

THE AMERICAN
Horticultural
MAGAZINE



AMERICAN HORTICULTURAL SOCIETY

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Original papers increasing the historical, varietal, and cultural knowledges of plant materials of economic and aesthetic importance are welcomed and will be published as early as possible. The Chairman of the Editorial Committee should be consulted for manuscript specifications.

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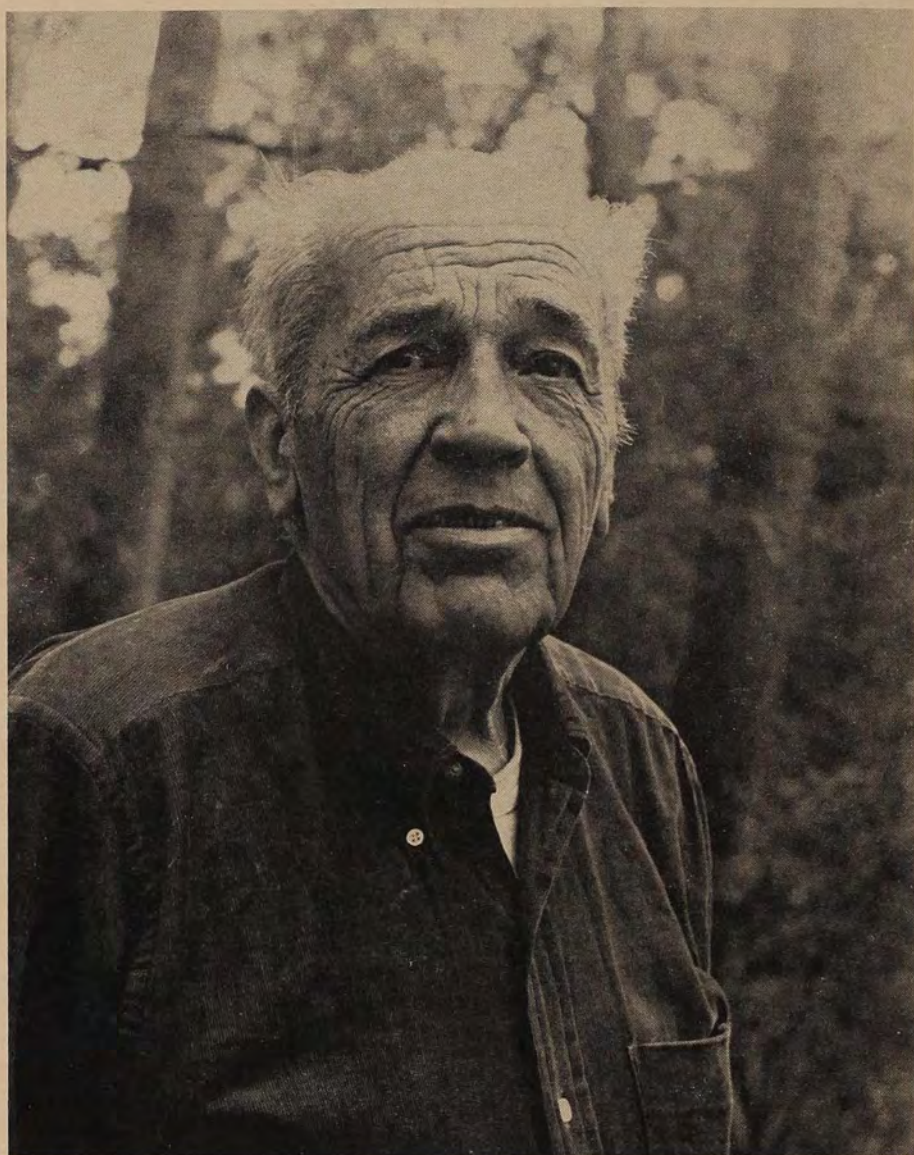
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JANUARY COVER ILLUSTRATION

Eucryphia × *nymansensis* at Ballamanaugh, Sulby, Isle of Man

(By Courtesy of Lady Collet)



W. H. HODGE

B. Y. Morrison

An Editorial Comment

This issue of The American Horticultural Magazine appears without a designated Editor—Benjamin Y. Morrison has retired from this position, one he has held for 37 years. This decision was made, surely with reluctance, on the part of Mr. Morrison, and much to the regret of those who have been close to the Magazine for any length of time. Somewhere “along the line” one has to break with his elected responsibilities in order to devote time to more cherished tasks. B. Y. Morrison, Horticulturist, may now contend with the problems (which are really pleasures) of everyday gardening, except for the notes and occasional articles he has promised to continue writing for the Magazine.

During the years of his leadership, Mr. Morrison has maintained The American Horticultural Magazine at a level of quality and distinctiveness of character that gives our Magazine an enviable status among the gardening magazines of the World—and The American Horticultural Magazine is world renowned.

*If one is fortunate to have a complete set of the Magazine, he will find that the breadth and profundity of writings contained are without comparison. Certainly if the vast array of horticultural knowledge accumulated in The American Horticultural Magazine during these “Morrison-years” were assembled in a volume, it would be a library treasure. It can be noted here that Mr. Morrison has been the only designated Editor of the American (National) Horticultural Magazine since Volume 5.**

The American Horticultural Magazine has remained without the necessity of deviation from its earliest concept—a scholarly presentation of original horticultural contributions directed to the interests of the serious amateur. This we owe to Editor B. Y. Morrison.

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*Volumes 1 through 4 were published by The National Horticultural Society at Henning, Minnesota; that Society and The American Horticultural Society joined forces in early 1926, and B.Y.M. commenced Volume 5 in 1926.

Miniature Daffodils

George S. Lee, Jr.*

When a gardener discovers that price is not always a measure of value, that the new is not necessarily better than the old, and that quality cannot be equated with size, it might be said that he has reached years of horticultural discretion.

Numerous horticultural families have already been exploited in pursuit of size at the expense of more significant traits—dahlias, iris, and gladiolas, for example. Invariably, in these pursuits there are laggards with more enduring, if less conspicuous, qualities which recommend them to critical gardeners.

In the case of daffodils, if we may adopt the more comfortable term, there is a restless search for greater size and new effects.** The largest is never quite large enough. Breeders vie for the elusive pink and assure us that beyond lie pure red and ultimately lavender and purple trumpets. The conflicting judgment of Nature to paint with muted colors on a small scale until a background of green can be broken out to provide a restful setting for more dazzling effects must be set aside.

It is unfortunate that those who are willing to accept the meager rewards for engaging in the commercial production of daffodil bulbs find their work subject to the same economic laws which spawn new models of automobiles and hem lines. It is unfortunate because the attention of the gardener is focused on what the producer has to sell and years will be lost in acquiring the adventurous spirit which leads to the greatest satisfactions in gardening.

The hybridizing of daffodils began nearly a hundred years ago at the hands of English gentlemen and has been pursued vigorously ever since, but a generation requires not less than five years and the increase is leisurely. Many gar-

dens in this country are still not advanced beyond the era of 'Van Sion' and 'King Alfred'. A somewhat wider selection of sturdy Dutch garden varieties may now be found in local stores and the occasional enthusiast will order from the lists of the few specialists here and abroad. But emphasis is on size and the choices are usually limited to trumpets, large and small cups, and doubles, i.e., Division I to IV of the Official Classification of the Royal Horticultural Society. That ubiquitous fellow, the average gardener, may never learn that beyond the limited range to which he has easy access are many daffodils of great charm and unusual form, although smaller in comparison with those he usually sees.

The term "miniature" has been loosely applied in connection with small daffodils. As a rule, the triandrus, cyclamineus, jonquil, and tazetta hybrids; the species and wild forms and hybrids; in fact, all species and garden varieties with the possible exception of the poets, falling within Divisions V to XI of the Official Classification, are smaller in all their parts than the trumpets and cupped varieties. For that reason many tend to lump all these smaller daffodils together and consider them miniatures.

Daffodil shows offering classes for miniatures must make a more precise determination and have usually defined a miniature daffodil in terms of length of stem, a most unreliable test, subject to the vagaries of Nature and the guile of man. Width of flower or proportion of flower and stem have also served to offer shaky evidence of special classification. The Royal Horticultural Society has consistently defined a miniature daffodil as one "not exceeding 12 inches tall which has individual flowers not more than 2 inches in diameter when flattened out." However, only the largest daffodil shows have made any special provision for miniature daffodils. A few classes, limited entries poorly dis-

*Daffodil and azalea specialist; former President, American Daffodil Society, coordinator of the Society's work with miniature daffodils.

**See "Exploring for Wild Narcissus" by Frederick G. Meyer, *The American Horticultural Magazine*, April, 1961.

played, and no prospect of major awards has been the traditional fate of small daffodils.

The goal of the early English hybridizers was larger flowers of better form and substance, but crossing the small species and the best of the available hybrids inevitably produced a percentage of seedlings marked by small size. Most of these were discarded at once or subsequently lost. A few, such as 'Colleen Bawn' (1889), lingered in gardens; others, such as 'W. P. Milner' (1890), have shown their ability to take care of themselves; and a small number, such as 'Sea Gift' and 'Pencrebar', have been salvaged and propagated by someone who cared.

Small daffodils were neglected until the 1920's when they caught the fancy of a Cornishman, Alec Gray. Gray began to collect them and shortly tried his hand at hybridizing. His achievements were displayed at the daffodil shows of the Royal Horticultural Society where they attracted considerable attention. For his work in breeding miniatures, Gray was awarded the Peter Barr Memorial Cup of the Society in 1945. He has written numerous articles for the Daffodil and Tulip Year Books of the Royal Horticultural Society and his Cornwall nursery is the primary source of stock for many varieties. In fact, so identified has Gray become with small daffodils that inclusion in his catalogue tends to confer miniature status, even though many of his listings are not miniature by any standard.

While Mr. Gray was the first and most effective advocate of small daffodils, others have shared his enthusiasm and done pioneer work. Sir Frederick Stern; F. R. Waley; and D. and J. W. Blanchard, father and son, are countrymen of Alec Gray, as was the late A. M. Wilson. Michael Fowlds and Grant Mitsch of Canby, Oregon; Mrs. George D. Watrous Jr., C. W. Culpepper, and the late Edwin C. Powell in the Washington area; and Mrs. Goethe Link of Martinsville, Indiana, have done creative work with smaller daffodils on this side of the Atlantic. Dr. Helen C. Scorgie has grown and studied them intensively for many years as rock garden subjects. The only commercial grower in this country who has attempted to stimulate interest in smaller daffodils is G. W. Heath, Nuttall, Virginia.

Some years ago a group of members of the American Daffodil Society who were interested in smaller daffodils undertook to determine the species and garden varieties to which the term "miniature daffodils" might properly be applied. After repeated attempts it was realized that it was impossible to write a definition which would operate consistently to segregate from all the smaller daffodils a group which were truly miniatures. A daffodil flower is a living thing which changes from day to day and varies from year to year. The response of bulbs of the same variety is also subject to regional and cultural conditions. Therefore, it was concluded to compile an arbitrary list of species and garden varieties which, after careful field study, should be classed as miniature daffodils in the opinion of a number of competent observers. Surprisingly, the voting of personal opinions produced nearly general agreement.

The proposed list of miniature daffodils was submitted to the membership of the American Daffodil Society at its annual meeting at Stratford, Connecticut, last April and adopted. The list, grouped according to the Official Classification of the Royal Horticultural Society, is as follows:

Div. I. Trumpets

- (a) Bowles Bounty
Charles Warren
Sneezy
Tanagra
Wee Bee
- (b) Bambi
Little Beauty
Rockery Beauty
Snug
- (c) Colleen Bawn
Rockery White
W. P. Milner

Div. II. Large Cups

- (a) Goldsithney
Marionette
Mustard Seed
Picarillo
Rosaline Murphy
- (b) Tweeny
- (c) None

Div. III. Small Cups

- (a) None
- (b) None
- (c) Xit

Div. IV. Doubles

Kehelland
Pencrebar

Div. V. Triandrus Hybrids

- (a) Kenellis
Mary Plumstead
Sennocke
Shrimp
Tristesse
- (b) Agnes Harvey
April Tears
Arctic Morn
Cobweb
Frosty Morn
Hawera
Raindrop
Samba

Div. VI. Cyclamineus Hybrids

- (a) Greenshank
Jetage
Jumble
Minicycla
Mite
Mitzy
Snipe
Tête-à-Tête
The Little Gentleman
- (b) Quince

Div. VII. Jonquilla Hybrids

- (a) Little Prince
Skiffle
- (b) Bebop
Bobbysoxer
Demure
Flomay
Hi-Fi
Kidling
La Belle
Lintie
Pease-blossom
Pixie
Sea Gift
Stafford
Sundial
Sun Disc

Div. VIII. Tazetta Hybrids

Angie
Cyclataz
Halingy
Hiawassee
Hors d'Oeuvre
Pango
Shrew

Div. IX. Poeticus Hybrids

None

Div. X. Species and Wild Forms

N. asturiensis
N. atlanticus
N. bulbocodium (various)
N. calcicola
N. cantabricus (various)
N. cyclamineus
N. × dubius
N. 'Eystettensis'
N. fernandesii
N. hedraeanthus
N. jonquilla var. *minor*
N. juncifolius
N. minor
N. minor var. *conspicuus*
N. minor var. *pumilus*
N. pseudonarcissus
N. pseudonarcissus ssp. *alpestris*
N. pseudonarcissus ssp. *bicolor*
N. pseudonarcissus ssp. *moschatus*
N. pseudonarcissus ssp. *moschatus*
'Plenus'
N. pseudonarcissus ssp. *obvallaris*
N. rupicola
N. rupicola var. *marvieri*
N. scaberulus
N. tazetta ssp. *bertolonii*
N. tazetta 'Lacticolor Canaliculatus'
N. × tenuior
N. triandrus
N. triandrus 'Aurantiacus'
N. triandrus var. *albus*
N. triandrus var. *concolor*
N. triandrus var. *loiseleurii*
N. watieri

Div. XI. Miscellaneous

Elfhorn
Jessamy
Marychild
Muslin
Nylon
Poplin
Taffeta
Tarlatan

The American Daffodil Society has accepted the responsibility of examining future introductions of smaller daffodils to determine which should be added to the approved list of miniatures. In addition, some changes in the above list may prove to be desirable in the light of further study.

While a primary purpose of the approved list of miniature daffodils is to improve their competitive position at daffodil shows, it should have other important effects. For one thing, "Miniature" as applied to daffodils need no longer be an ambiguous term. It should be used hereafter only in connection

with species and garden hybrids named in the approved list. Oral discussion and correspondence may be carried on with mutual understanding and it is hoped that horticultural literature and bulb catalogues will accept the proposed classification. It should be emphasized, however, that publication of a list of miniature daffodils does not tamper in any way with the Official Classification of the Royal Horticultural Society. The small trumpet 'Tanagra' will continue in Division I (a). It is now merely identified as a trumpet of very small proportions.

Interest in all smaller daffodils is on the rise in this country and quite possibly is greater here than in England or Ireland; certainly more than in Holland. Fashions in daffodils abroad have been shaped by the hybridizers in the British Isles and Holland and greater size has been a common objective. The chief difference is the English and Irish hybridizers from the Rev. George H. Engleheart to the late Guy L. Wilson and J. Lionel Richardson have sought large flowers of perfect form for the show bench, while the Dutch, with their eyes on larger markets, have bred for large and spectacular garden varieties. With the exception of Alec Gray and, to some extent, of Michael Jefferson-Brown, the young Cornwall grower who abandoned a teaching career, European daffodil catalogues have always neglected the smaller forms, i.e., those falling within Divisions V to XI of the Official Classification. Growing interest in smaller daffodils on the one hand, and limited breeding for new varieties and slowness of increase on the other, have created a very tight market situation. While a source for the triandrus, cyclamineus, and jonquilla hybrids which have comparatively small flowers, but are not all true miniatures, can usually be found by a determined gardener, many

of the varieties on the list of miniatures are quite scarce and the demand is growing more rapidly than the supply. In fact, Alec Gray has practically withdrawn from the American trade since he is able to market his modest output within the British Isles.

The growing of miniature daffodils will always be rewarding to those who are fascinated by perfection on a small scale, but the field will never be crowded. However, miniature daffodils have some definite advantages in comparison with flowers of standard size. Most importantly, they will advance the season for the impatient gardener to whom the daffodil symbolizes the advent of another year. *N. asturiensis* and 'Tanagra' are likely to precede 'February Gold', itself a comparatively small flower but not a miniature, by a couple of weeks. 'Fortune', the first widely grown large flower, will be still later by a few days.

While some of the species miniatures can be a bit temperamental, as a rule the miniature garden varieties are less demanding than their larger colleagues. Genetically closer to their species forebears which grow in the mountains of the western Mediterranean, they are quite contented in a lean, stony soil which is hot and dry in summer and cold and windy in winter. The exception is *N. cyclamineus* which prefers shade and moisture. In addition, the season is lengthened by the appearance of *N. rupicola*, *N. scaberulus*, and some of the triandrus species and hybrids after the large flowers have passed.

The bulbs of small daffodils seem to be immune to the ravages of the daffodil fly, *Lampetia equestris*, a pest which seems to be on the increase in the northern parts of the United States. Possibly the larvae of the fly feel that the small bulbs offer inadequate winter pasturage for their healthy appetites.



GOOCHLAND NURSERIES, INC.

Irrigation system in operation during the 1962 freeze at Goochland Nurseries, Pembroke, Florida. Mr. R. E. Brown, proprietor at Goochland Nurseries, wrote: "We found that we had to use the same volume of water during the freeze as we normally use in ordinary sprinkling when plants are in need of water. We have photographs showing that when only one nozzle hit the plants, they were severely damaged. When both nozzles on the rainbirds covered the plants completely, however, there was no damage whatsoever." Operation of sprinklers has proved a better weapon against cold, than either oil heaters or blazing fires of wood or old automobile tires, particularly when winds are high.

December 1962 Cold Damage in Florida

Edwin A. Menninger*

The coldest weather in half a century or more invaded Florida on December 14, 1962 and did enormous damage to ornamental plantings, as well as to citrus and other crops. USDA Crops Research Division estimated one month after the freeze (Jan. 15, 1963) that 80 per cent of unprotected tropical landscape ornamentals on the east coast from Daytona Beach to Melbourne were dead, and 99 per cent were damaged. Likewise in the Tampa-St. Petersburg area, 70

per cent were killed and 99 per cent damaged. Although these preliminary estimates were later toned down and many plants showed surprising ability to recover, the loss to growers was enormous and the damage to groves, nurseries, and both private and public plantings was extremely severe. It developed later that the west coast was harder hit than the upper east coast. Even in the northern part of Florida from Jacksonville to Pensacola, the Department of Agriculture estimated that 20 per cent of hardy ornamental plantings of azalea, *Camellia*,

*Stuart, Florida.

Ligustrum, etc, were killed outright by the cold, and 60 per cent of unprotected plants injured.

All over the state the cold was accompanied by clear skies (except at Miami) and very high winds which in many places were more destructive than the low temperatures. A comprehensive survey of the damage sustained by growers would require a computer and the finished report would consume much more space than could be allotted here. Two months after the freeze, this author did send questionnaires on cold damage to every nurseryman in Florida, enumerating about 250 plants ordinarily used in ornamental landscaping. More than 100 nurseries returned these in-

quiries with data for their location. To compile these in detail would involve 25,000 entries, and the result would look like the following (actual) compilation in which the first number (401) identifies the nursery reporting and its location, the second number (15) indicates the low temperature (degrees F.) record, and the initial letters signify:

- K = Killed
- G = Cut back to the ground
- B = Badly injured
- S = Slightly injured
- U = Uninjured

The 400 series of numbers applies to nurseries in the north-to-central Florida region (roughly Jacksonville and Gainesville to Winter Haven).

Florida Sago Palm (<i>Cycas circinalis</i>)	K	401-15	408-18					
	G	420-19						
	B	402-16	414-13	415-12	424-17	425-16	429-19	
	S	407-20	412-10	413-15				
	U	410-22	427-19	428-19				
Sago Palm (<i>Cycas revoluta</i>)	K	409-17						
	G	420-19						
	B	403-16	404-8	411-12	419-8	424-17	428-19	429-19
	S	401-15	406-14	408-18	412-10	413-15	415-12	
	U	402-16	407-20	410-22	425-16			
Traveler's Tree (<i>Ravenala madagascariensis</i>)	K	409-17	410-22	415-12	420-19	422-19	423-16	424-17 426-18
	G	402-16	408-18					
	B	429-19						
	S							
	U							
Spanish Bayonet (<i>Yucca aloifolia</i>)		Reported uninjured by all reporting stations						
Screw Pine (<i>Pandanus utilis</i>)	K	401-15	409-17	410-22	415-12	418-17	419-8	420-18 422-19
	G	424-17						
	B	402-16	421-19					
	S	429-19						
	U							
<i>Dracaena</i> (Several species)	K	401-15	408-18	409-17	411-12	414-13	415-12	418-17 419-8
	G	420-19	422-19	424-17	426-18	429-19		
	B	402-16	410-22	421-19				
	S	416-19						
	U							
Bird-of-paradise (<i>Strelitzia reginae</i>)	K	404-8	411-12	413-15	418-17	419-8	424-17	
	G	401-15	402-16	408-18	415-12	420-19	421-19	
	B	410-22	416-19	423-16	425-16			
	S	409-17						
	U	417-25						

Strangely enough, such a tabulation makes for contradictions because the first grouping shows that the Florida sago palm was killed in one location by a temperature of 15°, but elsewhere the plant was only slightly hurt by 10° and 15°. There is no reconciling such differences because much depends on whether the plant had been fertilized recently (dormant or active growth condition), on exposures, on wind velocities, and other factors. Hence it appears futile to undertake a complete compilation and analysis of these data when a superficial survey of the returns made by these 100 nurserymen will serve to give a positive picture of what plants do survive, on the average, in certain thermal belts.

For the purposes of this analysis, the state of Florida is divided into four thermal belts. Under each heading appears a list of the plants that DID survive a given cold minimum, without protection, together with appropriate comments by nurserymen in that area.

In the lists which follow, plant names are not repeated. The coldest area (north-to-central Florida) is examined first. Plants that survived there in the open, one might have expected to survive in areas that were warmer, although this assumption was not entirely supported by the facts.

In the next coldest area (the west coast) where the damage was less severe, survival attention is given to the plants that did NOT escape damage in north Florida, but were unhurt this much farther south. Likewise in the third zone (upper east coast), the plants listed as unhurt were more or less badly damaged in the two preceding areas. The fourth zone (lower east coast to Miami) lists a lot of plants unhurt that were killed or badly damaged elsewhere. Considerable overlapping of zones, temperatures, wind velocities, etc., makes the lists only indicative, but the survival reports were composed by Florida's leading nurserymen who know their plants and speak with authority.

A study of accompanying maps prepared by the Frost Warning Service, Weather Bureau, U.S. Department of Commerce, in collaboration with the University of Florida Agricultural Experiment Stations, in *The Season's Report* (Lakeland, Fla., May 1963) will show how spotty the cold was and how difficult it would be to divorce the effects

of low temperatures and high winds.

One noteworthy fact that is NOT brought out in the tabulations is that the area from Miami northward about 100 miles, particularly near the ocean along the east coast, was covered during the fateful frigid hours by a cloud bank that was highly effective in preventing damage. In fact, Miami itself had no damage at all, though outlying areas farther away from the 72° Gulf Stream and with fewer clouds, did suffer frost damage. The Gulf Stream was similarly responsible for the protection of the "gold coast" as far north as Palm Beach and Stuart, for coconut palms (highly susceptible) were not injured at all. A common observation is that where the coconut palm grows, freezes never come, and this is broadly true.

Following is a report on four thermal regions in the state:

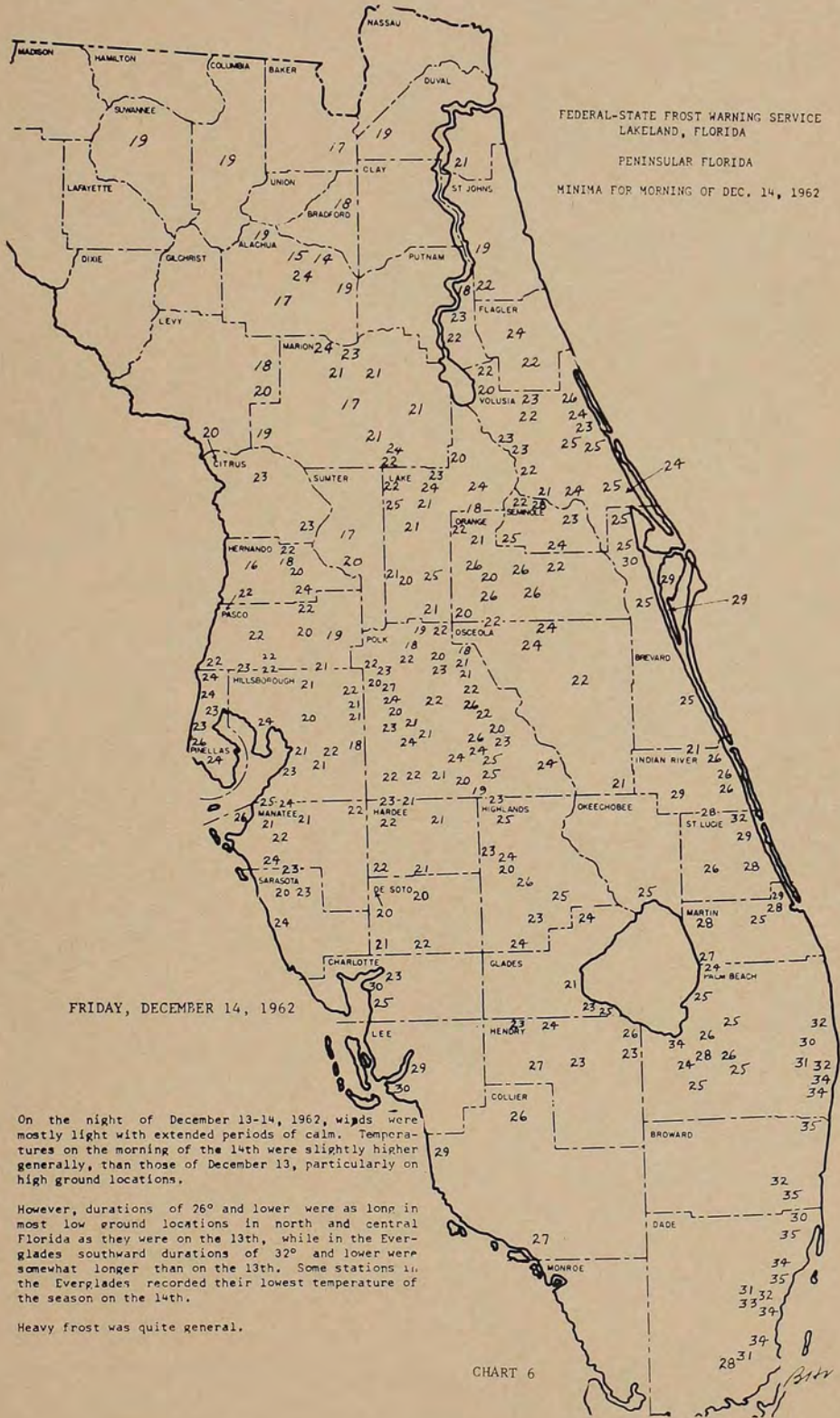
Cold Damage in North Florida

(Jacksonville to Pensacola and south to Winter Haven) Temperature minimum 7° to 22° F.

Plants, unprotected, that DID survive the freeze without perceptible damage, although in a few instances nurserymen reported windburn of foliage. Attention is drawn to the comments of several nurserymen which follows this list of hardiest plants:

Trees

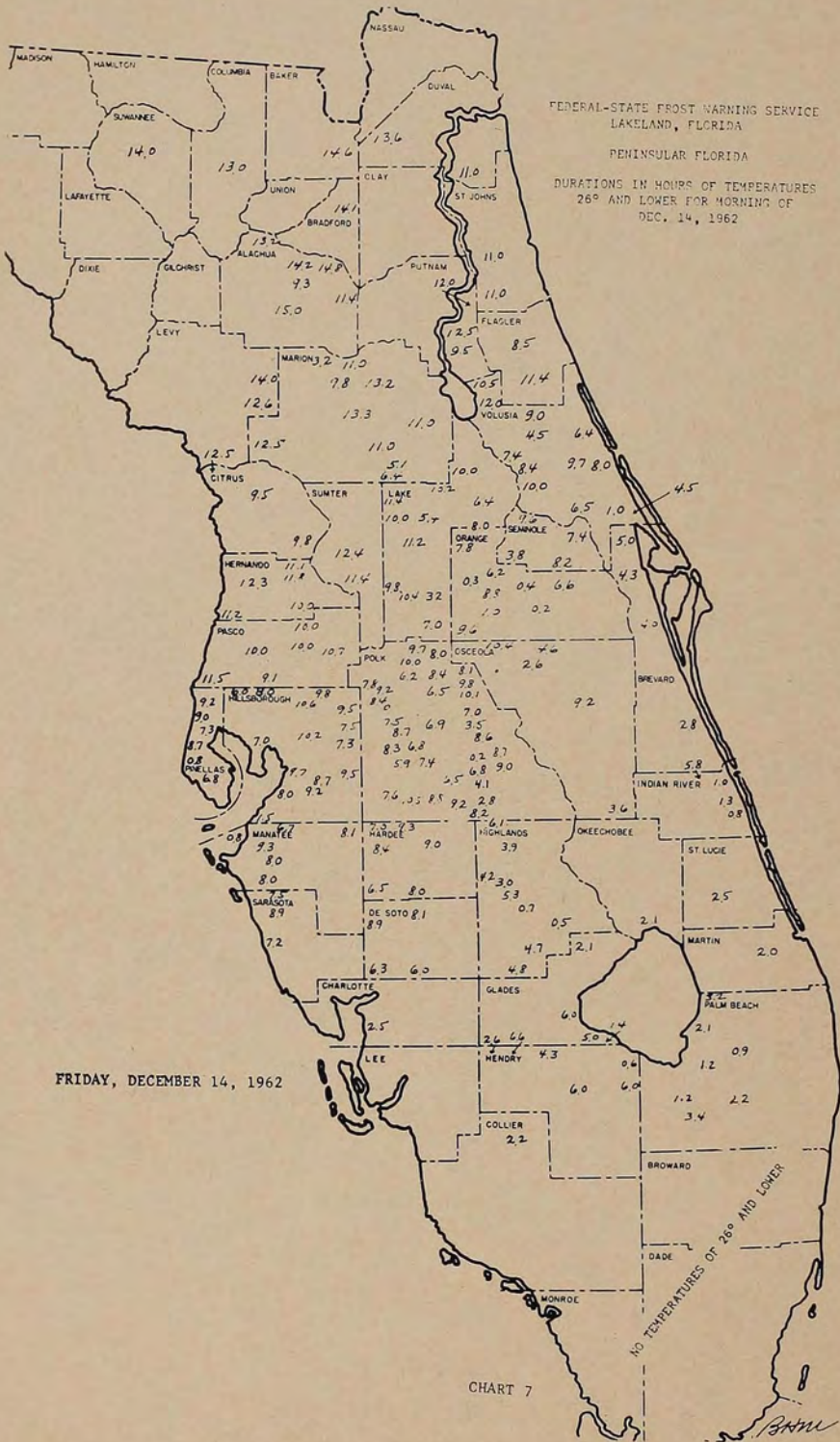
Dogwood (*Cornus florida*)
 Redbud (*Cercis canadensis*)
 Bull Bay (*Magnolia grandiflora*)
 Loblolly Bay (*Gordonia alata*)
 Cherry-laurel (*Prunus laurocerasus*)
 Goldenrain (*Koelreuteria paniculata*)
 Silk-tree (*Albizia julibrissin*)
 Coastal Cedar (*Juniperus virginiana*)
 Lily-pilli (*Araucaria bidwillii*)
 Arbor-vitae (*Thuja occidentalis*)
 Italian Cypress (*Cupressus sempervirens*)
 Fig (*Ficus carica*)
 Pomegranate (*Punica granatum*)
 Loquat (*Eriobotrya japonica*)
 Fruiting-myrtle (*Feijoa sellowiana*)
 Japanese Persimmon (*Diospyros kaki*)
 Jerusalem-thorn (*Parkinsonia aculeata*)
 Maidenhair-tree (*Ginkgo biloba*)
 Chinese Tallow-tree (*Sapinum sebiferum*)
 Soapberry (*Sapindus saponaria*)
 Red-bay (*Persaea borbonica*)
 Cypress-pine (*Callitris robusta*)
 China-fir (*Cunninghamia lanceolata*)



On the night of December 13-14, 1962, winds were mostly light with extended periods of calm. Temperatures on the morning of the 14th were slightly higher generally, than those of December 13, particularly on high ground locations.

However, durations of 26° and lower were as long in most low ground locations in north and central Florida as they were on the 13th, while in the Everglades southward durations of 32° and lower were somewhat longer than on the 13th. Some stations in the Everglades recorded their lowest temperature of the season on the 14th.

Heavy frost was quite general.





GOOCHLAND NURSERIES, INC.

The theory behind running the sprinklers in a nursery when temperatures get below freezing, is that the ice which forms on the plant has a temperature of 32 degrees F. and as long as 50-degree water continues to sprinkle the area, the ice and the plants under it, will never get colder than 32 degrees, even if the air temperature goes down to 20 or 15 degrees. Sprinklers are preferred by nurserymen to heaters because their effectiveness is not destroyed by strong winds. This illustration, made from a photograph taken at Goochland Nurseries, Pembroke, Florida, shows the iced-over plants after the sprinklers had been turned off when the temperature reached 40 degrees. The sprinklers were again turned on when the temperature dropped back to 38 degrees, and there was no damage to the plants. Mr. R. E. Brown, proprietor at Goochland Nurseries, wrote: "This was tried on Meyer lemon, which is one of the most tender citrus varieties grown, and these plants never showed any sign of damage. In fact, they continued to bloom after the freeze."

Palms

Chamaerops humilis

Shrubs

Spanish Bayonet (*Yucca aloifolia*) and other species.

Firethorn (*Pyracantha* spp.)

Sweet-shrub (*Osmanthus fragrans* and *O. heterophyllus* 'Ilicifolius')

Gold-dust Aucuba (*Aucuba japonica*)

Cape Jasmine (*Gardenia florida*)

Japanese Pittosporum (*Pittosporum tobira*)

Chinese Photinia (*Photinia serrulata*)

Bush-crapemyrtle (*Lagerstroemia indica*)

Podocarpus (*Podocarpus macrophyllus*) usually as a shrub.

Ligustrum (*Ligustrum lucidum*) usually as a shrub.

Viburnum (*Viburnum* spp.) Some species proved more tender.

Kurume Azalea (*Rhododendron obtusum*)

Vines

Star or Confederate Jasmine (*Trachelospermum jasminoides*)

Clematis (*Clematis* spp.) Many cultivated forms.

The following comments by north and central Florida nurserymen were sent in with their reports on cold damage:

"*Eucalyptus* 'Silver Dollar' was uninjured in egg cans (1/2" to 3/4" caliper to 6 ft. tall) but plants in gallon cans and all plants in open ground (3/4"—1-1/2" x 10 ft.) were killed. My thermometer did not go below 20° but its location and the wind direction caused faulty reading; more likely it was about 15°. Some plants were showing first signs of recovery 60 days after freeze."—401 (Jacksonville).

"Most of the bottlebrush trees (*Callistemon* spp.) were uninjured, though a few small ones were killed. A large specimen of *Peltophorum dubium* in downtown Winter Haven bloomed beautifully after the 1957 cold weather. This spring the tree is covered with dead leaves but growth is appearing irregularly on the smaller wood 60 days after the freeze. It is hard to tell how much actual damage was done to it. On Goldenrain trees (*Koelreuteria* sp.) some damage was done to growing tips and some younger trees were frozen nearly to the ground; generally speaking though these trees were only slightly in-

jured. Ten years ago Menninger gave me a weeping cajeput (*Melaleuca leucadendron* var. from northern Australia); The smaller wood was killed but it is coming out well on 2-inch wood." 402 (Lake Alfred) 16°; wind 20 m.p.h.

"Iced some plants—had to sprinkle for 72 hours—had a good bit of limb breakage from weight of ice. *Rhapis* palm froze under the ice; these plants seemed to survive better without ice. Large Nagami kumquats were badly frozen under the ice."—409 (Leesburg); wind not too high.

"We lost all our limes and most of our lemon trees. Some replanted orange trees were cut back to the ground."—409 (Mt. Dora) 17°.

"Our temperatures varied more than one would think, ranging from 8° in one spot, 10° in another, 12° in another, 16° in another, all at the same time."—414 (Jacksonville); wind 12-18 m.p.h.

"We have made surveys of our trade area (Marion, Lake, Orange, Brevard and surrounding counties). While in February we list much material as 'killed to the ground,' we are not sure how much will come back.... Things have been too badly damaged to suit me, (many) that I've never seen damaged before. Usually *Cycas revoluta*, *Washingtonia*, etc., withstand our weather, but never having had such low temperatures for such long periods, many strange things have happened. Used icing for protection of citrus trees in cans. This was O.K. where we used deep well water. The rainbird sprinklers froze in windy locations so we saved pie-shaped sections. Persons using water from lakes or tanks found all their sprinklers froze up. We learned a lot." Wind velocity rather high; "we think a lot of the damage to palms (usually evergreen) and to large trees, was by wind burn."—415 (Leesburg) 14° at Leesburg field, 12° at Ocala.

"Some plants killed alongside some badly damaged. Some palms like *Phoenix roebelenii* were still green at bud, and tight, after the freeze, as were some *Cocos plumosus*.—419 (Jacksonville) 8°.

"Some damage to fronds on *Cocos plumosus*. Limes, lemons, and kumquats suffered more than other citrus. Lychee-nut killed; cannot tell (2 months later) whether they will come back from root."—421 (Winter Haven) 19°.

"Most well-fertilized ornamental plants

received some injury, even camellias."—430 (Jacksonville) 8°; wind to 40 m.p.h.

"All our palms were in same location. Dwarf date (*Phoenix roebelenii*) and fishtail (*Caryota* sp.) killed or badly hurt, right alongside others not affected by the cold or at least only slightly hurt."—423 (Haines City) 16° to 18°.

"Very unusual cold. One plant would be damaged, and the plant next to it would not. Most plants are recovering slowly."—426 (Bartow) 18°.

"Our main crop is azaleas. All Kurume varieties were not hurt. Some of the Indica varieties were split. Most of the Belgian and Pericat varieties were split in the wood, and buds were hurt on some."—427 (Apopka) 19°.

"On the University of Florida campus, *Cocculus laurifolius* trees with 6 to 10-inch trunks are sprouting from the base, 6 inches above the ground. Large trees of *Dalbergia sissoo* are sprouting from the main trunk."—428 (Gainesville) 12°.

"Firewheel (*Stenocarpus sinuatus*) and African tulip (*Spathodea campanulata*) were damaged but still growing."—430 (Windermere).

Cold Damage on Florida's West Coast

(From Estero and Fort Myers to Tampa, St. Petersburg, Largo) Temperature 14° to 22°.

Plants (in addition to those in previous list) which survived in the open, without perceptible freeze damage:

Trees

- Murray Red-gum (*Eucalyptus camaldulensis*)
- Camphor (*Cinnamomum camphora*)
- Pepper (*Schinus terebinthifolius*)
- Chinaberry (*Melia azedarach*)
- Silk Oak (*Grevillea robusta*)
- Bottlebrush (*Callistemon* spp.) All kinds except *C. rigidus*.
- Brazilian Pine (*Casuarina cunninghamiana*)
- Queen's Crapemyrtle (*Lagerstroemia speciosa*)
- Roseapple (*Eugenia jambos*)
- Queensland Nut (*Macadamia ternifolia*)
- Tulip Poplar (*Liriodendron tulipifera*)
- Flame-bottle (*Brachychiton acerifolium*)
- Sago (*Cycas revoluta*)
- Carob (*Ceratonia siliqua*)

Moreton Bay Chestnut (*Castanospermum australe*)

Palms

- Queen Palm (*Cocos plumosus* = *Arecastrom romanzoffianum*)
- Washingtonia (*Washingtonia filifera*)
- Dwarf Date (*Phoenix roebelenii*)
- Thorny Date (*Phoenix reclinata*)
- Canary Island Date (*Phoenix canariensis*)
- Southern Palm (*Cocos australis* = *Butia capitata*)
- Chinese Fan-palm (*Livistona chinensis*)

Shrubs

- Surinam Cherry (*Eugenia uniflora*)
- Blue Sage (*Eranthemum nervosum*)
- Shrimp-plant (*Beloperone guttata*)
- Blue Leadwort (*Plumbago capensis*)
- Dwarf Poinciana (*Caesalpinia pulcherrima*)
- Pleroma (*Tibouchina semidecandra*)
- Chaste-tree (*Vitex negundo*)
- Oleander (*Nerium oleander*)
- Lantana (*Lantana* spp.) Several kinds in cultivation.
- Cattleya Guava (*Psidium cattleianum*)
- Cocoplum (*Chrysobalanus icaco*)
- Barbados Cherry (*Malpighia glabra*)
- Yellow Jasmine (*Jasminum humile*)
- Galphimia (*Thryallis glauca*)
- Tamarisk (*Tamarix gallica*)
- Brunfelsia (*Brunfelsia latifolia*)
- Candlebush (*Cassia alata*)
- Natal Plum (*Carissa grandiflora*)

Vines

- Wisteria (*Wisteria chinensis*)
- Flame Vine (*Pyrostegia ignea*)
- Rose-of-montana (*Antigonon leptopus*)

Ground Covers

- Wedelia (*Wedelia trilobata*)
- Ice-plant (*Mesembryanthemum* spp.) Several kinds cultivated.
- Century-plant (*Agave americana*)
- Common Aloe (*Aloe vera*) Several other kinds cultivated.
- Kalanchoë (*Kalanchoë coccinea*)
- Crown-of-thorns (*Euphorbia splendens* = *E. milii*)
- Wandering Jew (*Zebrina pendula*)

Here are comments by West Coast nurserymen:

"A check of our *Eucalyptus* plantings showed that *E. camaldulensis* and *E. rudis* are the most cold hardy, some having withstood temperatures down to

17°. *E. robusta* may be expected to survive 20° with slight damage. *E. saligna* (*E. grandis*) down to 25°—302 (Fort Myers) 26°-17°.

"Most shrubs killed to the ground, as observed 2 months later. *Hibiscus* starting to sprout, but *Ixora* shows no signs. Chalcas (*Murraya*) seems dead."—304 (Largo) 19° for 12 hours; wind 20-30 m.p.h.

"The bulk of our stock was under slat and much a total loss."—305 (Bradenton) 28°.

"All plants not fertilized after September got along better."—307 (Dade City) 14° and below 34° for 20 hours; wind 15-18 m.p.h.

"Never in my thirty years in the nursery business have I seen such widespread destruction from freezing. We are almost completely wiped out."—313 (Tampa) 18° for nearly two days.

"We were hurt badly by the cold. We had no protection at either Palma Sola or Oneco, but our sprinkler system covered our main nursery with tons of ice, as it was laid out to do, and saved 90% of the material that was iced over. We were more fortunate than other nurseries in this area as they used heaters that were ineffective against the wind. Many conflicting conclusions may be drawn from reports: with identical items 10 feet apart, with one killed and the other only slightly damaged. Litchi trees killed to the ground but Royal Poinciana (*Delonix*) nearby still had green cambium 5 feet from ground. Coconuts with still green petioles in same areas where they were killed outright in 1957 freeze."—316 (Bradenton) 26° Palma Sola; 23° Bradenton; 20° Oneco; wind 30-40 m.p.h.

"Some plants survived right beside some that froze. Some misted cuttings in gallon cans in peat and perlite survived, while others in same area froze. A huge *Hibiscus tiliaceus* is starting to leaf out 5 feet from the ground (2 months after freeze). Two large Silk Oaks (*Grevillea robusta*) 3 to 4 feet in diameter, look more dead than alive, yet small trees in egg cans are alive. 65 orchids in shade house were killed; one survived. Pansies and seedling plants froze stiff but recovered completely. Weeds are growing like crazy! Don't know wind velocity but it did almost as much damage as the cold."—319 (St. Petersburg) 21°.

Cold Damage on Florida's Upper East Coast

(Daytona Beach to Stuart and Palm Beach) Temperature minima 21° to 31°.

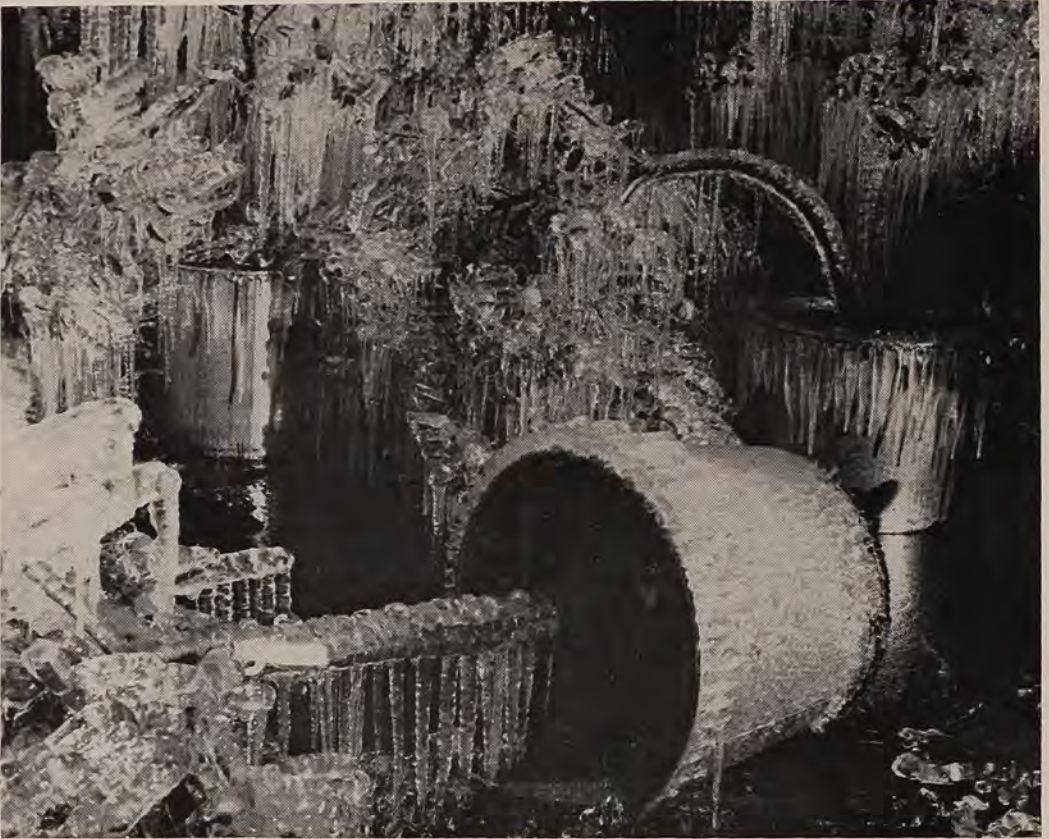
Plants (in addition to those on previous lists) which survived in the open:

Trees

- Avocado (*Persea americana*)
- Ear Tree (*Enterolobium timbouva*)
- Canistel (*Lucuma nervosa*)
- Guava (*Psidium guajava*)
- Mango (*Mangifera indica*)
- Jambolan Plum (*Syzygium jambolana*)
- Soursop (*Annona muricata*)
- Papaya (*Carica papaya*)
- Sapodilla (*Achras zapote*)
- Australian Pine (*Casuarina equisetifolia*)
- Seagrape (*Coccoloba uvifera*)
- Dragon Tree (*Dracaena draco*)
- Nolina (*Beaucarnea recurvata*)
- Tree Verbena (*Gmelina arborea*)
- Ear Acacia (*Acacia auriculiformis*)
- Cherimoya (*Annona cherimola*)
- False Mangosteen (*Garcinia spicata*)
- White Sapote (*Casimiroa edulis*)
- Grumichama (*Eugenia dombeyi*)
- Jaboticaba (*Eugenia cauliflora*=*Myrciaria cauliflora*)
- Lychee (*Litchi chinensis*)
- Red Silk-oak (*Grevillea banksii* var. *forsteri*)
- Jacaranda (*Jacaranda mimosifolia*=*J. acutifolia*)
- Mother-of-cocoa (*Gliricidia maculata*=*G. sepium*)
- Eucalyptus (*Eucalyptus* spp.) Several kinds cultivated.
- Frangipani (*Plumeria acutifolia*)
- Hong Kong Orchid (*Bauhinia blakeana*)
- Chorisia (*Chorisia speciosa*)
- Silver-trumpet (*Tabebuia argentea*)
- Golden-shower (*Cassia fistula*)
- Sogabark (*Peltophorum inerme*)
- Palmer's Trumpet (*Tabebuia palmeri*)
- Coral-tree (*Erythrina indica*) And other species.
- Royal Poinciana (*Delonix regia*)

Palms

- Coconut (*Cocos nucifera*) Unhurt from Stuart south.
- Everglade Palm (*Pavotia wrightii*)
- Fishtail Palm (*Caryota urens* and *C. mitis*)



GOOCHLAND NURSERIES, INC.

This illustration, made from a photograph taken at Goochland Nurseries, Pembroke, Florida, shows what can happen to larger plant material once it is completely covered with ice. There was not nearly so much damage to these trees, as far as breakage goes, as might appear from the illustration. Mr. R. E. Brown, proprietor at Goochland Nurseries, wrote: "Most of this material was salable as soon as the ice melted. In fact, I showed some of this material at a convention in New York City in January, a month after the freeze. On the Calamondins, especially, we had bloom as well as the fruit on the trees, with no apparent damage whatsoever."

Shrubs

- Red-head Powderpuff (*Calliandra haematocephala*)
- Pink-powderpuff (*Calliandra surinamensis*)
- Crape-jasmine (*Tabernaemontana coronaria*)
- Aralia (*Polyscias* spp.) Several kinds in cultivation.
- Chinese Hibiscus (*Hibiscus rosa-sinensis*)
- Yellow-elder (*Stenolobium stans*)
- Sanchezia (*Sanchezia nobilis*)
- Florida Sage (*Salvia azurea*)

- Boxwood Beauty (*Carissa grandiflora* var.)
- Orange Jasmine (*Murraya paniculata*)
- Grand-duke Jasmine (*Jasminum sambac*)
- Pigeon Berry (*Duranta repens*)
- Lady-of-the-night (*Brunfelsia americana*)
- Wax-jasmine (*Jasminum dichotomum*)
- Shrub-thunbergia (*Thunbergia erecta*)

Ground Covers

- Crinum (*Crinum* spp.) Several kinds grown.
- Ginger-lily (*Hedychium coronarium*)

Vines

- Pothos (*Scindapsus aureus*)
 Rangoon-creeper (*Quisqualis indica*)
 Allamanda (*Allamanda cathartica* and varieties)
 Bougainvillea (*Bougainvillea glabra*) and other species.
 Climbing fig (*Ficus pumila*)
 Mexican Flame-vine (*Senecio confusus*)
 Sky-flower (*Thunbergia grandiflora*)
 Passion Vine (*Passiflora coerulea*)

Plants that were slightly injured in this zone were the native Gumbo Limbo Tree (*Bursera simaruba*) and the *Thrinax* palms.

Comments of nurserymen in the zone from Daytona Beach to Stuart:

"Many 10-year-old mango trees in the field are killed to the ground but 6-month-old mango seedlings sheltered only by *Casuarina* withstood 27° with no injury, even to new red flushes. At least 50 species of plants, mostly tender palms, were uninjured under any type of covering, even if the sides were open. The most effective protection method was provided by tube frames covered with clear polyethylene which raised the temperature inside 6° with no supplementary heat."—202 (Stuart) 27°-29°; wind 20-30 m.p.h. (North of St. Lucie River; south of this river temperatures were 3° higher in protected places.)

"In Clewiston (26°) palms were slightly to badly injured; most tropical trees were badly injured. Beardsley farm 6½ miles east of Clewiston (29°) many plants uninjured. At Hiapoochee 3 miles south of Moore Haven on U.S. 27 (22°) bamboo and so-called "clammy cherry" apparently killed, *Casuarina cunninghamiana* and native cabbage palm slightly hurt."—205 (Clewiston); wind 20-25 m.p.h.

"Plants within 2 miles of the ocean were largely uninjured. In our field nursery farther from the coast, many items undamaged or slightly so in first location, were killed outright or severely damaged."—207 (Boca Raton) 28° at nursery, 22° in field.

"We used water. Container stock fine. Field stock killed. Mechanical damage from ice build-up was bad."—210 (Palm City) 22° from 8 P.M. to 8 A.M.; wind 10-20 m.p.h.

"Much damage (20°) at Indian River City. Temperatures on south Merritt Island were in the mid-20's with less

severe damage."—212.

"Coconut palms were not as badly damaged as they were in the 1957-1958 freeze, even though it got much colder this time."—214 (Vero Beach) 25° to 28°; wind 10-15 m.p.h.

"We had temperatures below freezing from 4 to 8 hours."—217 (Clewiston) 26°; wind 15 m.p.h.

Cold Damage Report For Florida's Lower East Coast

(Fort Lauderdale To Miami)

Temperature minima 24° to 39°

Unprotected plants which survived in the open without perceptible damage:

Trees

- Orchid Trees (*Bauhinia variegata*, *B. purpurea*, etc.)
 African Tulip (*Spathodea campanulata*)
 Geiger (*Cordia sebestena*)
 Norfolk Island Pine (*Araucaria excelsa*)
 Purple-glory (*Tibouchina granulosa*)
 Pink Shower (*Cassia javanica*)
 Cuban Pink-trumpet (*Tabebuia pal-lida*)
 Snakewood (*Cecropia palmata*)
 Woman's Tongue (*Albizia lebbek*)
 Tamarind (*Tamarindus indica*)
 Sabinea (*Sabinea carinalis*)
 Carambola (*Averrhoa carambola*)
 Black Olive (*Bucida buceras*)
 Shaving-brush (*Bombax ellipticum*)
 Kapok (*Ceiba pentandra*)
 Cashew (*Anacardium occidentale*)
 Strawberry-tree (*Muntingia calabura*)
 Custard-apple (*Annona reticulata*)
 Pond-apple (*Annona glabra*)
 Spanish Lime (*Melicocca bijuga*)
 Ant-tree (*Triplaris americana*)
 Hawaiian Tree-hibiscus (*Hibiscus tiliaceus*)
 Eucalyptus spp. Various species cultivated.
 Sandbox (*Hura crepitans*)
 Candle-tree (*Parmentiera cereifera*)
 Native Mahogany (*Swietenia mahagoni*)
 Ape's Earring (*Pithecellobium dulce*)
 Native Calabash (*Enallagma latifolia*)
 Common Calabash (*Crescentia cujete*)
 Pongam (*Pongamia glabra*)
 Traveler's Tree (*Ravenala madagascariensis*)
 Scotch Attorney (*Clusia rosea*)
 Fiddleleaf Fig (*Ficus pandurata*) also *F. microcarpa*, *F. decora*, *F. altissima*, etc.
 Madagascar Olive (*Noronhia emarginata*)

Queensland Umbrella (*Schefflera actinophylla*)
Lipstick (*Bixa orellana*)

Palms

Royal Palm (*Roystonea regia*)
Merrill Palm (*Veitchia merillii*=
Adonidia merrillii)
Madagascar Palm (*Arikuryroba schizophylla*)
King Palm (*Archontophoenix alexandrae*)
African Oil Palm (*Elaeis guineensis*)
Madagascar Palm (*Bismarckia nobilis*)
Golden Coconut (*Cocos nucifera* var.)
Areca (*Chrysalidocarpus lutescens*)

Shrubs

Ruellia (*Ruellia amoena*)
Angel's Trumpet (*Datura* spp.) Several kinds in cultivation.
Red Tear-drop (*Mussaenda erythrophylla*)
Common Ixora (*Ixora coccinea*)
Poinsettia (*Euphorbia pulcherrima*)
Milk-bush (*Euphorbia lactea*)
Dombeya (*Dombeya wallichii*)
Sleeping Hibiscus (*Malvaviscus grandiflorus*)

Vines

Queen's Wreath (*Petrea volubilis*)
Brazil Morning-glory (*Ipomoea horsfalliae*)
Ceriman (*Monstera deliciosa*)

Ground Covers

Sweet flag (*Acorus calamus*)

Bromeliads were mostly unhurt.

Plants which did sustain a little damage in this zone were the vine *Congea tomentosa*, the white flowered *Euphorbia leucocephala*, bananas (*Musa* spp.), many crotons (*Codiaeum* sp.), three kinds of *Acalypha*, and the tropical almond trees (*Terminalia catappa*).

Comments of nurserymen in this area:

"Very little cold damage, none to the trees."—101 (Miami 31°).

"Had very little damage in Ft. Lauderdale. Outlying districts had 28° and most shrubs, young coconuts and *Veitchia* (*Adonidia*) and *Areca* palms were really burned in these areas."—104 (Ft. Lauderdale) 32°.

"Wind burn was our only real damage (10 to 18 m.p.h.) because of continuous wind at very low humidity."—105 (Key Biscayne) 39°.

"We were very lucky, we had prac-

tically no damage; some leaf spotting and lots of leaves dropped, particularly on large citrus and *Ficus benjamina*. Practically no damage to shrubs and trees." 106 (Miami) 29° at ground for short time.

"Used sprinkler system."—107 (Miami) 30° to 32°; wind 15-25 m.p.h. for 5 hours.

"We had no damage of any kind in our nurseries at Perrine and Cutler. We have wind machines, heaters, and very large pumping systems. Equipment and know-how really paid off."—109 (Miami) 26°; wind 30 m.p.h.

"Some larger plants in nursery were not injured as much as small stuff."—110 (Fort Lauderdale) 29.5°; very little wind.

"No damage of any serious consequence; crotons dropped leaves, silk cotton (*Bombax*) dropped buds, sugar apple (*Annona*) leaf burn."—111 (Marathon Shores) 39° three mornings in a row; wind 40-50 m.p.h.

"These were killed: *Eugenia malaccensis*, *Synsepalum dulcificum*, *Millettia thonningii*, *Quararibea dariensis*."—112 (Kendall) 32°; wind 12 m.p.h.

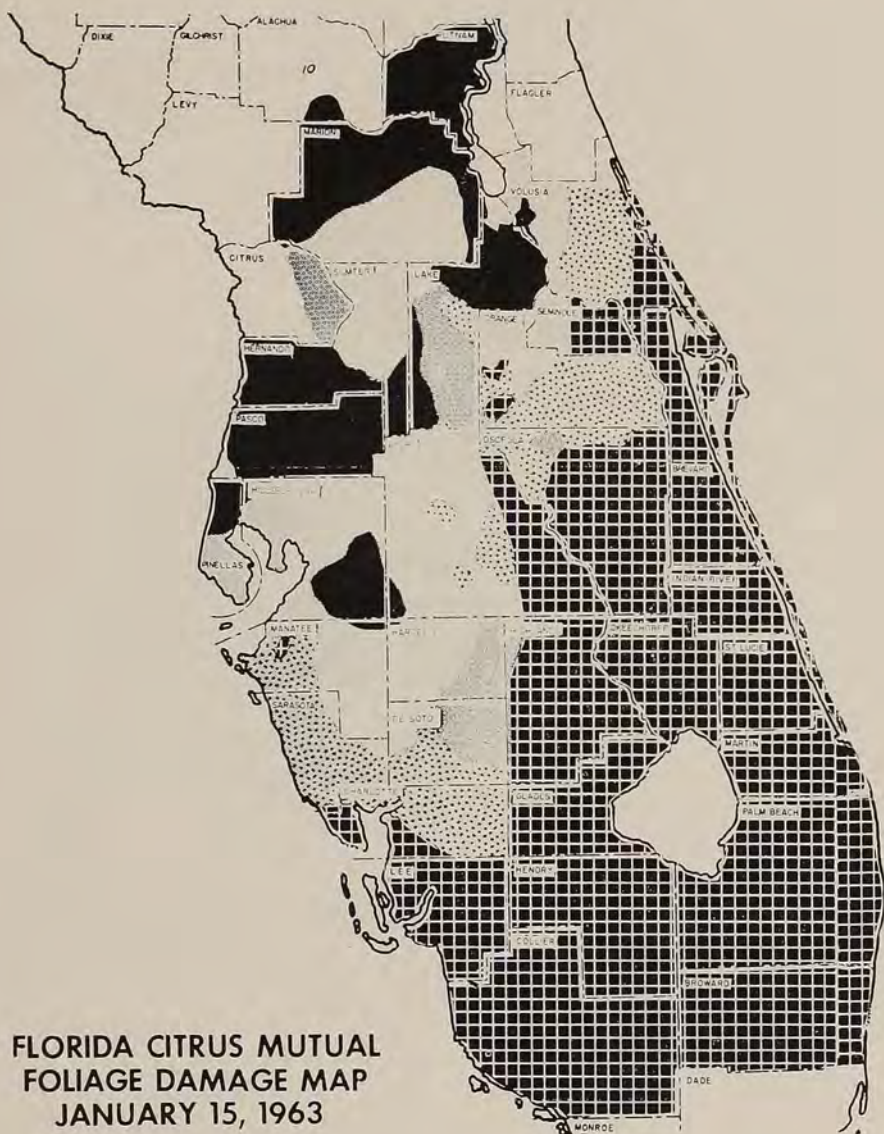
"Nursery plants were under water cover. Dec. 12 was the bad night; we had ice form five nights that week."—113 (South Miami) 26° for 3½ to 4 hours; wind 8-12 m.p.h. on Dec. 12, 20-25 on Dec. 15.

"My plants live with the water on all night."—115 (Miami) 24°. "No wind that night."

"In some areas I used fires. Temperature reached 32° at 9 P.M. and did not go above it till 9 A.M."—116 (Homestead) 24°.

"We have considerable protection from extreme temperatures. Cold hardy plants are generally located in most dangerous areas. If the Frost Warning Service forecast of Dec. 11 had been accurate, (37° indicated, 32° actual) we would have escaped without damage, for the bulk of the damage was from settling frost when the air was very humid."—119 (Fort Lauderdale) 32°; wind 20 m.p.h.

"My Fairchild *Sterculia* lost all its leaves in about 5 days, now completely leafed out again. *Licuala grandis* and *Coccothrinax fragrans* had a few burned leaves. *Heliconia distans* showed more damage than any other plant."—121 (Miami) 36°.








**FLORIDA CITRUS MUTUAL
FOLIAGE DAMAGE MAP
JANUARY 15, 1963**

Pattern Chart

This report is based on observations of bearing trees, except in those areas where the largest percentage of trees is of non-bearing age. The report is intended to be the general estimate of an area and does not take into account the individual groves in each area that are the exception --- good or bad.

It must be recognized that this is only an estimate since it is too early to determine the full extent of damage caused by the freeze of December 13 and 14.

-  - Brown leaves hanging on trees indicating severe wood damage and reduction of bearing surface.
-  - 100% defoliation -- some wood damage and small reduction in bearing surface.
-  - 90% to 100% defoliation, but trees budding out strong.
-  - 25% to 75% defoliation - no apparent wood damage or loss of bearing surface.
-  - Trees in excellent condition - with only minor leaf drop. Some counties in this section produce very little citrus.



Citrus Affected by the Freeze

Although damage to commercial plantings is beyond the general scope of this report, two maps are included to show the damage to citrus trees resulting from the freeze, because comparison with

the temperature charts is enlightening. These maps, one showing foliage damage one month after the freeze, the other showing wood damage four months after the freeze, were prepared by the Florida Citrus Mutual, and are incorporated here with their permission.

Fruit Characters in Holly

Shiu-ying Hu*

Introduction

In recent years, increased interest in hollies (*Ilex*) among individual citizens, private educational institutions, governmental research centers, and botanical gardens has led to the creation of numerous cultivars through selection in native and introduced species, and hybridization of native and/or introduced species. The sudden increase of a large number of novelties makes it imperative that growers be provided with certain criteria to follow for the identification of cultivars in their plantings. Characters used to differentiate kinds of hollies involve the growth habit, leaves, flowers, fruit, and pyrenes. In this account, fruit characters are discussed in some detail, because hollies exhibit good diagnostic characters in their fruit, and there is now much economic interest in good fruiting holly.

The establishment of holly orchards has become a growing horticultural enterprise in the United States. Orchards which yield cut-holly for the multimillion-dollar business around Christmas are found both in the Pacific and the Atlantic States. New holly orchards and nurseries specializing in hollies are added annually. A good crop of fruit is a primary goal of a holly orchard. Fruit quality is an important mark set for the selection and propagation of hollies in nurseries. An introduction and explanation of the technical terms on the characteristics and arrangements of holly fruits would help growers in the communication of their knowledge and experience.

The fruit characters of holly are of major importance in distinguishing between members of the Holly Family (Aquifoliaceae). This is to say that given a fruiting specimen of any plant one can determine whether it belongs to the

Holly Family or not. Moreover, holly fruits furnish reliable characters for distinguishing the species, varieties, and horticultural selections and hybrids. Holly fruit also provides evidence to botanists for interpretation of relationships between various species. A summary of the scattered information published in technical periodicals here and abroad and a presentation of the findings of professional botanists in simple and illustrated form would give growers the satisfaction of having increased knowledge about their plants and vitalize their intellectual interest in them.

This article was prepared through the request of a holly grower who observed the variation in shape of the fruit in his cultivars of *I. opaca* and *I. aquifolium*. He wished to describe holly fruits with technical terms but could not find descriptions in his collection of botanical books. In this article the technical terms concerned with shape, structure, and arrangement of holly fruits are explained by definitions, illustrations, and examples of native or cultivated species. In addition, the areas of importance that one should emphasize in looking for distinguishing characters in holly fruits are indicated and the methods of gathering data for separating closely related forms are clarified. In short, this article is designed as a bridge to connect public interest with technical research in hollies. It is hoped that through this approach holly enthusiasts will be led to the horizon that fascinates a professional botanist. Most examples given are American species or species introduced into American gardens.

My deep appreciations are due to Dr. and Mrs. L. A. Hausman, Professor Emeritus, Rutgers University, and to Dr. C. E. Wood, Jr. of the Arnold Arboretum for reading the manuscript with many helpful criticisms and suggestions.

*Arnold Arboretum, Harvard University.

Peculiarities of Holly Fruit

In a botanical sense a fruit is the ripened ovary of a seed plant. Regarding the types of fruit, the unabridged second edition of *Webster's New International Dictionary* gives an illustrated outline. This outline covers the subject of the types of fruit as completely as can be found in any modern textbook of general botany or plant taxonomy. By comparing a holly fruit with the illustrated forms and examples presented in this outline, one soon discovers that a holly fruit fits into none of these types.

In general practice a holly fruit is called a "berry" or a "drupe." In technical publications, eminent botanists in the past have used one or the other of these terms in their works. For example, as early as 1825, De Candolle of France used "bacca" (berry) in his *Prodromus systematis naturalis regni vegetabilis* (2: 13, 1825). Later Bentham and Hooker of England used "drupa" (drupe) in their *Genera Plantarum* (1: 357, 1862). Loesener of Germany also used "drupa" in his *Monographia Aquifoliacearum* (1901-8). Actually, a holly fruit is neither a true berry nor a true drupe. This fact can be better understood by a study of the developmental changes which take place in the process of the transformation of a holly ovary into a mature fruit.

A holly fruit is developed from a superior ovary of a compound pistil. It is composed of two or more segments (*carpels*). The ovary of the native American Holly (*I. opaca*) of eastern United States, the English Holly (*L. aquifolium*) cultivated in holly orchards in the Pacific States, and the Chinese Holly (*I. cornuta*) common in gardens of the Southeastern States, is normally 4-carpellate. As the ovary grows into a mature fruit, its outer layers of cells become the red or black covering of the fruit (the *exocarp*, Figures 9 and 12, Exoc), the middle layers of cells become a homogeneous yellowish or bluish black flesh (the *mesocarp*, Figures 9 and 12, Mesoc), and the inner layers of cells become transformed into separate woody, leathery or stony compartments (the *endocarps*, Figures 9 and 12, Endoc). Consequently, each endocarp forms a locule which contains a single seed. This structure, a seed enclosed in a hardened endocarp, is called a *pyrene* in literature concerning hollies.

The transformation of the ovary wall into three distinct layers—a tunicate exocarp, a fleshy or juicy mesocarp and several woody (*ligneous*), leathery (*coriaceous*), or bony endocarps—of a holly fruit, is comparable to the changes occurring in the development of a drupe in the genus *Prunus* (including the peach, cherry, and apricot). The peculiarity of a holly fruit lies in the separation of the endocarps and in the production of several pyrenes each covering a single seed. In a true drupe, like a peach or cherry, there is only one stone. In a holly fruit there are several small stones. Therefore, a holly fruit is not a typical drupe.

A holly fruit is definitely not a berry. In a true berry, like a grape or tomato, there is no hard endocarp. The hard portions in a grape or tomato are the seed coats. These are derived from the integuments of the ovules and they are devoid of vascular tissue. The hard portions in a holly fruit are, as mentioned above, derived from the inner layer of the ovary wall and they are furnished with tightly clinging or loosely attached vascular bundles.

In the manner of the fusion of the exocarps and mesocarps and the separation of the endocarps into distinct compartments, a holly fruit is comparable to an orange, a common citrus fruit. The citrus fruit, technically called an "hesperidium" is limited to the genus *Citrus* (orange, grapefruit, tangerine), *Fortunella* (kumquat), and a few other genera in the citrus family (Rutaceae). In contrast to a citrus fruit, the exocarp of a holly fruit is not glandular; its mesocarp is not spongy; and its endocarps are not membranaceous as in a citrus fruit. Moreover, in each compartment of a citrus fruit there are several seeds and in a segment of a holly fruit there is only one seed.

Recently, the term "bacco-drupe" which means berry-like drupe, was applied to the fruit of *Ilex*. Since this proposal was circulated in a journal limited to the academic world, the name has not been adopted by popular usage. It is to be hoped that in time the term "holly fruit" will replace the misused "berry" and the term "bacco-drupe" will be used solely in technical literature on holly.

In the discussion that follows the fruit of holly is subdivided into two categor-

ies: (1) Characters of individual fruits, and (2) characters related to the fruiting habits of holly and the manner of arrangement of holly fruits.

Characters of Individual Holly Fruits

The distinguishing characteristics used to separate the species, varieties, and cultivars of holly are generally drawn from the accessory parts, as well as the fruit proper. The accessory parts of a holly fruit include the bracts and prophylls, the pedicel, and the calyx. The fruit proper will be discussed under two subtitles, namely the external features and the internal features.

Characters of the Accessory Parts.

1. Bracts and prophylls: An individual holly fruit is borne in the axil of either a normal leaf (Figures 16-21 and 32-34) or a modified leaf (Figures 1, 11 and 35). In the latter case the size of the modified leaf may be so reduced that it no longer resembles a leaf. Such a reduced leaf associated with a flower or fruit is called a *bract*. With a holly fruit the position of a bract is always below the point of insertion of the pedicel (Figures 1 and 11). The bracts in most species of holly are *persistent*. They last up to or after maturity of the fruits. In the native American Holly (*I. opaca*) many bracts drop off while the plant is still flowering. These bracts are therefore said to be *caducous* (dropping off early). Each fallen bract leaves a scar. Under a good hand magnifier (9 \times), one can easily observe two very small scales, one on each side of the scar. These minute scales represent vestigial (rudimentary) stipules.

On the pedicel of the fruit in most species of holly there are two (rarely one) very small bractlets (*bracteoles*). In holly literature these are called *prophylls* (singular *prophyll*). The positions of the prophylls on the pedicels may be basal (Figure 1), submedian (Figure 4), median or supra-median (Figure 5). In some Chinese hollies the prophylls are obscure or absent (Figures 7 and 8).

The size, color, texture, persistence of the bracts, the hairs or cilia on the bracts, and the positions of the prophylls may be used in distinguishing varieties and cultivars which have been established on the basis of more conspicuous differences, such as the color, sheen and

size of leaves, and the color and size of fruits.

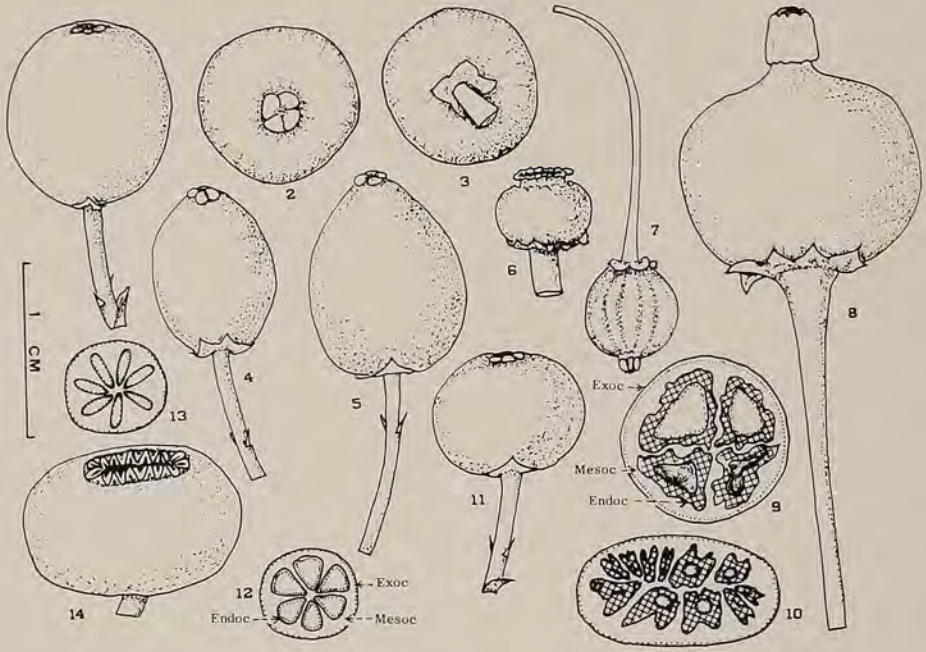
2. Pedicels: The pedicels of holly fruit generally furnish a relatively reliable character for the identification of species, varieties, and cultivars. For example, among the red-fruited species common in gardens, the Chinese Holly (*I. cornuta*) has the longest pedicels; the English Holly (*I. aquifolium*) has the shortest pedicels; and the native American Holly (*I. opaca*) has pedicels of intermediate length. To distinguish cultivars a comparison between the length of the pedicel and the diameter of the fruit of two closely related forms is made. The ratio obtained is a convenient means for comparing and distinguishing these related cultivars. For example, in *I. opaca* the cultivars 'Shirley' and 'Aalto' both have relatively small globose fruits about $\frac{1}{4}$ inch in diameter. The pedicels of 'Shirley' are $1\frac{1}{2}$ -2 times as long as the diameter of the fruit; while the pedicels of 'Aalto' are $\frac{1}{2}$ - $\frac{3}{4}$ times as long as the diameter of the fruit. These simple data depict the very obvious and definite difference between the cultivars selected by the same grower.

The orientation of the pedicels of various species of holly is also quite constant. The pedicels of most species are upright. In *I. pedunculosa* (Figure 32), *I. geniculata* (Figure 16), and *I. asprella* (Figure 7), the pedicels curve downward, hence the fruits are pendant.

The length, color, orientation, and quantity of pubescence on the pedicels are additional characters useful in distinguishing between cultivars.

3. Persistent calyces: Persistence of the calyx after flowering is another characteristic common to all species of holly. Size, shape, number of lobes, and the amount of hairs on the persistent calyx vary considerably between species, variations which form very handy characters for distinguishing species, varieties, and cultivars.

The persistent calyces of the evergreen species of holly common in American gardens are usually 4-lobed. They are small and appear square (Figure 3). Five-lobed calyces have been observed in English Holly. The persistent calyces of the deciduous species of holly are usually larger than those of the evergreen species. They appear roundish and normally consist of six or more lobes. The calyx-lobes of most deciduous spe-



MICROCARPA TYPE



GENULATA TYPE



VERTICILLATA TYPE



LAEVIGATA TYPE



LONGIPES TYPE



MONTANA TYPE



MACROCARPA TYPE



OMIENSIS TYPE



LATIFOLIA TYPE



AQUIFOLIA TYPE



TUTCHERI TYPE



CHINGIANA TYPE



AMARA TYPE



SPICATA TYPE



CYNOSA TYPE



ROTUNDA TYPE



CHINEHSIS TYPE



PEDUNCULOSA TYPE



LANGIANGA TYPE



GLABRA TYPE



OPACA TYPE



Figures 1-14. The external and internal features of holly fruits: 1. The lateral view of a single fruit of *I. aquifolium* with pedicel, basal bract and two sub-basal prophylls (California market). 2. Apical view of the same showing the 4-lobed discoid stigmas. 3. Basal view of the same showing the quadrangular persistent calyx. 4. An ellipsoid fruit of a form of *I. opaca* with pedicel and two sub-median prophylls (Millichamp 1895). 5. An ovoid fruit of a form of *I. opaca* with supra-median prophylls on the pedicel (Millichamp 1881). 6. A subglobose fruit of *I. fragilis* showing the large ciliate calyx and the cristate stigma (Rock 10208). 7. Pendant fruit of *I. asprella* showing the slender elongate pedicel, ciliate calyx, and capitate stigmas (Tsiang 617). 8. Large globose fruit of *I. macrocarpa* showing the elongate pedicel, ciliate calyx, and columnar stigmas (Ching 2750). 9. Cross-section of a 4-carpellate fruit of *I. aquifolium* showing the exocarp, mesocarp, and the four thick-walled endocarps. Two locules are empty (diagrammatic). 10.

Cross-section of the fruit of the Hawaiian Holly (*I. anomala* f. *sandwicensis*) showing the compressed-globose shape of the fruit and the eleven thick-walled endocarps—four seeded and seven empty (diagrammatic). 11. Depressed-globose or pomiform fruit of a form of *I. opaca* showing the basal bract and the sub-median prophyll (Willard 1922). 12. Cross-section of a fruit of *I. verticillata* showing the exocarp, mesocarp and six thin-walled endocarps triangular in cross-section (diagrammatic). 13. Cross-section of a fruit of *I. glabra* showing the seven thin-walled elliptic endocarps (diagrammatic). 14. Compressed-subglobose fruit of the Hawaiian Holly with very short pedicel and navel-like stigmas (Howard 15300). Figures 15-35. Arrangement of holly fruits (infructescence). (see text for explanation of figures). Figure 36. Abnormal infructescence observed in cultivated *I. cornuta*, caused by off-season flowering to show the parthenocarpic fructification in rudimentary ovaries of the staminate flowers (Steed's garden, Hyattsville, Maryland).

cies (*I. verticillata*, *I. decidua*, and *I. montana*) are obtuse, pubescent and ciliate along the margin (Figures 6-8). The calyx-lobes of *I. laevigata* are glabrous, without cilia along the margin, and each lobe is furnished with a sharp, short and stiff point (*apicula*).

In some species or cultivars, as the fruit increases in size, the margin of the calyx-lobes becomes torn. Such a margin is described as *erose*. A persistent calyx with erose margins may be found in both deciduous and evergreen species.

Characters of the Fruit Proper.

1. External features: The external features of a holly fruit involve the shape, size, color and remnants of the stigmas and sometimes the style. These are the most obvious characters and they are frequently employed for distinguishing species, varieties, and cultivars. A color chart is useful for comparing fruit-color of closely related plants, and a caliper-rule is a very good tool for measuring size of fruits.

To determine the shape of a holly fruit measure (1) the length of the longitudinal and the transverse axis, and (2) the width of the basal and the apical ends of the fruit. If the longitudinal and the transverse axes of the fruit are about the same, the fruit is *globose* or *subglobose* (Figures 1-3 and 6-8). If the transverse axis is longer than the longitudinal axis and the apical and basal ends are flattened, the fruit is *depressed-globose* or *pomiform* (Figure 11). In a fruit with many empty segments and where the underdeveloped endocarps are pressed aside by the well-developed segments, the length of one transverse axis of the fruit is likely to be longer than that of the other. Such a fruit is *compressed globose* and its cross-section appears oblong (Figures 10 and 14).

When the longitudinal axis of a fruit is longer than the transverse axis, the fruit may assume one of the following shapes: *Ellipsoid* when both ends are smaller than the middle (Figure 4); *ovoid* (egg-shaped) if the broadest portion is basal (Figure 5), or *obovoid* or *pyriform* (pear-shaped) with the broadest portion at the apical end.

The ovary of most species of holly lacks a style, thus the stigmas are *sessile*. A fruit developed from an ovary with sessile stigmas may have a 4-lobed discoid remnant (Figures 1-2 and 4-5), or a plain

navel-like mark at the apex (Figure 14). In several deciduous species a style is present. The fruit may have head-like (*capitate*) stigmas (Figure 7), columnar stigmas (Figure 8), or crested (*cristate*) stigmas (Figure 6). The presence or absence of a style and the configurations formed by the remnant of the stigmas are helpful means of identification of species.

2. Internal features: To examine the internal structure of a holly fruit one may use a sharp grafting knife or a firm razor blade to make a clear-cut cross-section through the middle of a fruit. This exposes diagnostic patterns in the number and arrangement of the carpels of the fruit and in the thickness and texture of the endocarps. These are reliable characters in helping to distinguish the species, varieties, cultivars and even series and section in *Ilex*.

The evergreen hollies in American gardens usually have 4-carpellate fruits, although five-carpellate fruits have been observed in the English Holly (*I. aquifolium*). A cross-section of a fruit of these species normally shows four segments (Figure 9). The endocarps are woody and thick. There are usually some empty segments.

A cross-section of the Hawaiian Holly (*I. anomala* f. *sandwicensis*) shows more than ten segments (Figure 10). The endocarps are thick and woody. The empty segments are more numerous than the seeded ones. The seeds of this species are much smaller than those of *I. aquifolium*, *I. opaca*, and *I. cornuta*.

Another type of endocarp in the holly fruit is thin and smooth. A cross-section of the fruit of Black Alder or Winterberry (*I. verticillata*) shows six to eight segments (Figure 12). The thin endocarps are coriaceous and the segments mostly contain seeds. As the endocarps are rather broad at the back, each one appears triangular in cross-section. Another holly fruit with coriaceous endocarps, the Inkberry (*I. glabra*), shows approximately six to eight segments; however, the fruit of this species has more copious mesocarp and the endocarps are narrow at the back which in cross-section appear elliptic (Figure 13).

In the past, characteristics of texture and color of the mesocarp of holly fruits have not been used to any extent for the identification and classification of the species of *Ilex*. Lack of attention to

the mesocarp of holly fruit by our leading botanists is due largely to limitations based on availability of specimens for study. It is almost impossible to draw any conclusions on the morphology of the mesocarp from dry herbarium specimens. The sudden increase of hollies in private gardens, holly orchards, and botanical institutions in the past few decades has changed present concepts. Many species widely separated geographically can be seen in arboreta, botanic, and private gardens nowadays. For example, mature plants of *I. laevigata*, *I. montana*, *I. verticillata*, and *I. serrata*, all deciduous species with red fruit, can be observed side by side in the Arnold Arboretum. With mature fresh fruit, the identity of these species is made relatively simple. The mesocarp of *I. montana* is very juicy, while the mesocarp of the other species is mealy. The fruits of many Latin American species of *Ilex* (*I. theezans* for example) contain copious mealy mesocarp. The introduction of Latin American species into North American gardens will lead to a wider usage of the characters of the mesocarp for distinguishing species and cultivars in the future.

In literature the fleshy mesocarp is described as *carose*. The firm mealy type of mesocarp is described as *farinose-carose* and the juicy type is described as *sucrose-carose*.

Characters of Holly Fruit Based on Arrangement

In the literature the arrangement of holly fruits is defined as the *infructescence*. The diverse types of infructescence, in species of *Ilex*, have always been used as basically important in the definition and delimitation of species in the genus.

A holly infructescence is described as either *solitary* or *fasciculate*, according to the place and manner of attachment. A solitary infructescence (Figures 15-21 and 29-35) occurs on the current year's growth. It consists of a single pedicellate fruit (Figures 18 and 19) or a cluster of pedicellate fruits on a common peduncle (Figures 15 and 29-31) situated either in the axil of a normal leaf or in the axil of a bract at the base of a leafy branch (Figure 35). When an infructescence is axillary to a normal leaf it is often associated with a super-

posed dormant vegetative bud (Figures 17 and 31). Many evergreen and all deciduous hollies have solitary infructescences. A leaf that subtends a solitary infructescence is always less than a year old. This means that a species which produces solitary infructescences also produces mixed buds which in time develop into branchlets bearing both flowers and leaves on the current year's growth.

A fasciculate infructescence (Figures 22-28) occurs on the second year's growth or on even older wood and consists of a cluster of pedicellate fruits. A fasciculate infructescence may or may not have a conspicuous axis. It is always well-marked by the persistent bud-scales at the base and every individual fruit-pedice in the fascicle is subtended by a basal persistent or caducous bract. Only evergreen species of holly produce fasciculate infructescences, and the subtending leaf of a fruit fascicle is one or more years old. This means that a species with fasciculate infructescences has two kinds of buds: Flower buds which unfold into flowering fascicles and vegetative buds which develop into leafy shoots.

Solitary infructescences in evergreen hollies: Types of solitary infructescence among the evergreen hollies vary from trichotomously compound cymes (Figure 29) to simple cymes (Figure 31) and to single fruits (Figures 32 and 33). The gradual reduction in the number of fruits of the infructescences among the evergreen species of *Ilex* is associated with other morphological characters together with phytogeographical evidence which combine to indicate the evolutionary position of the species within the genus. The species with a large number of fruits in an infructescence suggest an older evolutionary history than species with fewer fruits in the infructescence; those with single fruits in the axil of a bract or leaf are thought to be of more recent evolutionary development. The various types of solitary infructescence in evergreen hollies are as follows:

Cymosa type: Infructescence occurs in the axil of a normal leaf. It has a large cluster of medium-sized fruits, an elongate peduncle and trichotomously branched secondary axes (Figure 29, *I. cymosa*). The Hawaiian Holly (*I. anomala* f. *sandwicensis*) also has this type of infructescence.

Rotunda type: Infructescence normally occurs in the axil of a leaf. It has an umbellike cluster of medium-sized scarlet fruits on an elongate peduncle. The secondary axes are much-reduced and they are obscure (Figure 30, *I. rotunda*, cultivated in Florida and other Southeastern states).

Chinensis type: Infructescence occurs in the axil of a normal leaf. It has large ellipsoid or subglobose red fruit in a simple, loose cluster. The number of fruit in a cluster may vary from three to nine. A cluster that contains five or more fruits usually has conspicuous secondary axes. Occasionally the lower cluster on a branchlet may be reduced to a single fruit (Figure 31, *I. chinensis*, cultivated in the Southeastern states).

Pedunculosa type: Infructescence occurs in the axil of a normal leaf. It has medium-sized red fruit, solitary on an elongate peduncle with median prophylls, or rarely with fruits in groups of three. The unusually long peduncle generally bends downward and projects the fruits into a pendulous position (Figure 32, *I. pedunculosa*, cultivated in eastern United States). Two other introduced species, *I. yunnanensis* and *I. sugaroki*, have this type of infructescence. The peduncles of the latter species are much shorter.

Lancilimba type: Infructescence occurs in the axil of a normal leaf. It has a large red fruit on a very much reduced short peduncle (Figure 33, *I. lancilimba* of China).

Opaca type: Infructescence occurs in the axil of a scale or leaf at the basal portion of a leafy branch (Figure 35, *I. opaca*). It has a large red (rarely three and sometimes yellow) fruit on a pedicel variable in length according to the cultivar. The Mexican Holly, *I. rubra*, also has this type of infructescence.

Glabra type: Infructescence occurs in the axil of a normal leaf with a punctate lower surface, or very rarely in the axil of a bract at the basal portion of a leafy branch. It has one, rarely three, medium-sized black fruit on a slender pedicel with median or submedian prophylls (Figure 34, *I. glabra*, *I. coriacea*). The Japanese Holly (*I. crenata*) and many Latin American species (*I. cubana*,

I. ovalis, *I. microphylla*, etc.) all have this type of infructescence.

Fasciculate infructescences in evergreen hollies: Types of fasciculate infructescences among the evergreen species of *Ilex* vary from fasciculate pseudo-umbels (Figure 22), fasciculate pseudo-racemes (Figure 28), pseudo-racemes (Figure 23), fasciculate individual fruits (Figures 24 and 25) and solitary fruits (Figure 26). The evergreen species of *Ilex* producing fasciculate infructescences represent very heterogeneous elements. They probably represent descendants of several divergent ancestral stocks. The major infructescence types are as follows:

Omeiensis type: Infructescence with fasciculate pseudo-umbels situated in the axil of a normal leaf on two-year or older wood. The central axis of the fascicle may be conspicuous or obscure (Figure 22, *I. omeiensis*, of China). Several Himalayan and Latin American species (*I. venulosa*, of India and *I. amygdalifolia*, of Bolivia) manifest this type of infructescence.

Latifolia type: Infructescence with pseudo-racemose fruits in the axil of a normal leaf. The central axis of the pseudo-raceme is often longer than the petiole of the leaf that subtends the infructescence (Figure 23, *I. latifolia* of Japan, cultivated in eastern United States).

Aquifolium type: Infructescence with large red fruits on long or short pedicels, fasciculate in the axil of a leaf. The central axis is obscure. Usually the fruits are 4-carpellate and the endocarps are woody, or bony, and wrinkled (Figure 24, *I. aquifolium*). Many Chinese and Japanese species (*I. cornuta*, *I. pernyi*, *I. integra*, etc.) have this type of infructescence.

Tutcheri type: Infructescence with medium-sized or very large fruits on elongate pedicels, fasciculate in the axil of a thick coriaceous leaf. The central axis is much-reduced, and the fruits are 5- or 6-carpellate. The endocarps are coriaceous (Figure 25, *I. tutcheri*, of China). Many Brazilian species (*I. theezans*) have this type of infructescence.

Chingiana type: Infructescence with unusually large fruits on very short pedicels. The number of fruits in

each fascicle is reduced to one or very rarely to two or three (Figure 26, *I. chingiana*, of Central China). A Venezuelan species, *I. diospyroides*, has the same type of infructescence. The chingiana type infructescence superficially resembles the lancilimba type since both exhibit extreme reduction in the number of fruits and in an unusual increase in size of the fruits. The persistent bud-scales in the chingiana type indicates its position on the second year's growth, thus a fasciculate type; while the absence of such scales in the lancilimba type denotes its occurrence on the current year's wood, thus a solitary type. Pyrene characters confirm this classification.

Spicata type: An infructescence with medium-sized fruits arranged in solitary or paired axillary pseudo-racemes. The central axes are long and the pedicels are without prophylls (Figure 28, *I. spicata*, of the Pacific Islands).

Amara type: An infructescence with pseudo-racemes or loose fascicles axillary to punctate evergreen leaves. Each fascicle is furnished with a central axis terminated by a functionless rudimentary bud or an active terminal bud which may continue to develop into a leafy shoot. In the latter case the infructescence approaches the opaca type (Figure 27, *I. amara*, of Brazil).

Solitary infructescences in deciduous hollies: All the species of deciduous hollies bear solitary infructescences. These range from compound cymes to solitary fruits (Figures 15-21). Variations in the number and in the arrangement of the fruits in the infructescences of the deciduous species demonstrate parallel evolution between these and the evergreen species with solitary infructescences.

Some deciduous species of *Ilex* produce abbreviated shoots (spurs) in addition to long shoots, typical of *I. decidua*. Usually the terminal bud of a branch unfolds and develops into a long shoot, while the lateral buds develop into spurs. The terminal bud of a spur continues to produce flowers and leaves for many years without adding much length to the shoot (Figures 19-21). The telescoping effect of a spur causes an infructescence borne on it to appear fasciculate, a condition different from the

true fasciculate infructescence of the evergreen species which develops from a flower bud (Figures 22-25). The various types of solitary infructescence in deciduous hollies are as follows:

Micrococca type: Infructescence of large clusters of medium-sized scarlet fruits arranged in a trichotomously compound cyme. Fruit clusters on a long peduncle with conspicuous secondary axes (Figure 15, *I. micrococca*, of China and Japan). In structure, this type is comparable to the cymosa type of the evergreen species. It is worthy of note that *I. micrococca* is the most primitive deciduous holly known.

Geniculata type: Fruits medium-sized, solitary or in groups of three, borne on an elongate peduncle with median prophylls. The peduncles usually bend downward and the fruits are pendulous (Figure 16, *I. geniculata*). This type is comparable to the pedunculosa type among the evergreen species.

Verticillata type: Infructescence with three fruits or a solitary fruit borne in a simple cyme with a very short peduncle. Each infructescence is borne in a leaf axil adjacent to a rotundate dormant bud. The peduncle of a cyme can be so short that the infructescence appears fasciculate (Figure 17, *I. verticillata*). The cymose nature of the infructescence is very evident, especially during the flowering period. *Ilex serrata* of Japan has this type of infructescence.

Laevigata type: A solitary fruit borne on a very short pedicel in a leaf axil, or caducous bract at the base of the branch. When axillary to a leaf, a small flat dormant superposed bud is evident (Figure 18, *I. laevigata*).

Longipes type: A solitary fruit borne on an elongate pedicel in leaf axil or bract at the base of a long shoot, sometimes crowded among leaves at the end of a spur (Figure 19, *I. longipes*). *Ilex asprella* of China also has this type of infructescence.

Montana type: A solitary red fruit borne on a short pedicel in the axil of a basal bract or lower leaf of a long shoot or crowded with normal leaves at the apex of a spur (Figure 20, *I. montana*). Several Chinese species (*I. macropoda*, *I. aculeolata*) also have this type of infructescence.

Macrocarpa type: A solitary large black fruit borne on an elongate pedicel among normal leaves at the end of a spur or in the axil of a leaf of a long shoot (Figure 21, *I. macrocarpa*). This species is not common in American gardens. Regarding its horticultural merit the Director of the Royal Botanic Gardens, Kew, commented (personal communication) ". . . a graceful tree, and this with its deciduous habit and fruits like large black cherries, would surely make it well worth a place in any collection of hollies."

Abnormalities and Modifications of Holly Fruit

The above discussion relative to the terminology in structure and arrangement of holly fruit was prepared from observations of normal plants seen in living collections and in herbarium specimens. Anyone who describes the fruit and infructescence of holly should be reminded of two facts. Abnormalities of the plant and changing conditions of the environment may produce modifications in the form of the infructescence and in the structure of the fruit to such an extent, they may appear very different from normal individuals of the same species. The explanations and examples up to now have covered only fruit of normal holly plants.

Abnormalities found in holly fruit often are perplexing to growers of holly. A few abnormal conditions in holly fruits are explained below.

Environmental factors: Abnormalities may be induced by unusual environmental conditions. These characters are changeable and they can be distinguished from the more stable genetic characters by their less frequent occurrence. To illustrate differences in the effect of genetic and environmental characters on the fruit of *Ilex* we may take as examples *I. verticillata* and *I. laevigata* of eastern North America. These species are normally distinct, and no trouble exists in distinguishing between staminate plants of these species. The staminate cymes of *I. verticillata* contain 3-25 flowers, while the three staminate flowers of *I. laevigata* are grouped in a simple fascicle, and the pedicels of the staminate flowers of *I. laevigata* are slender and long. Under

normal condition, the pistillate plants of these species may be distinguished with ease, since *I. verticillata* produces the verticillata type of cymose infructescences and *I. laevigata* produces the laevigata type of solitary fruits (Figures 17 and 18). Nevertheless, an old specimen of *I. verticillata* reduced in vigor, or a plant growing in poor soil, or one suffering from insufficient water supply or poor exposure, tends to produce solitary fruits. Although cymose infructescences may occur on some branches, often a specimen fails to produce any cymose infructescences. The environmentally induced solitary fruited plants plus the similarities found in the position, shape, color, texture of the mesocarp, and number of endocarps of the fruits of *I. verticillata* and *I. laevigata* have confused many botanists as well as amateurs. When a decrepit plant of *I. verticillata* is again grown under optimum conditions, the plant resumes the production of cymose infructescences. Similar changes do not effect the fruiting habit of *I. laevigata*, because the production of solitary fruits is a genetic character of this species.

In using fruit characters for distinguishing between hollies one should be alert and watchful for the more constant genetic characters. In making comparisons between different forms one should select plants of approximately the same age and vigor and from similar environments. Such precautions insure more reliable results.

Insect and fungus attacks either enlarge, deform, or discolor the fruits of holly. A specimen of *I. coriacea* sent from Hilton Head Island, South Carolina, for identification had pomiform fruits with prominent lobes. The owner of the specimen noted that the fruits of this plant do not agree with any described forms of *Ilex*. He was correct. The specimen was collected in January. At this time of year, a normal *I. coriacea* should have had mature fleshy fruit. The fruit of this specimen was brown and dry. A cross-section of any one of them indicated that the tissue of the mesocarp had been destroyed by a fungus early in the development of the fruit. Most of the locules were empty and the mesocarp was spongy. It is always helpful to examine the cross-sections of several fruits of unusual form

and size. The texture of the mesocarp and the inclusions of the endocarps give enough evidence for one to determine whether the specimen is normal or whether it represents abnormal growth due to insect or fungus attacks.

Parthenocarpy in holly: The development of an ovary into mature fruit without fertilization is known as parthenocarpy. This phenomenon is common among hollies in cultivation. *Ilex cornuta* 'Burfordii' fruits heavily without pollination. Many specimens of *I. pernyi* sent to me for identification are parthenocarpic. Instead of the normal globose fruit of the species, these parthenocarpic forms produce pomiform (apple-shaped) fruits with four prominent lobes. A cross-section of any one of these fruits shows the empty locules (seed chambers). In many letters from growers who sent these specimens for identification, the owners have claimed the production of new forms. In dealing with fruit characters of holly, a holly grower should make allowances for abnormalities in specimens bearing parthenocarpic fruits, and *not* treat these as new cultivars.

Modifications in the sexes of holly plants: Dioecism is a characteristic of the genus *Ilex*. Staminate and pistillate flowers borne on different plants is prevalent in all known species of *Ilex*. A perfect flower in holly is unknown to me. The staminate and pistillate flowers of holly are both structurally and functionally differentiated.

Without exception, the staminate plants of a species produce larger and more branched flower clusters (*inflorescences*) than the pistillate plants of the same species. For example, the pistillate plant of *I. opaca* produces solitary flowers and a few 3-flowered cymes; while the staminate plant produces 3- to 5-flowered cymes. Some of the staminate branchlets bear so heavily that their terminal portions fail to develop vegetatively. Consequently, the entire flowering branchlet forms a pseudo-panicle. This condition is more pronounced in *I. cassine*, wherein the pistillate plant produces 3-flowered cymes with very short pedicels, or rarely solitary flowers while the staminate plant produces 3- to 21-flowered compound cymes with prominent secondary axes, bracteoles, and prophylls. Flowering branchlets assuming the form

of pseudo-panicles are common. In *I. aquifolium* and *I. cornuta* the staminate fascicles consist of 3- flowered cymes, while the pistillate fascicles consists not of cymes, but of solitary flowers.

The condition is the same with the deciduous species. For example, in *I. verticillata* the pistillate plant produces 1- to 3-flowered cymes on inconspicuous peduncles, while the staminate plant produces 3- to 25-flowered simple or compound cymes on prominent peduncles.

Functionally, the anthers of a pistillate flower are sterile. They are small, sagittate, with empty pollen sacs (*thecae*). The ovoid pistil is the functional organ of a pistillate flower. Likewise, the rudimentary ovary of a staminate flower is sterile. It is small, cushion-like (*pulvinate*), and pointed at the center. The stamens are the functional organs in a staminate flower. There the anthers are oblong-globose, and the thecae are filled with pollen grains.

Some rudimentary ovaries of certain cultivated hollies develop into small red fruits. For example, in staminate plants of *I. yunnanensis* in the Arnold Arboretum miniature fruits are produced annually. They are about one-fourth the size of normal fruit of the pistillate plant, and they bear no seeds. Since the fruit developed from a staminate flower produces no seed, the rudimentary ovary is functionally sterile and the flower cannot be regarded as perfect. Holly growers should make allowance for the abnormality caused by fruit production from rudimentary ovaries and *not* treat the plant as a new cultivar.

Off-season flowers: Hollies are usually spring blooming plants. Buds formed during the current year's growth are usually dormant from mid-summer until the following spring. However, off-season flowering is common in cultivated hollies. Recently, the off-season flowering of some staminate specimens of *I. cornuta* in several gardens in Maryland have aroused considerable public interest. A picture of the specimen and some discussions about this condition appeared in the New York Times. It is worthy of note that the staminate flower buds of *I. cornuta* are compound structures. Each axillary bud consists of many microscopically well-developed flowers

covered by many minute scales. Under each visible scale there are three buds which on further development, form the flowers of a simple cyme. In response to the alternating cool and warm periods of late summer, some of the flower buds of the plants under discussion unfolded partially and developed into flowers. Often only the outer portion of the compound structure will unfold and send out flowers while the inner portion still remains dormant (Figure 36). Occasionally the central flower bud of a cyme unfolds into a flower while the lateral buds remain dormant (as indicated by an arrow in Figure 36). The stimulus which induced the off-season flowering of these plants also brought about the parthenocarpic development of the rudimentary ovaries in the staminate flowers and the elongation of the peduncles and pedicles of the cymes. Consequently, the

type of inflorescence and the shape and size of the fruits produced by the off-season flowering were completely different from those of the normal *I. cornuta*. Moreover, the parthenocarpic fruits developed from the rudimentary ovaries remained on the plants. The next spring when the dormant portion of the same compound flower-buds unfolded and developed into normal staminate flowers, the plants presented the unusual appearance that led the owner to claim the possession of a "male and female cornuta." It was concluded that these plants produced pistillate flowers in late summer and staminate flowers in spring. Actually, all the flowers of these plants are staminate, and their miniature and deformed fruits are developed parthenocarpically from the rudimentary ovaries. Off-season flowering, therefore, may also bring about abnormalities.

Ceanothus prostratus and *C. pumilus*

Promising Ground Covers

Robert L. Ticknor*

Visitors to the dry, open-pine forests of the Pacific Coast states and Nevada are attracted to the natural, prostrate, evergreen ground covers *Ceanothus prostratus* (Squaw Carpet or Mahala Mat), and *C. pumilus* (Siskiyou Mat). Many attempts have been made to transplant these ground covers. Usually the plant dies because it has deep woody roots difficult to obtain in transplanting.

Although *C. prostratus* was collected by Hartweg in 1848 and *C. pumilus* by Greene in 1893, neither plant has been domesticated. Occasionally plants have been available from native plant nurseries. Programs by Oregon State University and the University of Nevada, supported in part by U.S.D.A. Domestic Plant Exploration Funds, are presently underway to select plants, and to develop knowledge of the culture of these plants for domestication purposes.

C. prostratus resembles a miniature evergreen holly with glossy, leathery, leaves $\frac{1}{4}$ to $1\frac{1}{4}$ inches long, usually with 4 to 7 teeth on the leaf margins. Plants with revolute leaves are known and one entire leaved plant was found. Plants are wholly prostrate, much-branched and dense and develop into large mats, three to six feet across. The flowers are deep or light blue or sometimes white in plants native of Oregon and Washington.

C. pumilus differs from *C. prostratus* in minor characters, mainly in the smaller leaves, $\frac{1}{8}$ to $\frac{5}{8}$ inches long and consistently three-toothed at the apex. Some botanists, such as Jepson and Henderson suggest that *C. pumilus* is a variety of *C. prostratus*.

C. prostratus is found in California, Oregon, Washington, Nevada, and Idaho. In California it occurs on open flats in pine forests, at an altitude of 3000 to 6500 feet, in the Sierra Nevada mountains from Calaveras and Alpine

counties north to Modoc county and west to Siskiyou and Trinity counties. In Oregon it occurs at altitudes of 200 to 5000 feet on the eastern slopes of the Cascade mountains in Klamath, Deschutes, Jefferson, and Wasco counties. It has also been found in Douglas, Josephine, Jackson, and Lake counties in the southern part of Oregon. Distribution in Washington is limited to Klickitat county. In Idaho, it occurs in Adams county where it was found in 1916 but not since that time. In Nevada it is known from Washoe county.

The Idaho locality is of particular interest, since *C. prostratus* has not yet been found in the Ochoco, Blue, or Wallows Mountains of Oregon, located between the Cascade Mountains and the Idaho location. *Pinus contorta* and *P. ponderosa* are two pines usually associated with *C. prostratus*.

C. pumilus occurs at altitudes of 200 to 5000 feet in southwestern Oregon.

Environment

Both species under discussion grow on light, well-drained soils, or in heavier soils in areas of low rainfall. These soils are usually quite infertile with only limited growth of grasses. Where grass and other herbaceous growth is heavy no *Ceanothus* are found. Plants occur in full sun or in partially shaded situations on the edge of forest openings, or along roads. Rainfall in areas where *C. prostratus* and *C. pumilus* grow varies from 16 to 75 inches, but plants are distributed mostly in areas with less than 20 inches of rainfall.

Because snow falls early in the mountainous areas, hardness of these plants could be questioned. The winter of 1962-63 proved to be a test winter in Oregon and Washington with a combination of strong wind, low temperature, and little or no snowfall. Complete top kill occurred at -30° F. with no snow cover. At -20° F. with strong wind and no snow cover, all leaves were

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ROBERT H. RUF, JR.

*Natural stand of Ceanothus prostratus
(dark patches) in Nevada*



ROBERT H. RUF, JR.

*Rooted cutting of Ceanothus
prostratus*



ROBERT L. TICANNOR

Ceanothus prostratus in flower

killed on some plants, but others were not injured, and bloomed satisfactorily. Light shade of taller plants was the only protection needed as the shaded portions of some plants were not injured while the exposed area had the leaves killed. By July plants which did not have a green leaf in May were covered by new growth.

Uses

The glossy evergreen leaves and attractive, small, white to purple flowers make these attractive species strong candidates for a rock garden or for any area where a low ground-cover is desired. The plants bloom from April to July, depending on altitude and weather conditions. The plants creep over fallen trees, rock outcrops, and slopes. The creeping habit, plus root production at the nodes, gives this plant great potential for soil stabilization. Highway systems with cuts and fills need plants to stabilize the soil, and to present a pleasing appearance to the motoring public. Plants for this use must be drought-tolerant because water is not usually available on these sites. Low-growing plants are desirable because they do not hold bits of paper discarded by thoughtless people. *C. prostratus* and *C. pumilus* have the necessary attributes of a good ground-cover plant for highway use if they could be produced economically in quantity.

Experimental Studies

Studies have been conducted both at Oregon State University and the University of Nevada on the propagation of *C. prostratus*. Ruf** has reported successful propagation of cuttings under intermittent mist (45 seconds every 10 minutes) the middle of August, early October, and the middle of December. August cuttings were the most successful, with results up to 92 per cent rooting with Rootone-treated cuttings inserted in vermiculite. Poorest root systems and lowest survival of plants after being removed from the bench took place with plants rooted in peat. Cuttings from 2 to 11 inches long were rooted successfully, with rooting more rapid in larger cuttings. Survival following removal from the propagation bench was greatest with small cuttings.

Bark, bark and peat, perlite, perlite and peat, and sand have been tried as propagation media at the North Willamette Experiment Station of Oregon

State University. Cuttings rooted in all media, but the best results were in perlite or sand. Survival after rooting has been best for cuttings rooted in sand. Indolebutyric acid (Hormodin #3) has been used on all cuttings. All propagation prior to 1963, when a mist system was installed, utilized the plastic tent system of moisture control. Cutting of more than 50 selections of *C. prostratus* have shown wide variability in rooting. No cuttings of several selections have rooted, while other selections have rooted more than 90 per cent.

Losses that follow transplanting from the propagation bench have led to the use of 2 x 2 veneer plant bands in which one or two cuttings are inserted. Transplanting of cuttings rooted in this manner is not necessary prior to planting into one-gallon cans or directly into the field. Peat pots may be used instead of veneer bands if holes are cut in the bottom for drainage.

Ceanothus prostratus can be started from seed but several difficulties are encountered. First, few plants set seed in the northern part of the plant's range. Second, the seed capsule splits upon maturity forcefully ejecting the seeds. Third, often more than 80 per cent of the seed is infested with a seed chalcid and is non-viable, according to Ruf. Only one other insect has been observed on *C. prostratus*. This insect, identified as cottonwood scale, (*Chionaspis ortholobis*), was found on one plant on Mount Hood, Oregon, and on another near Satus Pass, Washington.

The usual recommendations for germinating seeds of *Ceanothus* is to treat seeds with hot water followed by stratification. To develop specific information on the germination of *C. prostratus*, a series of germination trials was conducted in cooperation with Dr. T. M. Ching of The Seed Laboratory at Oregon State University. The results of these trials are presented in Table I. Results on the cold stratified treatments would probably have been higher if a longer period for germination had been available. Soaking of seeds in gibberellic acid appeared to increase germination following heat treatment. Another germination trial in a greenhouse flat indicates that even with hot water and cold

**Ruf, R. H. Jr. Western Native Shows Promise as Ground Cover, *American Nurseryman*, 116 (7): 7, 8, Oct. 1, 1962.

Table I. Per cent Germination of *Ceanothus prostratus* Seeds Following the Use of Heat, Chemicals, and Stratification Treatments.
(100 seeds per treatment)

Treatment No.	Heat Treatment	Chemical Treatment	Stratification Treatment	Per Cent Germinating
1	no	no	no	9
2	no	no	yes	0
3	Hot water 85° C. for 5 minutes	no	no	12
4		no	yes	0
5		0.17.H ₂ O ₂ 18 hr. soak	no	3
6		0.17.H ₂ O ₂ 18 hr. soak	yes	0
7		1.07.H ₂ O ₂ 18 hr. soak	no	10
8		1.07.H ₂ O ₂ 18 hr. soak	yes	0
		{ 100 ppm gibberellic acid }	no	15
10		} 18 hr. soak }	yes	17
11		{ 1000 ppm gibberellic acid }	no	21
12		} 18 hr. soak }	yes	39
13	Infrared light 10 minutes 75° C.	no	no	21
14		no	yes	0
15		0.17.H ₂ O ₂ 18 hr. soak	no	8
16		0.17.H ₂ O ₂ 18 hr. soak	yes	0
17		1.07.H ₂ O ₂ 18 hr. soak	no	17
18		1.07.H ₂ O ₂ 18 hr. soak	yes	0
19		{ 100 ppm gibberellic acid }	no	23
20		} 18 hr. soak }	yes	1
21		{ 1000 ppm gibberellic acid }	no	18
22		} 18 hr. soak }	yes	2

treatment, approximately one-third of the seed does not germinate until the second year.

Since ground covers, including *C. prostratus*, do not exclude all weed species, a herbicide trial was started at the North Willamette Experiment Station in July 1962. Tolerance of eight ground-cover species, including *C. prostratus*, to herbicide treatment is being checked with two herbicides, a mulched plot, and a cultivated check. The herbicides were applied after planting, again in October 1962, and in the spring of 1963. The best growth has taken place in the mulched treatment, followed by the growth which has taken place in the plots treated with Casoron at 5 lb./acre, or Simazine at 2 lb./acre.

Nutrition and growth requirements in the nursery are being studied at the

North Willamette Experiment Station. Some of the variables under investigation are: types of container—plastic, pulp, or metal; type of growing media—bark or peat-perlite; and type of fertilizer—metal ammonium phosphates, uramite, or constant liquid feeding. It is too early to determine where best growth will occur.

Summary

C. prostratus and *C. pumilus* are attractive, evergreen, ground-cover plants. A research project to domesticate these plants is underway at the North Willamette Experiment Station of the Oregon State University and the University of Nevada. Propagation by cuttings appears to be feasible, but extensive testing will be necessary before plants are available for wider use.



U. S. DEPARTMENT OF AGRICULTURE

Auditorium stage bedecked with Lilium auratum × L. speciosum hybrids

The 1963 National Lily Show

Joseph Uhring*

The Sixteenth Annual Meeting of the North American Lily Society and the National Lily Show were held jointly in the new administration building of the U. S. National Arboretum, Washington, D. C., June 28-July 1.

Potted lilies placed at strategic points outside the building, and a colorful display of Mid-century hybrids in the parking circle adjacent to the new building greeted visitors to the show. Eight cultivars specially planted for the occasion were arranged in wedge-shaped blocks, like spokes of a wheel. This small demonstration illustrated what is possible under conditions far from ideal. Soil leveling delayed planting of the bulbs until the first day of May. As is usually the case with backfill soil at construction

sites, debris had to be removed during soil preparation. Peat and a liberal application of a complete fertilizer were incorporated into the soil. The vigor of certain hybrids to produce satisfactory growth under trying circumstances was amply demonstrated by the hybrids *L.* × 'Enchantment' and *L.* × 'Prosperity' flowered at show time. Such easy-to-grow varieties often appear on the recommended list for beginners.

Competitive exhibits were shown indoors. These consisted of hundreds of cut *Lilium* specimens, species and hybrids, entered by commercial and amateur growers from across the country. Commercial growers provided over a thousand bulbs of choice species and hybrid selections which were pot grown and forced in greenhouses of the U. S. Department of Agriculture at Beltsville and at the National Arboretum. For

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the first time in the National Show, potted lilies were displayed. Hybrids of *L. speciosum* and *L. auratum*, much in evidence at the show, normally flower outdoors later than the end of June. Plants can be satisfactorily forced in eight-inch pots in the greenhouse with sturdy stems five to six feet in height timed to flower at any desired season.

Exhibited were 226 competitive entries, including collections and displays. Of the 300 stems shown, only the new or otherwise outstanding entries are discussed. Hybrid lilies dominated the show.

Lilies of Special Merit

Two color selections of the native East Coast lily, *L. canadense* 'Rubrum' and 'Flavum' were especially attractive; also shown was Dr. A. M. Showalter's hybrid of these color forms. The flowers of the hybrid can be described as red-flushed on a yellow background which blends the red and yellow flower-color of the respective parents. Since 1951, Dr. Showalter has been collecting *L. canadense* in the wild for use in his breeding program. Some seedlings have been selected that possess greater vigor and show an improvement in flower form.

Another outstanding lily, originated by Dr. Showalter is clone '191-5', a hybrid between *L. michauxii* and *L. canadense* with yellow flowers flushed with orange, tinged with pink. The flowers retain the fragrance, graceful form, and substance of *L. michauxii* but the hybrids are more vigorous.

A new cultivar shown nationally at the show for the first time as *L.* × 'Cleopatra', has since been re-named *L.* × 'Invicta', after it was discovered that an earlier lily hybrid called 'Cleopatra' had been introduced some years ago. 'Invicta' is an *L. auratum* × *L. speciosum* hybrid from the Oregon Bulb Farms, Gresham, Oregon, with dark crimson-red flowers seven to eight inches in diameter. Plants have enormous vigor and will attain a height of six feet under good growing conditions. This cultivar thrives in full sun, but flower color is even more striking when plants are partially shaded from the late afternoon sunlight. Protection from the bleaching action of the sun's rays prolongs flowering in areas with intense sunlight, particularly in certain species, such as *L. speciosum* and *L. auratum*.

Another new lily originated by the Oregon Bulb Farms is *L.* × 'Sonata', a cross of a selected clone from the Harlequin group with a Mid-century hybrid. The ancestry of the various hybrids in this complex includes eight or more species, which accounts for the wide range of flower color obtained in the breeding program. Flowers of *L.* × 'Sonata' are salmon-pink and measure about four inches in diameter. This hybrid stands out because of its vigor, hardiness, good substance, and form of the flowers. In height it grows three to four feet with up to twelve flowers per stem. The blossoms make good cut flowers. Although 'Sonata' prefers full sunlight, it will tolerate partial shade. Flowering occurs in late June or early July.

L. × 'Lemon Royal Bowl', distributed by Blackthorn Gardens, Holbrook, Mass., was judged best lily stem in the show. Its outward facing clear lemon-yellow flowers are five to six inches across, and the substance of the petals is outstanding.

The Stenographer Group of lily hybrids was represented by an outstanding stem of *L.* × 'Edna Kean', a vigorous and hardy garden lily with a very sturdy stem. It grows to a height of three to four feet, and the flowers are glowing orange-red which contrast strikingly with the dark green foliage and stem. Parentage of the Stenographer group was *L. willmottiae* and *L. dauricum*. Further selections by the originator, Miss Isabella Preston, resulted in several later outstanding introductions.

Outstanding Hybrid Lilies

Sonata

Thunderbolt

Edna Kean

Lemon Royal Bowl



The Harlequin group, derived from *L. cernuum*, a Korean species, is outstanding because of the wide color range of the flowers. An unnamed yellow-flowered stem was exhibited, but red and also white-flowered types occur in this group. The Harlequin lilies predominate in shades of pink and tangerine; the combination of these basic shades produces some unique color blends. The flowers are of the Turkcap type and measure four inches across. The stems are five feet in height and bear twelve to fifteen flowers; they are useful as garden plants and in floral arrangements.

A very excellent stem of the cultivar, *L.* × 'Green Dragon' was judged best of the Chinese Trumpets. This excellent lily produces large, chartreuse-colored, bowl-shaped trumpet flowers with good substance on strong, tall stems. It was introduced over fifteen years ago by the Oregon Bulb Farms who made the selection from a population of Olympic hybrids.

An extremely vigorous lily is *L.* × 'Thunderbolt'. It grows to a height of five to six feet and produces up to eighteen flowers on a strong flower head which occupies the upper third of the stem. Flowers of this hybrid approximate in color ripe cantaloupe flesh; the flowers face downward at a 45° angle. The blooming date is late June—early July in the Washington area.

Educational Exhibits

The commercial displays were among the best ever presented at the National Show. Many species and hybrids not previously seen by many were displayed.

The U. S. Department of Agriculture, Ornamental Plants Section at Beltsville displayed some aspects of its research work on lilies. The first public showing of the cross *L. auratum* × *L. speciosum* 'Album', produced at Beltsville by embryo culture on nutrient agar, included both parent plants and the hybrid. Glass vials containing artificially cultured seedlings were also exhibited to show how germination of the hybrid was accomplished, thus overcoming the embryo decomposition within the maturing seed.

Polyploidy in *L. longiflorum* (Easter Lily) was demonstrated with the aid of enlarged photomicrographic prints of each of the chromosome plates of 2n,

3n, 4n, and 6n plants developed at Beltsville with colchicine treatment. Potted diploid and tetraploid plants of four commercially available selections were placed in two separate rows to demonstrate the increased flower size and thicker petals of the tetraploids. The tetraploid plants produced at Beltsville by Dr. S. L. Emsweller, included: *L.* × 'Mega' (spotted yellow); *L.* × 'Brandywine' (spotted orange); *L.* × 'Mountaineer' (spotted red); and *L. longiflorum*.

Other educational exhibits included chromosome idiogram charts of 38 *Lilium* species, to indicate how cytological methods were employed to determine the parentage of the hybrid, *L.* × 'Black Beauty'. Mr. Leslie Woodruff originator of *L.* × 'Black Beauty' knew that one of the several forms of *L. speciosum* had been the seed parent, but the pollen plant was not known. A study of the size and shape of certain marker chromosomes of this hybrid showed that *L. speciosum* 'Punctatum' had been pollinated with *L. henryi* pollen. The hybrid bears very dark red, recurved flowers slightly larger in diameter than those of *L. henryi*, and it possesses the great vigor of *L. henryi*.

The exhibit on hybridizing also showed the method used of protecting pollinations with soda straws slipped over the pistil and fastened with a rubber band. Pollen storage was demonstrated with a homemade dessicator consisting of a glass jar half filled with a dessicant (calcium chloride) on which the stoppered vials of pollen had been placed before storing at 40° F.

A demonstration on propagation showed the dates when each of the various methods of propagation had been started. Seed flats and tin cans contained seedlings of the "quick germinating" lilies, such as *L. formosanum* and *L. candidum*. Glass jars filled with moistened vermiculite contained germinating seeds of four West Coast native species, including *L. kelloggii* and *L. vollmeri*, which require low storage temperatures (40°—50° F.) to initiate germination. Vegetative propagation using bulb scales of three species revealed the comparative speed of bulblet formation in the wooden flats, showing that *L. longiflorum* is more readily propagated than *L. speciosum* 'Album' or *L. auratum*. The less common method

of propagation by leaf cutting under mist or in humid conditions was demonstrated by using *L. longiflorum* started on the 8th of last February, and on the same day in March and April.

Diseased specimens to illustrate virus symptoms were shown. The effect of roguing and the control of insects (aphids) to reduce the spread of virus was demonstrated to assist the amateur gardener with problems in disease control in lilies. Soaking the bulbs for fifteen minutes, prior to planting, in a fungicide solution to kill the surface fusarium spores that cause basal rot was recommended in another exhibit.

Visitors were taken to the Plant Industry Station, Beltsville, Maryland to see the lily field plots. A soil sterilization demonstration showed the use of methyl bromide gas to destroy fusarium and other fungi prior to planting lily bulbs. A pound can of methyl bromide will sterilize 100 square feet of soil and this treatment also destroys the seeds of most weeds and reduces the insect population. Outdoor bulb-scale propagation beds demonstrated a rapid and economic way of increasing the stock. This process may be accelerated when scales are started in the greenhouse in late winter

and transplanted to the field bed in May.

Reports from two foreign visitors gave insight as to the status of lily growing in England and South Africa. Mrs. Martyn Simmons from England pointed out that the species are still the favorite of many English gardeners rather than the hybrids. *L. canadense* is one of the popular species grown in England and *L. superbum* does very well. The Madonna Lily, *L. candidum*, is grown commonly in England and is often referred to as the "Cottage Lily." In England, botrytis blight is not as troublesome on *L. candidum* as in the United States. *L.* × 'Dark Princess', known in England as *L.* × 'Beltsville Tiger', is a favorite hybrid and *L.* × 'Shuksan' is another well known hybrid.

Miss Beryl I. Reynolds, President of the South African *Lilium* Society gave a fascinating report about lilies that are being grown in her country. Since this is a comparatively new group, the members are trying various species and hybrids to accumulate information on performance under South African growing conditions. Among lilies that have been grown, hybrids between *L. speciosum* and *L. auratum* have performed successfully.

Olneya tesota
(Desert Ironwood)



Chilopsis linearis
(Western Desert-willow)



Celtis laevigata var. reticulata
(Netleaf Hackberry)

Cercidium floridum
(Blue Palo-Verde)

Native Trees and Shrubs for Landscape Use in Southern Arizona

Joseph S. Folkner and Robert Charles*

People have landscaped their homes and cities over the ages as an expression of the advances of civilization and culture. The emphasis on plant material in the southwest has been in the past on species introduced from other areas. The first introductions were by Padre Kino and other missionaries. Later, as people migrated either from the east or west coast, plants most familiar were imported. Many species were introduced into the desert from subtropical regions and other semi-arid parts of the world. In recent years an increasing interest in native species for landscape use has been expressed. An inclusion of native plants will add a phase of southwestern vegetation to the landscape in addition to reducing water usage.

Soils preferred by native species are similar to those found around residential and other urban areas. In native habitats, the plants have grown for several years without mulching, fertilizing, and other benefits of common garden practices. These practices would be advantageous when the initial plantings are made, but they are not necessary to maintain the species.

The plants included in this report have been growing in this southwestern climate for hundreds of years under conditions of relatively low water supply. They have become adapted to our desert.

The plants have been selected for landscape use and warrant further use in relation to development of home plantings, school grounds, parks, and commercial and industrial establishments.

In addition to surviving the southwestern climate, these species have resisted insects and diseases. The plants listed have resisted garden insects and diseases that have, of late, become troublesome with introduced species.

Supplemental care of native desert species does not appear to be necessary. Pruning may be done to help shape a plant, but little else is required. Little

water is usually needed for these plants. (It is common knowledge that the desert goes for months without rainfall.) Once a plant is established in the home landscape it should survive under the same conditions as it would in the open desert.

These selected plants are as much a part of the desert as cacti; they survive under similar conditions and are much easier to handle.

Trees

Acacia farnesiana, Huisache Sweet Acacia, 23-35 ft., January-March. Flowers yellow. In foreign countries this deciduous tree is cultivated for glue, forage, and the aromatic flowers are used for perfume.

Celtis laevigata var. *reticulata*. Netleaf Hackberry, (Palo-Blanco), 30-48 ft. Flowers inconspicuous. Deciduous tree requiring continuously moist soil. Most specimens are generally good shade trees. Tree most valued for shade.

Cercidium floridum, Blue Palo-verde, 15-30 ft., late March or April. Flowers bright yellow. One of the most attractive desert species. Drought resistant. Requires little care.

Chilopsis linearis, Western Desert-willow, 6-24 ft., July-August. Flowers white or lavender, sweet-scented. Drought tolerant. Used widely in landscaping. Graceful habit, small to large tree. Deciduous.

Cupressus arizonica, Arizona Cypress, 40-70 ft. Tree with a well developed trunk forming a crown narrowly pyramidal or broad and flat. Excellent landscape species of rapid growth. Evergreen.

Dalea spinosa, Smoke Tree, 6-24 ft. Early summer. Flowers indigo to bright lavender. A good ornamental, but should be restricted to frost free areas. Loses leaves during drought.

Fraxinus velutina, Arizona Ash, to 35 ft., March-April. Flowers yellow-green. Attractive specimen requiring little care and infrequent irrigation. Good shade tree. Deciduous.

*Horticulture Department, University of Arizona.



Chilopsis linearis (Western Desert-willow)

Juglans rupestris var. *major*, Arizona Black Walnut, 40-50 ft. Good shade tree, well-formed and requires little supplemental care. Deciduous.

Olneya tesota Desert Ironwood, 5-15 ft., May-June. Flowers lavender. One of the most interesting trees of the desert; it has been used for fuel, novelties, and food. Drought resistant and requires little care.

Parkinsonia aculeata, Palo Verde, (Horse Bean), 40 ft., May. Flowers bright yellow. Southern Arizona, Texas, Florida to South America. Young bark is smooth, yellowish green becoming brown. Foliage needle or threadlike with leaflets in rainy season, rapid growth.

Platanus racemosa var. *wrightii*, Arizona Sycamore, 20-50 ft., February-April. Large tree with scaly bark. Trunk white and quite attractive. Good shade, but requires additional water. Deciduous.

Populus fremontii, Fremont Cottonwood, 50-75 ft. Flowers greenish yellow. Excellent shade tree for ranch or large suburban lots, particularly colorful in the fall. Requires a good moisture supply. Deciduous. Male tree not messy with cotton.

Prosopis juliflora Honey Mesquite, 9-30 ft., April-June. Flowers yellow. Drought tolerant and a good shade tree. Tree with attractive pods. Common in desert areas. Deciduous.

Prosopis pubescens, Screw Bean Mesquite, 6-30 ft., May-July. Flowers yellow. Plant has coiled pods and spiny leaf stalk. Drought tolerant and common in the desert. Deciduous.

Sapindus drummondii, Western Soapberry, 6-15 ft., July-August. Flowers white. Requires irregular irrigation. Fruit thought to be poisonous. Birds or insects rarely approach the tree. Deciduous.

Washingtonia filifera, California Fan Palm, 20-50 ft. This tree has been long cultivated. Native of Kofa Mountains near Yuma. A grove will furnish excellent shade. Requires irrigation.

Shrubs

Acacia greggii, Whitehorn, 6 ft., flowers at intervals all year. Flowers yellow, in round balls, numerous. Evergreen with continuous moisture. Much-branched with numerous thorns.

Anisacanthus thurberi, Bush Honey-suckle, 3-9 ft., June. Flowers red or

yellow-orange. Tolerant of heat and cold. Tan bark on trunk which scales off. Deciduous.

Atriplex canescens, Four-Wing Saltbush (Chamiso), 3-6 ft., June-August. Flowers greenish. Bush irregular in outline, more or less flat-topped. Moderate alkaline soil. Remarkably drought resistant. Useful throughout state. Evergreen.

Baccharis sarothroides, Desert-broom, 3-5 ft. Bright green branchlets practically leafless throughout the year. Tolerant of saline soils.

Beloperone californica, California Beloperone (Honey-suckle), 3-6 ft., March-June. Flowers red-orange. Tubular red flowers contrasting with green, velvety-hairy, flexible branches. Deciduous.

Bouvardia glaberrima, Bouvardia, 1-3 ft., May-September. Flowers red (pink-white) resembling honeysuckle. Prefers partial shade. Excellent for patio wall border. Deciduous.

Caesalpinia gilliesii, Bird-of-paradise, 4-12 ft., May-September. Yellow flowers with red filaments are striking; red-colored phase occasionally cultivated. Escaped from cultivation and naturalized, moderately drought resistant. Native of South America.

Calliandra eriophylla, Fairy Duster (Mesquitilla), to 3 ft., February-March. Flowers pink or red. Low, bushy shrub with gray twigs. Drought tolerant and needs little cultivation. Gray pods at maturity. Deciduous.

Cassia leptocarpa, Cassia, 3-4 ft., July-September. Flowers yellow. Cold tender herbaceous shrub, freezing back to ground in winter. Large terminal panicles of bright yellow flowers. Foliage ill-smelling.

Cassia wislizenii, Cassia, 3-5 ft., June-September. Flowers yellow. Much branched deciduous shrub with dark bark. Deserves more consideration.

Cephalanthus occidentalis var. *californicus*, Button Willow, 6-24 ft., June-September. Flowers white, in attractive ball-shaped heads. Desirable ornamental. Grows best in cooler areas and in wet soil. Deciduous.

Cercis occidentalis, Western Redbud, 6-15 ft., February-April. Flowers pink or lavender. Large round-headed shrub, much branched from the base. Grows best in northern half of the state. Deciduous.

Simmondsia californica
(Coffeeberry)



Baccharis sarothroides
(Desert-Broom)



Larrea tridentata
(Creosote-Bush)



Prosopis juliflora
(Honey Mesquite)

Fouquieria splendens
(Ocotillo, Coach-Whip)



Cassia leptocarpa
(Cassia)



Platanus racemosa var. *wrightii*
(Arizona Sycamore)



Cassia wislizenii
(Cassia)

Acacia greggii
(Whitethorn)



Fraxinus velutina
(Arizona Ash)



Juglans rupestris var. *major*
(Arizona Black Walnut)

Tecoma stans
(Yellow Trumpet-Flower)

Dalea greggii, Gregg Dalea, to 1 ft., July-August. Flowers rose-purple. Flower clusters small. Silvery leaves present good background for rose-purple flowers. Deciduous.

Erythrina flabelliformis, Coralbean Chilicote, 6-20 ft., June-July. Flowers bright red. Large shrub with bright red beans frequently used for decoration. Short-lived branches grow from a large tuberous-like root. Grows best in warm locations, south or west exposure next to wall. Seeds poisonous.

Forestiera neomexicana, Desert Olive, 6-8 ft., March-April. Flowers yellow. Grows best between three and five thousand feet altitude. Prefers well drained moist soil. Deciduous.

Fouquieria splendens, Ocotillo (Coach-Whip), 6-10 ft., April-May. Flowers red. Shrub with slender spiny branches. Frequently used as an ornamental. Does well under drought conditions. Deciduous.

Hibiscus coulteri, 1-3 ft., flowering throughout the year. Flowers yellow. Commonly found on well-drained soils. Has a rather straggly appearance. Excellent plant for rock gardens. Evergreen.

Larrea tridentata, Creosote-Bush, to 11 ft., flowering at intervals all year, profusely in spring. Flowers yellow. Widely distributed in Southwest. Responds to water and fertilizers with lush dark green

foliage and many flowers. Plant may be sheared and grown as specimens or a hedge.

Lysiloma microphylla, Lysiloma, 3-9 ft., May-June. Flowers white. Limited to warm areas three to five thousand feet altitude. Tips may freeze in extremely cold weather.

Nolina microcarpa, Bear Grass Sacahuista, 1-3 ft., June-July. Flowers white. Resembles a large coarse grass. Common throughout southern Arizona on gravelly or sandy well-drained soil. A showy plant. Evergreen.

Penstemon antirrhinoides, Bush Penstemon, 1-4 ft., April-May. Flowers yellow. Responds well to cultivation. Does not require heavy rainfall and tolerates near freezing temperatures. Deciduous.

Rhus ovata, Sugar-Bush, to 15 ft., March-May. Flowers with red buds opening cream-colored. Excellent ornamental shrub with bright green leathery leaves, tolerant of a wide range of temperature and soil. Evergreen.

Simmondsia californica, Coffeeberry (Jojoba), 3-4 ft. Low gray-green shrub with dense evergreen foliage adapted to many uses. May be used as a hedge.

Tecoma stans, Yellow Trumpet Flower, 3-6 ft., August-September. Bright yellow flowers and bright green leaves are desirable for ornamental plantings. Plant in warm location. Deciduous.

A Book or Two

Garden Open Today

Beverly Nichols. E. P. Dutton and Company, 201 Park Avenue South, New York 3, New York. 1963. 252 pages. \$4.95. (Library).

Those of you who have read the garden books written by Beverly Nichols and enjoy his style, will enjoy this latest book which is primarily concerned with his favorite flowers and his experiences in making his and other gardens. The "Nichols Snowdrop Invention" is explained. Though he uses common (in England) names for the plants that he is writing about, the Latin names do appear, as for example, "The other late blue, flowering in August alongside the plumbago is called *Caryopteris 'Ferndown'*."

Each chapter ends with "Practical Notes" and his appendix, he admits, is very much a one-man appendix in that the nurserymen, seedsmen, and horticultural suppliers mentioned are, with very few exceptions, people with whom he has dealt. I was pleased to see that Hillier's nursery at Winchester headed the list as a MUST (that is for the catalogue). Those of us who have had the privilege of meeting Mr. Hillier or seeing the Winchester Nurseries will agree with Mr. Nichols that this should head a list.

The charming drawings by William McLaren add a great deal to a book through which one literally flits.

F. P.-K.

A Guide to Mushrooms and Toadstools

Morten Lange and F. Bayard Hora. E. P. Dutton & Company, Inc., 201 Park Avenue, South, New York 13, New York. 1963. 257 pages. Illustrated. \$5.95. (Library).

This guide is based on the monumental work of Jakob E. Lange in which about 1200 species are illustrated in color. The present book has 96 color plates. Nearly 600 species are illustrated and are said to be, for the most part, common in Britain. There is an identification key, descriptions in the text, a glossary, and an index. The book could be helpful to the amateur in gaining an understanding of some of the major characters upon which the classification of the mushrooms are based. For definitive identification of American mushrooms other sources would be necessary. May we repeat a warning sounded many times. Never eat a wild mushroom unless you are absolutely certain of its identification.

C. M.

Sertum Anglicum

Charles-Louis L'Heritier de Brutelle. 1788. Facsimile with Critical Studies and a Translation. The Hunt Botanical Library, Pittsburgh, Pennsylvania. 1963. (Library)

This handsome volume is the first of the Hunt Facsimile Series—the object of which is to bring to plantsmen and admirers of botanical illustration, facsimile reproductions of titles which were published in limited editions. These early works are generally rare and the information contained is not readily available to researchers. With the high quality off-set reproduction that is now attainable, we may look forward to seeing many such works placed in the hands of the botanist and horticulturist through the Hunt Facsimile Series.

L'Heritier de Brutelle's *Sertum Anglicum* was selected as the first of the Series because it was published in less than 100 copies. The author described a number of new genera and species and the illustrations represent the early drawings of two distinguished 18th and 19th century botanical illustrators, Pierre-Joseph Redouté and James Sowerby. Finally, horticulturists will want to refer to the work because it centers around the plants introduced into the gardens of London and Paris prior to 1786.

The volume contains three introductory essays to the Facsimile—a discussion of L'Heritier, the man; a scholarly piece on the plants in the *Sertum Anglicum*, appropriately done by three distinguished English botanists, Gilmour, King, and Williams, and an essay on the illustrators of L'Heritier's work. Thus, in this first volume, one can gain an appreciation of the intended scope of the Series and realize the magnitude of effort that must go into such thoughtfully-planned work.

The introduction includes an English translation of *Sertum Anglicum* and essential information such as explanatory notes. The Facsimile contains 36 pages and 34 reproductions of the plants described. An index to Latin names and a general index completes the volume. The frontispiece is one of the reproductions in the Facsimile done by Redouté—*Lycoris aurea*. This particularly interested the reviewer because of personal knowledge of this genus. In reading the description of *L. aurea* and noting the origin as China, I am curious as to whether L'Heritier was describing *L. aurea* or the recently-named species, *L. chinensis*. Unfortunately, he does not state the time of bloom, a possible clue to the identity of the *Lycoris* he saw. It does, however, illustrate the point as to one facet of value of this kind of work.

The Hunt Facsimile Series is edited by Dr. George H. M. Lawrence, Director of the Hunt

(Books available for loan to the Membership are designated: (Library). Those not so designated are in private collections and are not available for loan. Books available for sale to the Membership are designated with the special reduced price and are subject to the usual change of price without notice. Orders must be sent through the American Horticultural Society accomplished by the proper payment. Please allow two to three weeks for delivery. Those not designated for sale to the Membership at reduced prices can be purchased through the Society, however, at the retail prices given. In these instances the full profit is received by the Society to be used for increased services and benefits of the Membership.)

Botanical Library and is a salute to the fine taste of those who participated in this undertaking in a field that appears to have been too long neglected.

J. L. C.

The Story of Pollination

B. J. D. Mecuse. The Ronald Press Company, 15 East 26th Street, New York 10, New York. 1961. 243 pages. Illustrated. \$7.50. (Library).

Here is a fascinating account written, so the author prefaces, "for young persons between the ages of eight and eighty." This should include most gardeners! Certainly anyone who has anything to do with flowers would glean a host of unusual facts about the relationships of the various pollinating agents to their flower associates. As any biologist would affirm, this area of natural history has some of the most striking relationships that exist in nature. Here, as some of Mecuse's chapter heads suggest, one can read about "Busy Bees and Efficient Bumblebees," "Something for the Birds," "The Blundering Beetles," "Of Sausage Trees and Bats," "Burglars and Law-Abiding Citizens"—and a dozen others equally intriguing. In short, if the reader has ever wondered about the rhyme and reason behind the infinite variety of form, color, and odor that exists among flowers, he'll find most of his answers interestingly illuminated in this volume. Besides a text, this volume is enhanced by numerous well-delineated drawings, a sampling of fine photographs and some elegant water color drawings by Hilda Kern. Emily Dickinson unknowingly epitomized the content of this well-printed volume when she wrote: "To make a prairie it takes a clover and one bee,—

One clover, and a bee,
And reverie."

W. H. Hodge

A Checklist of Woody Ornamental Plants of California

Mildred E. Mathias and Elizabeth McClintock. California Agricultural Experiment Station Extension Service, Agricultural Publications, University Hall, University of California, Berkeley 4, California. 1963. 65 pages. \$7.50. (Library).

This checklist, Manual 32, is "designed to serve as a guide to nurserymen and others in the labeling of nursery stock in compliance with the Agricultural Code of California" which states: "Ornamentals, except roses and annual herbaceous perennial ornamental plants, shall be labeled with the botanical name." The checklist is far more than these simple statements imply. The compilation was made from current nursery lists to include all woody plants

normally sold in California as ornamentals—species, cultivars (horticultural varieties), and garden hybrids. The list does not include fruit trees commonly used in orchard, nor bamboos, succulents, and ferns. Omitted also are the cultivars of *Camellia*, *Fuchsia*, *Rhododendron*, and *Rosa*, for which checklists already exist. In all, the checklist includes about 2700 kinds of woody ornamentals grown in California.

The geographical position of California is unique among the various states, especially with regard to climate. Horticulturally speaking, it is possible to grow an extremely diverse assortment of introduced plants in California. Most of the woody plants common in eastern United States, for example, are grown in northern areas of the state, and plants of subtropical and tropical origin flourish in southern areas of the state.

The real value of this checklist, apart from its legalistic value in California, rests as a reference to correctness of the plant names cited. All names have been carefully checked with the literature. The Holly Leaf *Osmanthus*, for example, is brought up to date as *O. heterophyllus* 'Ilicifolius' (syn. *O. aquifolium*, *O. ilicifolius*) in accordance with Peter Green's recent world monograph of *Osmanthus* and *Hydrangea* is updated in accordance with Dr. McClintock's monograph, and other groups are brought into line with the latest references. The valid Latin binomials (with authorities) are printed in bold face. All synonyms are in italics with a cross reference to the valid name, and common names with their Latin equivalents are listed. The authors were unable, in most instances, to check plant names listed in nursery catalogues against actual plant material. This means that some kinds of plants in the nursery trade most likely are still wrongly named. However, the application of the names in the list is up-to-date botanically. In other words, nomenclature is brought into line with latest botanical knowledge.

An appendix records authorities for all Latin binomials in the checklist. Horticulturists and nurserymen prefer not to use authorities in citing botanical names, but the lack of the author's name can and often does result in endless confusion. This leads to serious errors in plant names.

The situation regarding names in cultivated plants might well take a turn for the better, if only more specialists, like Drs. Mathias and McClintock, would interest themselves in this group of plants. The authors should not stop with a mere checklist. Why not a full blown manual of the cultivated plants of California?

Frederick G. Meyer

Advances in Horticultural Science and Their Applications

(Proc. XVth Int. Hort. Congress. Nice, 1958). Vol. 2 and 3. The Macmillan Company, 60 Fifth Avenue, New York 11, New York. 1962. \$60.00. (Vols. 1, 2, and 3). (Library).

These are the volumes which report the papers presented at the XVth International

Horticultural Congress. Each volume is well over 500 pages and together include a total of 136 papers covering the fields of fruit growing, flower growing, ornamental trees and shrubs, and the various factors which govern success with these plants.

Papers from many countries are included but the preponderance are European. Thus, the reader has an opportunity to see what is going on, horticulturally, in that part of the world. For each paper there are Abstracts in French, English, and German. Perhaps a fifth of the papers are in English, the majority of the others in French.

Plant societies might well have a look at these volumes to see what goes on at such a congress in view of the fact that the 1966 Congress will be held in the U. S. A. The European Congresses reflect the interests of professional horticulture. With the involvement of AHS in the planning for the next one, plant societies have an opportunity to demonstrate their serious participation in horticultural research.

J. L. C.

The Origin and Cultivation of Shade and Ornamental Trees

Hui-Lin Li, Morris Arboretum, University of Pennsylvania Press, 3436 Walnut Street, Philadelphia 4, Pennsylvania. 1963. 282 pages. Illustrated. \$6.00. (Library).

This 282-page hardback book brings together legendary and factual material about shade and ornamental trees widely cultivated in temperate climates. Technical terminology is kept at a minimum. Although the book is written for the general reader, the appended bibliography provides sources for the student. The origins of some common shade trees are well known; others have been cultivated for so long that their origins are lost in the mythical past. How the discovery of the New World and the opening of ancient trade routes to Asia enriched our heritage of shade trees is clearly explained. Some of the 90 illustrations are excellent but too much confusing background obscures the central figure in others. Chapters 1 to 9 inclusive are based on material originally published in the Morris Arboretum Bulletin, 1956 to 1960.

C. M.

All About Miniature Plants and Gardens, Indoors and Out

Bernice Brilmayer. Doubleday and Company, 575 Madison Avenue, New York 22, New York. 1963. 319 pages. Illustrated. \$4.95 (AHS Member's price \$4.20). (Library).

The author of "All about begonias" and "All about vines and hanging plants" has produced another "All About" book, this time about miniature plants and gardens.

Recently people have become more interested in dwarf and miniature plants, partly due to the increasing popularity of house plants and the bonsai, which are to be seen at some of the larger flower shows.

Mrs. Brilmayer's new book is of interest both for the beginner and those who have been gardening for some time. Separate chapters deal with various types of miniature gardens, be it a sink garden, water garden, or a garden planted in container, with suggested plants listed for the various kinds of gardens. The short list of pests and their control on page 85 would be of great use to the beginner.

Liberal laced with black and white photographs, color plates, and line drawings as well as a list of where to buy plants and supplies, this book will bring pleasure and information to the reader.

F. P. K.

Trees of Northern Florida

Herman Kurz and Robert K. Godfrey. University of Florida Press, Gainesville, Florida. 1962. 311 pages. Illustrated. \$8.50.

This is an illustrated manual to the trees of that area of northern Florida "north and northwest of a line drawn from the Atlantic Ocean through Marion County to the Gulf of Mexico." In a general way it would serve also for the southern parts of Georgia, Alabama, and Mississippi. This whole area has up to now lacked a modern manual of any sort to the higher plants. A work by two of the most competent students of this rich woody flora is, thus, especially welcome. Both native and naturalized species are included. Each tree in this volume is illustrated by line drawings, is keyed out, has a full botanical description to which have been added notes on flowering, habitat, and special characteristics enabling one to distinguish the tree species from the nearest congeners. Although no horticultural notes are included, the interested reader can find information of use in the growing of certain of the native trees of the area which deserve more extensive attention in horticulture. Among these would be the large flowered Two-Wing Silverbell (*Halesia diptera* var. *magniflora*), the Big-Leaf Snowbell (*Styrax grandifolia*), *Magnolia ashei*, and Florida Torreya (*Torreya taxifolia*).

W. H. Hodge

Colour All the Year Round

Roy Genders. St. Martin's Press, 175 Fifth Avenue, New York 10, New York. 1963. 287 pages. Illustrated. \$5.95. (Library).

Roy Genders' new book is written with the small garden in mind and though written for the English gardening public, much of the book will interest gardeners in the United States.

The value of trees as a frame for a garden picture is discussed and how much can be gained from making the right selection. Suggestions are given for both evergreen and deciduous trees with colorful foliage, with a short but helpful description of each tree listed. The

same treatment is given to shrubs with a chapter devoted to hedges. The rose garden information is quite complete with coverage of pests and diseases, and the pruning information includes some drawings. Chapters on bedding plants, annuals, the half-hardy plants for summer, the dahlias, the Michaelmas daises (a great favorite in the English garden) are included. Also included are chapters on spray chrysanthemums, plants with colored leaves, bulbs all the year round, the rockery, and wall plants.

Some useful tables showing heights and flowering time of the plants listed are again directed to the English climate.

The book has a fair number of black and white illustrations and the text is easy to read.

F.P.-K.

Nature, Art, and Flower Arrangement

Emma Hodkinson Cyphers. Hearthsides Press, 118 East 28th Street, New York 16, New York, 1963. 160 pages. Illustrated. \$4.95. (\$4.20 to AHS Members). (Library).

This book of 74 photographs and 55 drawings is an excellent one to stimulate both the flower arranger and the viewer with an urgency to obtain a greater insight in the art of flower arranging in both the naturalistic and the impressionistic manner.

The author's comparisons of the principles of design and the elements, such as space, shapes, color, texture, and overall design, with the various aspects of nature and paintings, is thought-inspiring and is encouraging to others to work at developing a keener perception through the study of these arts as seen in nature.

The final pages deal with the need of flower show judges to familiarize themselves with art in the abstract in order to understand what the arranger is saying. This is a thought-provoking book and one that may be found very helpful in the modern day conception of flower arranging.

M. W. L.

The Eucalypts. Botany, Cultivation, Chemistry, and Utilization

A. R. Penfold and J. L. Willis. Interscience Publishers, Inc., 250 Fifth Avenue, New York 1, New York, 1961. xx + 552 pages. Illustrated. \$13.25. (Library).

A World Crops Books under the general editorship of Professor Nicholas Polunin.

Australia and *Eucalyptus* are practically synonymous. *Eucalyptus* trees were discovered on the shores of Botany Bay at Sidney, New South Wales, by Banks and Solander, botanists to Captain Cook on his first voyage of discovery around the world in 1770. Since that day, the eucalyptus tree has become one of the most important introductions in warm climates. The trees grows well in arid regions of the tropics and subtropics where it provides in many areas much needed fuel and acts as a soil binder. One has only to visit areas, such as Ethiopia and

some parts of western South America to see what effect the eucalyptus has on the economy of the people. Species of *Eucalyptus* are among the tallest trees in the world, and many are used for purely ornamental purposes as shade trees, especially in California, and some are noted for the highly attractive flowers, *E. ficifolia* being well known for this attribute.

FREDERICK G. MEYER

Bonsai, Dwarfing Trees in the Modern Manner

Gladys Aske (Photography by Irene Haynes). St. Helena, California, 1962. (Library).

While the cultural information on bonsai is sparse, as is to be expected in a small paperback book, the photographs are enough to whet the appetite of the gardener who may be toying with the idea of trying something different.

The three photographs of ivies (*Hedera helix*) show the various forms into which the plants can be trained, and there are other examples of both deciduous and evergreen subjects.

F. P.-K.

Flowering Trees

R. B. Clark. D. Van Nostrand Company, Inc., 120 Alexander Street, Princeton, New Jersey, 1963. 240 pages. Illustrated. \$6.50. (Library).

This book is about hardy trees of small to medium height for cold-winter regions of the United States and that show conspicuous flowers. Where to buy, what to select for flower color, season and sequence of bloom (too often a neglected consideration), fragrance and color of flowers, and persistence, usefulness or hazards of fruits are discussed. This book can be a useful reference for northern cold-winter regions.

M. C.

Rubber. Botany, Production and Utilization

Loren G. Polhamus. John Wiley and Sons, Inc., Interscience Division, 440 Park Avenue, New York 16, New York, 1962. xviii + 449 pages. Illustrated. \$14.50. (Library).

Rubber as covered in this book includes not only *Hevea* or Para rubber but also other plants, such as guayule (*Parthenium*), *Cryptostegia*, kok-saghyz (*Taraxacum*), *Ficus*, and several others exploited from time to time as sources of crude rubber. While the technical part on production of rubber may be of less interest, the discussion on the botany of rubber producing plants stimulates interesting reading and provides for the uninitiated a wonderful background into the world of rubber.

FREDERICK G. MEYER

John Lyon, Nurseryman and Plant Hunter and His Journal, 1799-1814

Joseph and Nesta Ewan. Transactions of the American Philosophical Society, 104 South Fifth Street, Philadelphia, Pennsylvania. 1963. 70 pages. New Series, Vol. 53, Part 2. \$2.00. (Library).

John Lyon's journal covers his notes of ten trips he made north and south along the central and south Atlantic states and his business records of selling plants which he collected and his customers. At one time he was gardener for William Hamilton of Philadelphia who also later helped make it possible for him to do plant exploration. Still later, he made trips on his own account collecting plants for eventual shipment to England. Many of these he first grew in a nursery in Philadelphia. Lyon is credited with having introduced about 31 new plants into English gardens and collected others which were already in cultivation or had been introduced by other plant hunters. Several familiar plants were introduced by him which we know as *Pieris floribunda*, *Magnolia pyramidata*, *Dicentra eximia* and *Sanguinaria canadensis*. He was a hardy traveler and a good plantsman.

Gardeners interested in history and travel will find John Lyon's journal a pleasure to read, especially those who are familiar with the area in which he traveled.

CONRAD B. LINK

Flower Arrangements, Designs for Today

Helen van Pelt Wilson. D. Van Nostrand and Company, Inc., 120 Alexander Street, Princeton, New Jersey. 258 pages. Illustrated. \$5.95. (Library).

In this latest book of flower arranging published by Van Nostrand, Helen van Pelt Wilson presents the work of thirteen flower arrangers in the United States, Japan, and Canada.

The opening chapter explains some of the types of work shown through the photographs used in the book, the Interpretive, Romantic, Free Style, Abstract, and Avant-Garde.

A short biographical sketch heads up each chapter which contains full page black and white photographs with a descriptive paragraph facing the arrangement.

While not every design will appeal to every

reader, there is enough variety to make the book interesting to flower arrangers.

F P K

Flower Arrangement Through the Years

Patricia Esterbrook Roberts. The Viking Press, 625 Madison Avenue, New York 22, New York. 1963. 95 pages. Illustrated (in color and black and white). \$5.95. (Library).

The author has made flower arranging fairly simple for the busy homemaker who has neither the time nor the inclination to devote to the arrangement of flowers according to all the rules of art such as those done in competition and for Garden Club exhibits.

This book has many fine helpful suggestions for making arrangements including a very adequate list of flowers obtainable each month of the year. There are practical instructions on necessary tools and their use, proper containers, methods of conditioning flowers, and forcing branches. There are paragraphs on setting an interesting table including the flower arrangement. Also there are many ideas on tables and arrangements for special occasions.

To add to the beauty of the book there are 84 photographs, many of them in exquisite color.

M. W. L.

Cucurbits. Botany, Cultivation, Utilization

Thomas W. Whitaker and Glen N. Davis. John Wiley and Sons, Inc., Interscience Division, 440 Park Avenue, South, New York 16, New York. 1962. xii + 250 pages. Illustrated. \$11.50. (Library).

Cucurbits is a book about pumpkins, squashes, cucumbers, and gourds, their history and evolution. Ten chapters cover the geographic origin of cultivated species, the taxonomy of cultivars, culture and plant breeding. The authors have brought together a wonderfully clear account about a group of useful plants which are food staples in many parts of the world. The book makes elementary reading for all the horticulturally minded. The history of many of our food plants is practically a history of mankind itself, and for this reason the present book is important.

FREDERICK G. MEYER

The Gardeners' Pocketbook

Climbing Hydrangeas

Well known are the shrubby hydrangeas, especially *Hydrangea macrophylla* of Japan, the florist's Hydrangea with its many varieties and cultivars widely cultivated; *H. quercifolia*, our native Oakleaf Hydrangea and the splendid Chinese *H. sargentiana*, are cultivated to a lesser extent. Very few people are aware of climbing hydrangeas. Seldom are they found in home gardens. The plant fancier must visit botanical gardens and arboretums to see them thrive in cultivation.

"Climbing Hydrangea" is a collective group common name for climbers of the subfamily *Hydrangeoideae* of the large family Saxifragaceae (90 genera, ca. 750 spp.).

In our area the following should have a good chance to grow:

Decumaria barbara: Half-evergreen, climbing by aerial rootlets; leaves shiny vivid green of various shapes, 1-5 inches long, and 1/2-2 inches wide, entire or with a few prominent teeth on the upper third; inflorescence a corymb of pure white very showy small flowers. Collected by the writer in Louisiana, in West Feliciana parish. To Florida and north to Virginia. This plant is so little known, it does not have a vernacular name.

Decumaria sinensis: Scrambling climber, 15 ft. tall, half-evergreen; leaves to 3 1/2 inches long, lustrous green; flowers white in dense corymbs, fragrant; very outstanding. Central China.

Hydrangea serratifolia (*H. integririma*): A very rare plant in gardens. The leaves are evergreen, glossy, 2-5 inches long and 1-3 inches wide; flowers in terminal and axillary corymbs, creamy-yellow. Central Chile and adjacent Argentina.

Hydrangea petiolaris: The best known climbing hydrangea; leaves are deciduous, entire or serrate, lustrous green, 2-4 inches long, and 1-3 inches wide; corymbs large, and the marginal sterile flowers are very attractive. China and Japan.

Pileostegia viburnoides: A monotypic genus (1 species); leaves evergreen; flowers white. The outstanding feature of this climber is the large glossy leaves 4-7 inches long, and 1-3 inches wide with deeply impressed veins on the upper side. Seldom seen in cultivation, but grown in California*.

Schizophragma hydrangeoides: Deciduous coarsely dentate, roundish leaves 2-5 inches across with red petioles; corymbs over 8 inches in diameter with very showy white sepals on the marginal flowers.

Schizophragma integrifolium: Differs from the preceding in the entire or only slightly serrate thick textured leaves and by the much larger corymbs, to 12 inches across.

Climbing hydrangeas belong to the group of neglected plants in our area. Some, like *Hydrangea petiolaris* and *Schizophragma hydrangeoides* are offered by the trade; *Decumaria barbara* does occur in the trade, and as a native, it is hard to buy along the Gulf Coast.

This interesting group of climbers may be used to cover walls, wooden, and stone structures, and even as a decumbent bushy solitaire, in this instance without support planted in the ground or in containers. It is believed that with increasing interest in "outdoor living" these plants eventually will find their place in patios and gardens. Propagation by seed is somewhat complicated, since the seeds require stratification before planting. Vegetative propagation (cuttings) is fairly easy in the humid climate of the Gulf Coast; in dryer regions layering brings better results.

It may be of interest to the reader to know that the subfamily *Hydrangeoideae* does not occur outside Asia and the Americas, as if it had followed the prehistoric crossing of man from Asia to North America and to South America.—SIGMOND L. SOLYMOSEY, *University of Southwestern Louisiana, Lafayette, Louisiana*.

*See *Pileostegia viburnoides*, *The American Horticultural Magazine*, July, 1963.



W. H. HODGE

Ammocharis coranica

Showing attractive fan-like arrangement of arching leaves—a wild plant in Transvaal, S. Africa

Mr. Wolfe's *Ammocharis*

In the State and Columbia Record (Columbia, South Carolina, July 7, 1963) W. O. Freeland wrote in his column, "About Gardens," of finding an *Ammocharis* in bloom in Russell Wolfe's garden in Orangeburg. He said he noticed a clump of bluish green foliage, and when he looked closer he saw a short scape of about thirty flowers of a much-grayed red.

When I read this I thought of the *Ammocharis* that I had got from Mr. Wolfe a year ago, and realized that I had seen no sign of life since I planted the large, rough bulb on the 13th of June, 1962. I was not surprised, as *Ammocharis* is described as a greenhouse bulb, native to South Africa. South African bulbs are not likely to do well with me, and after last winter I should not expect anything of a tender nature to survive, especially as it had no protection. Then, on the 25th of July, I saw something red coming through the myrtle, and I realized it was in the spot where I had buried Mr. Wolfe's bulb; but there was no foliage. That came later, when the bloom was gone.

There were twenty-one flowers on the flat, four-inch scape, and as they came out a few at a time the umbel was never in perfection. The exact color of the flowers is not in Ridgway, but it is very near Pompeian Red, the wonderful faded tone of old frescoes. By evening they fade to almost white. I couldn't tell whether this is characteristic, or whether they got too much of the morning sun. The segments are reflexed and revolute at the tips. They are a quarter of an inch wide and an inch and three-quarters long. The umbel was seven inches across.

I think the leaves are the most beautiful and curious of any amaryllid I know. They are set in two open fans, facing each other, and are close to Ridgway's Grass Green, but they are glaucous and have a lovely silvery sheen. They are from three-quarters of an inch to two inches wide. Unfortunately, I cut the tips off before they came up, as I did not know they were there, so I don't know how long they would have been.

Mr. Morrison wrote that he bought two bulbs of *Ammocharis* from Mr.

Wolfe, and "planted one with the neck showing, and one with the bare tip of the bulb showing. Each grew last year, but foliage only. This year [1963] the third crop of leaves is ripening off (in July), but they have not bloomed. They have leaves that are two inches wide, and now often up to fourteen or eighteen inches long. They are shorter as they pass to the center. The leaves are not strictly in two ranks, but almost suggest a circle, though not completely." Now that I look again they do give the effect of a circle, and as they lean outward, I can see how the short scape that comes up from the side of the bulb would be almost, if not entirely hidden, if the flowers and leaves came at the same time.

Although Mr. Wolfe lists the bulb only as *Ammocharis*, and does not give a specific name, I took for granted that it is *A. falcata* because Weathers, in *The Bulb Book*, says that is the only species the genus contains. He says it is a native of Cape Colony and Natal, and is found at elevations of 5,000 feet, which would account for its hardiness here. He says the "sweet-scented bright red flowers are borne twenty to forty in an umbel on stout two-edged scapes, six to twelve inches long, springing up from the side of the bulbs."

Later, I looked in Mrs. Loudon's *Ladies Flower Garden of Ornamental Bulbous Plants*, and found that she describes two species, *A. falcata* W. Herb. and *A. coranica* W. Herb. She calls *A. falcata* the "sweet-smelling Brunswick lily," and says it has the fragrance of the lily-of-the-valley. Mr. Wolfe's *Ammocharis* doesn't smell at all like lily-of-the-valley to me, but has a very sweet and heavy fragrance that is not altogether pleasant. I was interested in her comments that the leaves are *sometimes* produced before the flowers. She quotes Herbert as saying that the bulbs require complete rest in winter, when they must not be watered. "They are exceedingly thirsty in summer, and if planted in light earth, and left for some time in the sun without water, the leaves will die back." The species of this genus are all half-hardy, Mrs. Loudon adds, and may be grown in the open air by planting the bulbs in February and taking them up as soon as the leaves wither.—ELIZABETH LAWRENCE, Charlotte, North Carolina.



COURTESY OF LADY COLLET

Eucryphia × *nymansensis* at Ballamanaugh, Sulby, Isle of Man

Eucryphia* × *nymansensis

Eucryphias are noteworthy ornamental evergreen trees confined in nature to the Southern Hemisphere. Two species, *E. cordifolia* and *E. glutinosa* (the latter practically deciduous), are found in Chile, while *E. lucida* comes from Tasmania, and *E. moorei* from New South Wales. Both of the Australian species are more tender than the Chilean species, which are hardy along the western coast of the United States south of San Francisco to British Columbia.

Eucryphia × *nymansensis* (*E. cordifolia* × *E. glutinosa*) is a natural hybrid which was found as a seedling at Nymans, a garden in Sussex, England in 1915. It combines many good features of both species and is more vigorous and precocious in bloom than either parent. The handsome, deep glossy green foliage is either simple or pinnate, where quite often the terminal leaflet is the largest, thus reflecting both parents. In England, 25 year-old specimens often are 40 feet high. The hybrid is more tolerant of neutral or alkaline soils, resembling the *E. cordifolia* parent.

The fragrant blooms come in August and September and consist of four broad, pure white overlapping petals forming a 2½ inch bowl centered by prominent yellow-anthered stamens. They are borne on the tips of the growth and the columnar trees become more prolific in bloom as they grow older.

E. × 'Mt. Usher' is a similar hybrid with reversed parentage, which may possibly be slightly better than the *E.* × *nymansensis* in bloom, but otherwise is very similar. One hybrid of value exists between *E. glutinosa* and *E. lucida* and this is called *E.* × *intermedia*. It again is a somewhat columnar, handsome evergreen with smaller flowers than the previous hybrids.

In the San Francisco Bay region there are a few specimens of what are presumably *E.* × *nymansensis*. The Blake Garden in Berkeley, now a part of the University of California, has a large free-flowering specimen 20 feet high, while the botanical garden of the University and the Strybing Arboretum in Golden Gate Park have smaller plants.

In California, the tree is definitely limited to growth near the influence of the sea and the foliage will burn in a dry wind. Scale is a serious problem here and conditions similar to those for rhododendrons are needed for good health.—FREDERICK W. COE, *Box 697, Ross, California.*

Two Allamandas of Garden Merit

Seeing *Allamanda cathartica* 'Hendersonii' blooming where it had naturalized, near Kanchepara, in the vicinity of Calcutta during World War II made an indelible impression. A resolution was made that some day I would have one of these plants with the wonderfully smooth, clear yellow flowers. Shortly after the war a brief article was read in the *Gardeners Chronicle* in which allamandas were extolled and *A. cathartica* 'Grandiflora' was singled out as "very desirable." It was further noted that *A. cathartica* 'Nobilis' is starred in Chittenden's, *Dictionary of Gardening*. These items were tucked away mentally for later reference.

When a glass house 15 x 18 feet was finally constructed several years ago,

the ten-foot roof was made high enough for all allamandas for which it was primarily erected. Procuring superior clones, however, was to prove a minor adventure.

Efforts to obtain them from Florida; Longwood Gardens; the Foster Gardens in Hawaii; in the Carribean; the U. S. D. A. Station in Puerto Rico; and the Imperial College of Agriculture, Trinidad, as well as from prominent English establishments, such as Stuart Low and Rochford and Sons, all proved futile. The fact that these plants were once common in English stove houses, and are now unobtainable makes one realize the great loss of plant treasures that has occurred with the disappearance of these great conservatories.

Inquiry at Kew revealed that if no other sources were found, the Curator, Mr. D. M. Campbell would supply me with cuttings, though it is generally against policy to supply plant material to private individuals. Naturally, I feel much gratitude to Mr. Campbell.

With cuttings of 'Nobilis' success was obtained with the initial efforts. Failure twice rewarded my efforts with 'Grandiflora'. Fumigation appeared to damage the tissue at the internodes. I then hoped that the Plant Introduction Section of the U. S. Department of Agriculture would undertake to establish this desirable clone, since it possesses the required quarantine facilities. Through the efforts of several, particularly B. Y. Morrison, a successful introduction of 'Grandiflora' has been possible.

With the coming of hot weather, my start of 'Grandiflora' was planted with much confidence in a large redwood tub, as had been done with the robust 'Nobilis'. The plant was lost because of over-planting. With a second plant haste will be made more slowly.

The writer of a note in the *Gardeners Chronicle* states that allamandas are "... robust growers except the very desirable *A. cathartica* var. *grandiflora* and that this variety is happiest when grafted on to *A. schottii* or *A. neriifolia*. The last named species provided an excellent stock upon which to graft any of its congeners..." As Mr. Campbell observes, however, it does not require to be grafted and roots readily from cuttings.

In Baines, *Greenhouse and Stove Plants*, 'Grandiflora' is rated as a "mag-

nificent sort with beautiful bright canary yellow flowers produced in large quantities. It is very distinct in habit, and a much weaker grower than all the others, smaller foliage, and is most suitable for growing as a pot specimen in which way it may with advantage be trained to sticks, a trellis being dispensed with."

A. cathartica 'Nobilis' on the other hand is a very vigorous plant. In a single year its roots completely filled a large redwood tub, two feet square and nineteen inches deep. It grew the full ten-foot height of the glasshouse, in spite of pinching and training the growths on an aluminum trellis. Most of the triangular area under the sloping roof was occupied. The mature stems are quite sturdy. The leaves are large, up to six inches in vigorous plants, with the upper surfaces shiny and yellowish green. The writer in *Gardeners Chronicle* says of the plant, "*Allamanda cathartica* var. *nobilis* a grand and very popular variety came from Brazil in 1876; the large golden flowers are tinted with a rather deeper shade at the throat and are of large full form." In Chittenden, where the plant is starred as an outstanding form, it is described as "bright-yellow without marking." I find the flower-tube does contain slightly reddish brown markings but these are not especially conspicuous. Certainly the flowers are much less marked than in 'Hendersonii'. Except for these light dotted streaks, the color is uniformly deep yellow.

While pruning maintains allamandas within bounds for pot culture, where space allows them to grow freely, they are most beguiling, as the scandent stems drape down from a roof with blossoms borne at the tips.

Here in California, rigorous trimming is performed on 'Nobilis' in late winter when an increase in light hours and greater warmth of the sun will stimulate growth. Allamandas require good light to bloom and revel in heat. Outside temperatures frequently go above 100° F., sometimes for ten days in succession, and the greenhouse door is propped open for cooling. Though the glass on the house is clear with shade provided by lath on the roof, no scorched leaves have been observed, even though the branches often grow directly against the glass.

Allamandas are reputed to be quite pest free, I have seen none, but since some other plants in the greenhouse support mites and mealy bugs, I fumigate with smoke pesticides that would kill any harmful insects on allamandas.

The soil used for allamandas is rather heavy loam mixed with exploded pumice (sponge-rock) for drainage. Several writers admonish to plant firmly. Cuttings root readily from new growth by tip cuttings or from cuttings of last year's wood.

Some inflorescences of 'Nobilis' carry ten flowers, each of which last several days so that flowering is prolonged. Plants flower from spring into autumn, and they are eminently suited for glass house culture.

The Baines book, published in 1898 during the heyday of warm house culture contains a detailed account of allamandas, much of which is now irrelevant because of modern greenhouse practices and new pesticides. It is nonetheless an interesting account for anyone concerned with hot house plants.—WILLIAM T. DRYSDALE, 4300 Isabella, Riverside 1, California.

A Perennial Marigold

Tagetes lucida, known here as Mexican Marigold, is a yellow-flowered perennial that makes a neat mound about two feet high.

In Houston it has been root hardy to 10° F. with its tops browning about the first of January. The narrow, opposite, oblong, lanceolate leaves have a strong scent resembling that of licorice. The small yellow flowers are borne in clusters at the ends of each shoot, here, in November.

In Mexico the plant is used to make a tea, as also in the lower Rio Grande Valley, and is credited by some as being an excellent nerve tonic. A Latin American visitor upon seeing the plant growing in Houston exclaimed that she would like leaves to make a tea for her daughter who was frightened by traffic on the freeway. She was so confident of its tranquilizing effects that she had planned to order it from relatives down on the Rio Grande. She knew it by the Spanish



IVAN N. ANDERSON

Tagetes lucida

name of Yervaniz. The leaves are used either green or dried. The tea tastes much like sassafras tea.

Tagetes lucida is easy to propagate by stem cuttings or division of the clumps. Probably seed would be just as easy.

Whether or not it is a nerve relaxer, may need careful investigation, but as a perennial that can "take" our worst summers, there is no doubt.

Mr. Morrison writes that the plant I sent him some years ago, is now a clump though not of ultimate dimensions and reminds me that the shoots are very erect in growth. His plant blooms a little earlier than ours, but he reports the same tolerance of heat and drought. The soil in his garden is sandy and the site he chose is one of the sunniest, hottest corners of his garden area, with no shade of any kind all day long, all season long.

The illustration with this note is from material that grew in the Morrison garden in Mississippi.—LYNN LOWREY, Route 8, Box 308 Houston, Texas.

The Anacacho Bauhinia

A species of *Bauhinia* or "Orchid Tree" found in southwest Texas is one of the rarest trees in the United States. It is also probably the hardiest of the known *Bauhinia* species.

Bauhinia congesta (*Casparia congesta*) is known in the U. S. only from Anacacho Hills near Brackettville, Texas. They are numerous in a small area about 25 yards wide along a rocky draw. The minimum winter temperature in Brackettville is close to that of Houston where the temperature rarely drops below 10° F. The plants in October 1961 showed no evidence of previous freeze-back, so it is likely they would not succumb in temperatures somewhat be-

low 10° F. The deciduous small trees (or large shrubs) are usually several trunked and may grow up to 12 feet high.

The leaves have the typical Pata Vaca or cow hoof appearance so convenient in identifying the bauhinias. In *B. congesta* the dark green leaves are cleft to the base making them bifoliate; they are about half the length of *B. purpurea*. The twigs are thornless.

The white flowers are borne profusely on short racemes in spring. While not large (about one inch across) they are showy because of their abundance.

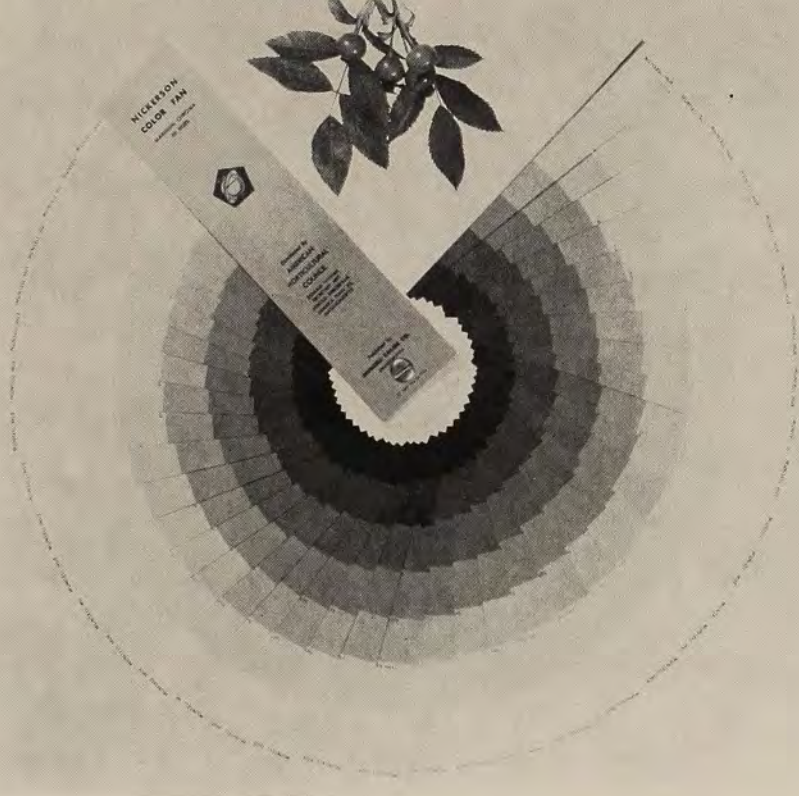
The seeds sprout readily when still quite green. When seeds are hard, germination may be spread over a period of several months if not treated or soaked. Softwood cuttings have rooted in less than 3 weeks.

One-year old seedling plants I have observed over the past two years in Houston have grown well and were unhurt in the severe winter of 1962-63.

There is one large specimen on the University of Texas campus in Austin. Small seedlings were coming up through Saint Augustine grass under it last summer.

Bauhinia congesta is also known from Coahuila, Mexico but it is logical to expect the Texas strain may be hardier. Since the Anacacho *Bauhinia* seems adapted to Houston's 45-inch rainfall (over double the 22 inches at Anacacho), it should have a chance in the southeastern states, at least in zone 9. It is an attractive plant in itself, but it may be a valuable parent in the production of cold hardy hybrids crossed with tropical species.

This plant is described in *Trees, Shrubs, and Woody Vines of the Southwest* by Robert A. Vines and in *The Legumes of Texas* by B. L. Turner. Both are books by the University of Texas Press.—LYNN LOWREY, Route 8, Box 308, Houston, Texas.



Nickerson Color Fan

The American Horticultural Society has been interested for many years in making available to the horticultural public a popularly priced color chart that could be used as a standard in all phases of horticulture. Accurate charts, in the past, have been too costly to publish at a moderate price.

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Nicotiana glauca