brooded the spirit of repose and the silent energy of nature stirred the soul to its inmost depths."