pattern of a branch with leaves show on the background to the side of the subject . . . or above the subject . . .

Other things can be used for interesting shadow patterns . . . such as lattice or screens . . . round or square subjects casting a shadow on the background can be used effectively for many subjects . . .

Many of the colorful plastic dishes found in our dime stores can be used for fruits, leaves or flowers . . . One item I have found useful is a set of dishes shown in the photos and slides of the tamarind fruit and the Bixa orellana or lipstick tree . . . These dishes are red, green or clear and measure 4½ x 6 . . . and large blotters are used underneath . . . The set-up of dishes and fruit are tilted by placing an object such as a book underneath . . . and the camera is pointed down at a slight angle . . . You can change the color of the dishes by placing one upon another . . . Then if you have a green fruit . . . you can use a red dish . . . or vice versa . . . or you can use a clear color dish on a colored blottie . . . There are many color effects obtainable by just experimenting with different colored blotters, cardboards . . . or colored dishes . . . and props . . .

BREEDING GLADIOLUS FOR DISEASE RESISTANCE

ROBERT O. MAGIE

Florida Agricultural Experiment Stations
Gulf Coast Experiment Station
Bradenton

Fungus diseases are estimated to have destroyed in one year about two million dollars' worth of gladiolus flowers and corms in Florida. The Fusarium disease of corms, caused by F. oxysporum f. gladioli Sny. and Han., accounted for over three-quarters of this loss. The remainder of this loss was due to diseases of the leaf and flower. These diseases caused by Curvularia lunata (Wak.) Boed., Botrytis gladiolorum Timm., and Stemphylium spp., usually can be controlled by spraying the plants with zineb or nabam. The cost of controlling diseases of the leaves and flowers and the poor control of Fusarium corm rot by chemical treatment make it highly desirable to develop disease-resistant varieties. The problem is to develop resistant varieties adaptable to winter production of cut flowers and tolerant to long-distance shipping.

In many cases a cut-flower grower must make a choice between a good commercial variety which is susceptible to Fusarium corm rot and one that is resistant but not as suitable for the market. In too many instances the choice is made in favor of varieties whose flowers are inferior in quality but which appear to be more profitable to grow because of disease resistance.

The unsatisfactory control of the Fusarium disease by chemical treatment of corms has been due to the fact that the fungus is carried in the vascular tissue of the corms and is transferred to the new corm crop in spite of treatment. There is no known method of detecting latent infections of corms and cormels. Until a chemotherapeutic agent is found which will kill the fungus without injuring the corm, breeding for disease resistance will continue to be the most promising method of control.

Next to Fusarium in importance is the Botrytis disease which attacks flowers, corms, and leaves in cool moist weather. The flowers of all varieties appear to be susceptible. However, the leaves of a few varieties show good resistance. This disease is controlled satisfactorily by frequent spraying but, during prolonged periods of rainy weather, adequate control by spraying may be impractical. Botrytis is especially serious because the fungus may spread from a few infected flowers causing an entire hamper of spikes to rot in transit and storage.

The other two major fungus diseases of gladiolus in Florida are Stemphylium leaf spot, and Curvularia spot of leaves and flowers. Some varieties are highly resistant to either or both of these and no difficulty is experienced ordinarily in breeding varieties with good resistance to them.

The Fusarium and Botrytis diseases are so destructive and difficult to control that one of the most important research problems is to develop resistant varieties. During the past six years, hundreds of varieties have been tested for disease resistance. Results indicate that none are immune to either disease. However, it is not expected that a lack of immunity
in existing varieties will hamper the breeding program materially. Factors for immunity may be found in some of the hundred or more wild species of gladiolus.

A search for immunity in wild species is planned. Meanwhile, a breeding program, using the most resistant varieties, is under way because the degree of disease control obtained with these varieties usually is satisfactory. There is always a chance that some seedlings from these resistant varieties will be just as resistant as their more resistant parent, and resistance possibly will be higher than that of either parent. Although the prospect of finding resistance to Botrytis in the flower petals is practically nil, it is possible to control the disease satisfactorily in Florida by growing only varieties that have resistant leaves. In Florida the disease usually becomes established on the leaves before the flower spike develops. Exposure of the spike to primary infection is relatively short because the flowers are harvested about ten days after the spike appears. Primary infection is seldom serious. With no leaf infection to serve as a source of secondary infection, Botrytis disease could be economically controlled in Florida.

A program of inbreeding or selfing of selected varieties is a very helpful method of developing varieties with resistance to disease and better horticultural characters. As far as known, this method has not been used previously with gladiolus. While selfing for several generations, the resulting seedlings will be selected with the idea of preserving only desirable characters. Suitable crossing of gladiolus inbreds, as in breeding hybrid corn, is expected to result in good disease resistance as well as hybrid vigor. The possibilities of developing better varieties by inbreeding are improved because such elusive traits as a pure color, shipping qualities, heat resistance, and Botrytis resistance may be attained through this procedure.

Maternal inheritance may also be a factor in obtaining highly desired qualities such as disease resistance in new varieties. Reciprocal crosses, using each variety as seed parent and again as pollen parent, should be made to avoid possible loss of sex-linked characters and those inherited only through the seed parent.

In a breeding program for disease resistance, it is desirable to eliminate susceptible seedlings as soon as detected. However, experience has shown that inoculations with Curvularia and Botrytis must be delayed until the seedling leaves are mature because young leaves are very susceptible, even in seedlings that would develop an excellent degree of resistance when grown from corms or cormels. Practically all resistant seedlings would be eliminated by too early inoculation. Early inoculation with Fusarium also is considered undesirable because the fungus may become established in corm stocks of resistant varieties. Resistant varieties infested with Fusarium contaminate the soil with the fungus. Such contamination should be avoided if possible. To avoid the danger of infesting the seedling corm and all future corm stocks grown from it, tests for Fusarium resistance should not be made until extra corms have been propagated for the test and these should be destroyed after the test.

In contrast to the extreme susceptibility of young leaf tissue to Curvularia and Botrytis diseases, leaves become more susceptible to Stemphylium disease as they mature. Susceptibility to these three diseases may be determined by spore inoculations made during the fifth month after emergence of the seedlings. To prevent loss of valuable seedlings before their resistance is developed, zineb spray is applied every week or oftener, depending on the weather and proximity of infected plants. Spraying is continued until the middle of the fourth month, after which the plants are allowed to develop the diseases without further application of fungicides.

Hundreds of people in this country are breeding gladiolus, but very little is being done in the South. Outstandingly better varieties for growing in Florida and for shipping possibly may not be developed until extensive breeding work is carried out in this section. The reason is two-fold: (1) varieties grown here in the winter must be relatively non-sensitive to day length, and (2) disease expression in northern states is not the same as in Florida. Varieties that produce most abundantly in the long summer days of northern states are often worthless for winter growing in the South.

In carrying out a breeding program, one should have in mind all of the desirable traits to be incorporated in new varieties. A composite picture of these might be called the "dream flower" or the perfect gladiolus. Besides immunity to the various diseases, the per-
fect gladiolus would have a better color and a more beautiful floret than comparable existing varieties; it would grow vigorously with average culture and be adaptable to short or long days and to hot or cool weather. The spike would have a strong straight stem and be able to open all of its florets from tight buds, after being harvested. The size and color of florets opened from tight bud would compare favorably with the field-opened florets.

Spikes harvested in tight bud would be capable of holding enough florets open to make a symmetrical flower head and a beautiful showing. The flower would be able to withstand rough handling in transit and in packaging. These attributes of the perfect gladiolus for commercial growing in Florida could apply to large or small-flowered varieties with florets of various shapes and colors.

THE BEAUTIES OF NATURE IN THE FAIRCHILD TROPICAL GARDEN

LUCITA H. WAIT
Coconut Grove

How fortunate we are, in that nature is so full of beauty! Do you recall that little passage in Edna Ferber's novel, "So Big," where the city girl is being driven in a buckboard through the country for the first time? She asks the driver what the plants are, growing in a field they are passing; he tells her they are cabbages, and she exclaims: "How beautiful they are!" The old countryman throws back his head, laughing heartily, and tells everyone he meets: "She says cabbages is beautiful!"

It has been said that beauty is in the eye of the beholder. I wonder, though, how we would feel if we looked up at the sky, or out across the water, and instead of a soft restful blue we saw muddy brown? What if all leaves of all the trees were dark red, and flowers, instead of the exquisite forms and colors we know so well, were formless masses of dirty gray? Would our eyes, unaccustomed to anything else, find them beautiful? Somehow, I feel that they would not, and that our lives would surely be greatly impoverished.

On the other hand, the educated eye is able to see and appreciate much that the casual observer might never notice. As our knowledge grows, we can see differences of form, texture, color; we marvel at nature's clever devices for the reproduction of certain plants; we look with more appreciation at an endless pageant; no lifetime will begin to be long enough for us to know and enjoy it all.

Take, for example, the Cannon-ball tree, *Couroupita guianensis*. In the first place, it does not produce its flowers at the ends of the branches, as most plants do; separate flower stems strike out from the trunk itself, growing longer each year, with new buds constantly appearing, and new flowers opening every morning. The blossom, like a large single rose, combines shades of gold, pink, white and lavender in subtle fashion, and gives off a delicate perfume. More unusual, it has two kinds of pollen, carried on two different types of anthers. Then come the odd fruits, looking much like old, rusty cannon balls, from which comes the tree's common name. A close study of this plant uncovers many other interesting features.

In the Fairchild Tropical Garden there are numbers of plants of equal interest. Our Garden has as its purpose the bringing from far-flung warm areas of the world the choicest plants, of the greatest ornamental value. These are carefully planted, either set out on our eighty-three acres or placed in the greenhouses, brought to maturity, and displayed for the pleasure and education of our visitors. Now that it has passed its thirteenth year, many new and beautiful plants are blooming and fruiting in the Garden, some, perhaps, for the very first time in North America.

Our landscape architects have had the unusual experience of planning an artistic garden from the very beginning. As I study the voluminous records of the early days I am much impressed with the amount of serious thought which was given to deciding what the objectives of the Garden would be, and how those objectives could best be carried out. Here is a short résumé of the problems and their solution:

"It was decided that this should be a garden for the display and study of truly tropical