

different from those attacking herbaceous perennials. Therefore the nurseryman will have to deal with diseases different from those combatted by the florist. The plantsman growing annuals has still a different set on his plants. Bulb growers can expect quite different fungi to attack their crop. Here in Florida many tender foliage plants are grown under shade and play host to still another array of parasitic organisms.

The disease may be classified still further according to the parts of the plants attacked. To begin with there are the so-called damping-off diseases that attack seedlings and very young plants for the most part. They vary greatly in nature and control from the root rots of woody plants such as shrubs and trees. Those fungi which attack stems constitute another category altogether different. Leaf-spotting diseases are almost as numerous as the kinds of plants. Occasionally fungi attack blossoms and we have a very serious condition as with the azalea flower spot disease. We can add to these the mildews, powdery and downy, the rusts and all the virous diseases such as mosaic, rosette, etc. These are only the diseases caused by parasites. We have as well the physiogenic troubles due to the action of toxic chemicals, deficiencies of certain elements and the water-induced abnormalities.

Truly we have a complicated problem under discussion, one that reveals few of its ramifications in that common expression "diseases of ornamentals."

You may well ask what is being done about it. Dr. Magie has outlined some of the work that is going on at the Bradenton Station, work dealing with only some of the phases of the gladiolus disease problem. He was preceded by other pathologists in the same field. Camellia diseases are under investigation at the Main Station in Gainesville. Money is available for another man to work on diseases of ornamentals at Gainesville but so far no capable pathologist has been found to take the position.

Many of the diseases of our Florida plants have been studied elsewhere and control measures worked out. In some cases these can be adapted to Florida conditions, for instance, when the work was carried on in another Southern State. On many other diseases there is no published information in this or any other country. Moreover many of the newer fungicides may be more effective in certain cases than the old established bordeaux and similar sprays, but we don't know. With the organic fungicides, each individual case must be worked out. The job of learning how best or even how to control the diseases of ornamental plants in Florida is a large and important one. It will not be completed this year nor next.

"BULBOUS PLANTS ADAPTED TO FLORIDA"

By WYNDHAM HAYWARD
Winter Park

The growing of bulbs, tubers, tuberous-rooted and rhizomatous plants in Florida is one of the more or less neglected phases of ornamental horticulture in our wonderful "Sunshine State," and in the very beginning of my remarks I would like to say that I believe we are fifty years behind the times in that phase. To the regret of all sincere

flower lovers and plantsmen, the recent World War II has given it another serious setback.

The number of bulbs, tubers, cormous plants, etc., which may be grown successfully in Florida is legion, but only a few of these have come to the front as important commercial items, as gladiolus, the calla lilies, Polyanthus Narcissus, hybrid Amaryllis, Fancy Leaved Caladiums, Easter Lilies, Hemerocallis, Gloriosas, and a few others.

The growing of bulbs in private and public gardens is on a greatly restricted scale. Certain bulbs, as the Dutch Iris, an important winter florists' flower, both in the North and South, are grown commercially in Florida to some extent from imported bulbs, these coming either from the Pacific Northwest or Holland.

Bulbs have a long and honorable history in Florida, mostly unwritten, and much of it lost to horticultural annals. The widespread occurrence of various exotic *Crinum*s in the city and country over the state, especially in old gardens, plantations and estates, indicates an appreciation of these giants of the bulb family which must date back centuries, probably to early Spanish times. The large numbers of such species as *Crinum Asiaticum*, *Crinum Amabile*, *Crinum Zeylanicum* and other "milk and wine" types of the genus, which are largely natives of Southeast Asia, the East Indies and the Pacific Islands, tends to show a horticultural connection with the Far East which must have been established many years ago, certainly in sailing ship times. It is entirely possible, of course, that these bulbs came to Florida as a secondary stage in their introduction into the Western Hemisphere, possibly from gardens in the Philippines, West Indies (Spanish and British islands) and from Mexico and other parts of Latin America.

Of bulbs commonly growing in Florida today, I would consider the *Crinum*s as having the longest apparent pedigree as residents of our state. Next, perhaps were certain *Amaryllid*s, introduced from the West Indies and Latin America, as the *Amaryllis* species, *Zephyranthes*, *Hymenocallis*, the lovely Japanese *Lycoris radiata* or "red spider lily," and the equally lovely and rare *Lycoris aurea*. *Lycoris radiata* (masqueraded as *Nerine Sarniensis* for many decades in North and West Florida gardens. Also the Easter Lily, which came in years ago from Japan doubtless by way of Bermuda, and certain tazetta types of *Narcissus* and jonquils, still found growing in a nat-

uralized condition on old plantations in North and West Florida.

There are bulb mysteries in Florida gardens. The *Lycoris aurea*, or Golden Hurricane Lily, found sparsely in old gardens around St. Augustine, is an utterly charming thing and one of the world's most beautiful flowers. There have been explanations offered for its presence there, but it seems likely that the story goes back to Spanish times. Some 12 or 15 years ago a planting of several hundred *Haemanthus multiflorus*, or East African Blood Lily, was discovered at Eustis, in negro yards. These must have multiplied over a period of more than 50 years or so. *H. multiflorus* is one of horticulture's most showy and spectacular bulb flowers. It is at home in Florida, and occasionally found as a pot plant over the state. It is considered too choice ordinarily to grow in the ground. The bulbs are worth five dollars apiece at this time. The explanation supplied by the original negro owners was that "grandma got a bulb off a sailor in St. Augustine" many years before. That is an excellent and plausible explanation.

There is a new species of white *Zephyranthes* which Dr. H. Harold Hume, noted Florida horticulturist and a leading bulb expert, found in a garden at Key West a few years ago. It has since been located in gardens on the West Coast near St. Petersburg. He has named it *Z. insularum*, and it is a real addition to our Florida bulb gardens, a lovely white-flowered spring-blooming species, of easy culture. It fills a need with the *Zephyranthes* collectors.

These examples show the romance which may be found in searching over old gardens and country places in Florida for such bulb finds. There are others still awaiting the searcher, without doubt. In the cities, the front porches and backyards of negro homes in the older sections will reveal many surprises in bulbs and other rare plants.

The modern phase of bulb growing in Florida may be said to date from the arrival

of the late Dr. Henry Nehrling in Orange county back in the 80's. At that time the late Theodore L. Mead was settling in Lake county and later at Oviedo, now in Seminole county, a few miles southeast of Sanford. Dr. Nehrling brought with him an intense horticultural interest in *Amaryllis* and many other bulbs and tubers among other things. His enthusiasm may well have induced Mr. Mead to take up various bulb cultures, in which they both figure largely in the horticultural history of the state.

In his little monograph "Die *Amaryllis*," published in Germany in 1909, and which regrettably has never appeared in English translation up to this time, Dr. Nehrling told of seeing various *Amaryllis* species and hybrids in numerous gardens on his way South from Jacksonville to Orlando on his first trip to Central Florida in 1886. He moved to Florida a few years later permanently, and undertook serious experiments and the commercial growing of *Amaryllis*, Fancy-Leaved *Caladiums* and other bulbs and tubers at his Gotha gardens. According to his own writings, he imported the choicest stock available from Europe and elsewhere to aid him in his hybridizing experiments.

A single bulb of the Nehrling *Amaryllis*, which Dr. Nehrling gave him at Gotha on a visit, was T. L. Mead's start in the growing of the hybrid *Amaryllis*, according to Mr. Mead's own story to me more than 15 years ago. His commercial planting of the bulbs was disseminated widely over Florida and the lower South so that the Mead strain is now the principal trade strain of these gorgeous bulbs in America. Mr. Mead said that when that one bulb came into bloom, he wrote to Dr. Nehrling at Gotha (in those days the two communities were a day's travel apart) and asked him for pollen of other good *Amaryllis* flowers to use on his plant. Dr. Nehrling sent the pollen, and Mr. Mead raised some 180 seedling bulbs from the result. That was the start of the Mead strain, now a rather meaningless word, as little effort has been taken in

recent years to maintain a high standard quality of flowers in commercial plantings.

There are a number of native bulbs, tubers, etc., in Florida, interesting for ornamental use in the garden, but few of commercial value. Among those we can mention various *Hymenocallis*, *Canna flaccida*, *Crinum Americanum*, and the *Zephyranthes* species, *Z. Atamasco*, found in North and West Florida, *Z. Treatiae*, native of Central and Northeast Florida, and *Z. Simpsoni*, a distinct species found in lower Florida. These are all white in color, fading to pinkish. They are natives of low, flatwoods or rather swampy locations, and occasionally are seen in bloom in large numbers along roadsides after spring fires have swept the fields.

They can be grown in pots with care, or in beds of sandy loam soil in a lath house with good results. With the writer they have bloomed for a decade in high hammock soil under lath shade. Types of the *Z. Atamasco* from around Tallahassee are among the largest flowered of the entire genus, with blooms up to four inches across. These *Zephyranthes* bloom in early spring. They are tiny bulbs an inch or so in diameter at best, with slender green or glaucous linear leaves, and bearing their small flowers on 6 to 12 inch stems. There are dozens of other species of *Zephyranthes* and closely related small-flowering *Amaryllids* in Texas, the West Indies and all through Latin America, including *Cooperia*, *Habranthus*, etc. Most of these are to be recommended for Florida bulb gardens, with the exception of the Texas *Zephyranthes* species, and they are possible with extra care.

Especially recommended are *Z. grandiflora*, the common large pink Rain Lily or Fairy Lily of front porches and gardens, *Z. rosea*, a tiny rose-pink jewel, *Z. insularum*, spring-blooming white, *Z. citrina*, the best yellow, *Z. Ajax*, a straw-colored hybrid, *Z. candidum*, late white, and *Habranthus robustus*, beautiful lavender and white from Argentina, formerly considered a *Zephyranthes*. The *Cooperias*, — Drum-

mondii, pedunculata, Smalli and Traubi, all are worth trying in Florida. These miniature bulbs take the place in Florida of the Crocus and similar small bulbous items in Northern Gardens. They will reward the grower with a maximum of delicate and dainty beauty for a modicum of care and attention. I grow them in flats, for the most part, using a sandy loam soil with one-fifth part well rotted cow manure, and providing good drainage. They like part shade.

Under Dr. Nehrling's and Mr. Mead's efforts, Florida became the great source of Fancy Leaved Caladiums for the nation's florists trade in the early decades of the 20th century. Their work began half a century ago. Fancy leaved caladiums are not a new bulb, but were exhibited at the Philadelphia Centennial Exposition in 1876 and at the World's Fair in Chicago in 1892. The Mead and Nehrling varieties have dominated the trade for many years. Other hybridizers in Brazil and Europe have produced a large number of varieties, and some work is still going on with this bulb in breeding at this time, but the two pioneer Florida breeders left comparatively little for their successors to do. Of course, Nehrling and Mead used parent stock of the best kinds then available. Foreign-originated varieties have not stood the test of time so well in the American trade. Only this season I received a price list of Fancy Leaved Caladium varieties from a firm in India offering, among others, a number of the Nehrling and Mead varieties.

Unfortunately the trade nomenclature of fancy leaved caladiums is badly confused, a number of varieties being offered under several names and various other kinds having been given new names by ignorant or unscrupulous growers, so that the situation is hopeless and aggravating except in the case of a few kinds.

Fancy Leaved Caladiums, like the gladiolus, calla lillies, hybrid Amaryllis, Polyanthus Narcissus and Easter Lilies, are among the few bulbs and tubers now grown

commercially on an acreage basis in Florida. They are popular pot and tub plants and widely used for bedding over the state, and the Lower South generally. They are growing steadily in popular demand in the florists trade in the North, where thousands of the tubers are sold and forced annually for colorful foliage plants. There is now a trade for the shipment of started bulbs in small pots from Florida.

The caladium requires a rich, peaty or mucky soil, or heavily manured location on higher land, to be at its best, with abundant water. On rich land, the bed should be well drained but moist. The root knot nematode is the worst enemy in sandy soils. It is possible that the new soil fumigants and nemacides will make it possible to grow the tubers under ordinary lath house conditions with greater success and facility. In commercial plantings on rich soil, they are usually grown in the open air.

The gladiolus is too well known over Florida to require more than the statement that it is one of our most dependable and useful cormous plants for the home garden and commercial growers of cut flowers. It is cultivated by the hundreds of acres for shipping north and local sales. Regretfully it may be said that there has been a serious lack of worthy effort in breeding of new varieties adapted to Florida conditions, especially suited to this climate, and originated in the state, but this matter is receiving some attention at this time from the state experiment station authorities, I understand. There is also little effort to grow the bulbs for sale as bulbs. Possibly the costs are excessive in Florida for this kind of culture on a large scale, as the best bulbs are grown without cutting the blooms for sale.

Florida needs, urgently, a state experiment station project on the growing of commercial bulbs, beyond what is now being done in the field of Gladiolus and the inspection of various crops like Gladiolus, Narcissus, hybrid Amaryllis, Easter Lilies, etc. We need further competent experimentation

in the breeding and culture of choice commercial types of hybrid *Amaryllis*, *Narcissus*, *Calla* lilies, Easter Lilies, etc. In most of these we are growing the same old stock and using the same old methods of 30, 40 and 50 years ago.

The Easter Lily has thrived for decades in Florida. In the country fields there is the *Lilium Catesbaei*, a rather delicate thing, but which may be seen in thousands on a favorable late summer afternoon over the flatwoods country. So it cannot be said that Florida is not a "lily country." The common Easter Lily is too erratic and usually too tall for current florist use. Certain strains may grow five to seven feet tall, and others bloom with many flowers on a short stem. Possibly some of the lilies now being developed on the West Coast, as the Croft, Estate or Ace strains might prove of value in Florida for breeding or commercial growing. Some progress is being made in the control of mosaic, "fleck" and other diseases, but the situation remains discouraging.

We don't know enough about hybrid *Amaryllis*, which also has great possibilities as a florist item beyond its present place. The bulbs are currently cultivated like potatoes, solely for size, regardless of the quality of the blooms. A glance at a dozen imported Dutch type hybrid *Amaryllis* bulbs in bloom would show the average Florida grower what is wrong with his *Amaryllis* stock in a large degree. The time will come when the Florida grower will have to provide flower quality as well as large and vigorous bulbs. The average selection of types found in the Mead strain today would be a laughing stock in competition with displays of imported greenhouse *Amaryllis* at any major show. The Dutch growers are accomplishing something in the way of seedling *Amaryllis* coming true to color, too.

It has long been my humble opinion that the state experiment station would serve the growers of Florida most effectively by the establishment of a department of ornamental horticulture and floriculture, which

would take the lead, among other things, in the research and discovery of new material and methods along the line of bulbous plants, etc. I hope that sufficient pressure will be forthcoming from the horticultural interests of the state to bring this important advance into reality before too many years. Then Florida will begin to catch up.

There are numerous bulbs, tubers, etc., which are not raised commercially in Florida but which produce satisfactory results for one or more seasons in gardens over the state. Among them we would mention the De Caen strain of *Anemone coronaria*, or Poppy Anemones. These succeed in winter in a well-drained sandy loam, fertile, but not richly manured. *Ranunculus* often do well for one season. *Ornithogalum arabicum*, the Giant Star of Bethlehem, will do well for years if lifted over summer. It has beautiful umbels of white flowers.

The *Gloriosa*, on the other hand, is entirely at home in Florida, so much so that after once growing it in a garden, it is practically impossible to eradicate it. Both species, *Rothschildiana* and *G. superba* are excellent, the former being more showy and effective. It will bloom at any time of the year, while *G. superba* blooms only in late summer customarily. The *Gloriosas* were introduced by Dr. Nehrling years ago. They are bulb vines, and climb by tendrils on the tips of the leaves. *G. Rothschildiana* is being raised at this time for cut flowers, shipped by air to the north. The tubers are L- or V-shaped and grow well in any light, loamy, sandy soil, well drained and preferably upland. On low land they are subject to rots.

The *Polyanthus Narcissus* are very familiar, of course, including the Paper White, Grand Soleil d'Or, Grand Monarque, Chinese Sacred Lily, etc. These have been grown for years in Florida by the acre, perhaps less now than 15 or 20 years ago, when there was a "boom" in "Paper Whites" which was promoted largely on a speculative plane. This will long be remembered with unease by certain growers.

These Narcissus like a rich, fertile soil such as is used for white potatoes. They will do fairly well in gardens in any good, well manured land.

Freesias will grow and bloom in Florida so well that they might become a weed if it were not for the limiting factor of the root knot nematode, to which they are particularly susceptible. They like a light, sandy soil with some moisture. In Iris, we have native species for water gardens in Florida, including the spectacular *Iris tripetala* and *I. savannarum* and occasional rare color types. Many of the rainbow shades of the Louisiana iris, recently described by Dr. John K. Small, are effective in waterside plantings in Florida. The so-called German and Japanese iris are not a success over the peninsula.

The Dutch Iris, horticultural types derived from bulbous species native to the Western Mediterranean region, are excellent for cut flower and garden use in Florida, but the bulbs do not last more than one or two seasons, as a rule, succumbing to rots in the hot weeks of late spring before maturing properly. Even when lifted in spring, there is usually a large loss, but the bulbs are inexpensive and their beauty so outstanding that they are well worth trying year after year. The pretty *Allium Neapolitanum* behaves similarly, as do many other charming bulbous subjects from the Mediterranean and African areas.

The white callas, *Zantedeschia aethiopica*, and its semi-dwarf variety, the Godfrey Calla, are handsome and valuable in Florida for the home garden and for commercial flower planting. They are winter and spring blooming, and usually "come back" quickly after a freeze. The Godfrey is most popular in Florida, while the larger *aethiopica* type is more commonly grown in California. The Godfrey is largely grown in Florida for shipping of the flowers.

The yellow (*Z. elliottiana*) and pink (*Z. rehmanni*) callas are showy and effective plants for winter gardens for a season. The bulbs are difficult to hold over.

The *Hemerocallis* or daylily, which is as well known as any tuberous plant, and has recently been enjoying a tremendous increase of popularity nationally as well as in Florida, and it succeeds admirably in Florida, especially the more or less evergreen types. The state experiment station has an important breeding project on this plant, and Florida may be said to have been one of the leading centers of daylily breeding and research in the past 15 years. Prominent among leading workers with this flower have been T. L. Mead, Dr. H. Harold Hume, Prof. E. L. Lord, Prof. John Watkins, Ralph Wheeler, Dr. H. P. Traub and others. The Jacksonville Garden club has contributed materially to its promotion as a fine garden plant in Florida, and our own Lakemont Gardens have produced a few varieties which have met with considerable popular flavor.

Lachenalia, *Alstroemeria*, *Hedychium*, various *Zingibers*, *Agapanthus*, *Moraea*, *Oxalis*, *Belemcanda*, *Sauromatum*, *Achimenes*, *Gloxinia*, *Gesnera*, *Amorphophallus*, *Alpinia*, *Cypella*, *Curcuma*, *Ixia*, *Leucojum*, *Eucharis*, *Marica*, *Hymenocallis*, *Watsonia*, *Leucocoryne*, *Clivia*, *Kaempferia*, *Cannas*, etc., are other subjects to be mentioned in this connection as well worth growing in Florida. As the result of personal experience or the experimentation of other growers in Florida known to us, these can all be recommended for trial. Some of them will need coddling, while others will last for years with little care. In particular I would point to the *Crinum*s and the *Crinum* hybrids as easy bulbs for the garden with abundant blooming rewards for little care and trouble. Many of them are handsome foliage specimens, too.

One of the significant events in the bulb history of Florida was the organization by four plantmen at Orlando in 1933 of the American *Amaryllis* Society, now the American Plant Life Society, which has published a succession of yearbooks under the name "Herbertia" which contain valuable and informative material on various bulbous

Amaryllids and the Hemerocallis or Day-lily, under the editorship of Dr. Hamilton P. Traub, now with the U. S. Department of Agriculture, in Washington, D. C. This Society has had considerable success in stimulating enthusiasm for the field of bulbous plants.

One of the fascinating facts of bulb culture and experimentation in Florida is the seemingly endless list of new material which

we are anxious to obtain and test for Florida conditions. There is always so much to look forward to seeing and so much work to be done that it keeps one on the alert continually. Never a dull moment. I wish to thank you, Mr. Chairman, for the opportunity to say something in behalf of my favorite subject, and to express to you, ladies and gentlemen, my sincere appreciation for your kind attention.

THE DISEASE FACTOR IN EASTER LILY BULB PRODUCTION IN FLORIDA

HOWARD B. JOHNSON
Sebring.

Commercial Easter Lily plantings are found in widely separated locations in Florida ranging from Perry in the north to Homestead in the south. However, the largest concentration of plantings is found in the Lake Placid area where acid muck and climatic conditions are generally adapted for the culture of Easter Lilies.

In the past, practically every grower in the area was interested in bulb production rather than the sale of flowers. The commercial bulbs, six inches or larger in circumference, grown in Florida provided the northern greenhouse operators with a large part of their forcing stock. During the war years, with Japanese bulbs off the market, the financial return to the grower was considerable. In good years gross incomes of five to six thousand dollars per acre for commercial bulbs only were common.

The Easter Lily is quite resistant to man-made hazards of cultivation practices. Unfortunately, however, the lily is not resistant to necrotic fleck and other virus diseases.

Necrotic fleck¹ is described by Brierly and Smith as a complex disease, the result of two viruses being present in the plant at the same time. One is apparently limited to

Easter Lilies and is completely symptomless when present alone. The other virus is the common cucumber-mosaic virus. Neither of these viruses injures Easter Lilies materially when present alone but the two in combination produce necrotic fleck. The melon and green peach aphids are responsible for the field spread of the disease.

Necrotic fleck made its appearance in the Lake Placid area in the 1943-44 season. It apparently came in on planting stock from outside the area. Because of their concentration in a relatively small area all fields were affected to some extent within two years after the introduction of the disease. Careful roguing kept the visual infection to a low percentage in most cases. However, late season infections, which are not noticeable until the following growing season, resulted in a carry-over of the disease in the planting stock for the 1946-47 crop year.

This initial source of infection, present in practically every Easter Lily field in Lake Placid and wherever Lake Placid planting stock had been carried, set the stage for a most disastrous year. Summer-like weather, continuing until the freeze

¹BRIERLEY, PHILLIP, AND SMITH, FLOYD F. Spread of Fleck Disease. *Florist Review* 96 (2491): Aug. 23, 1943. *Florist Exch.* 105 (11):16 Sept. 15, 1945.