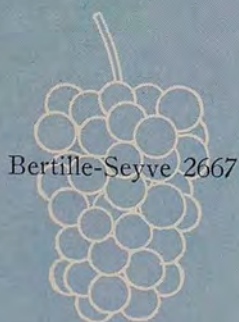
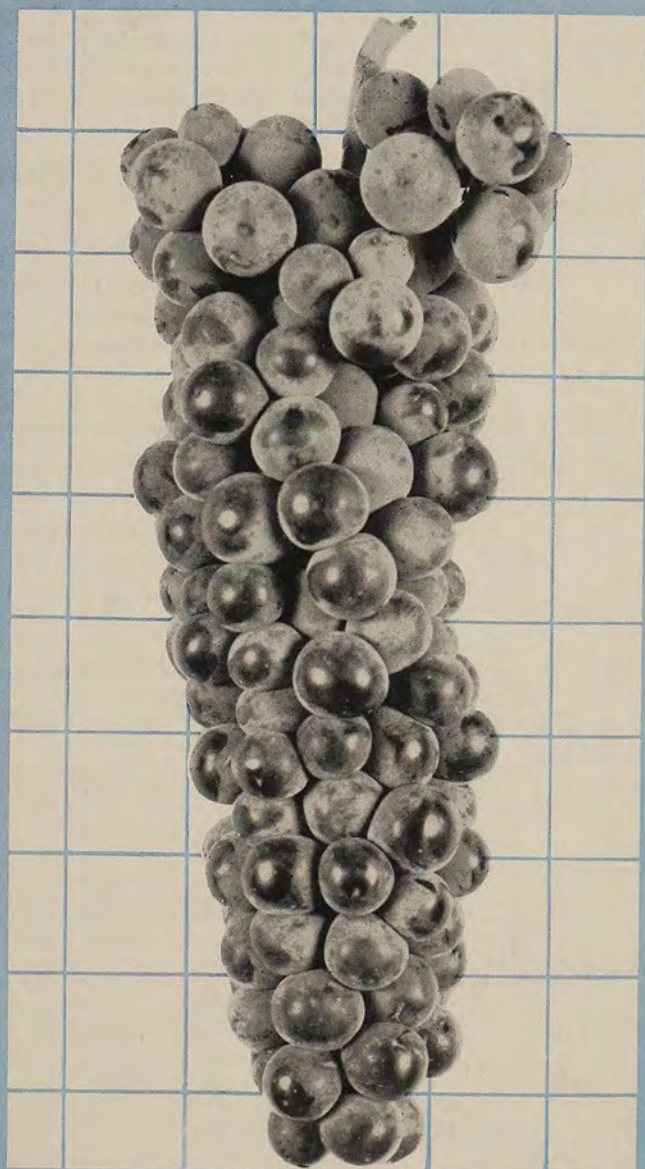


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THE NATIONAL
MAGAZINE



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The National Horticultural Magazine

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Original papers increasing the historical, varietal, and cultural knowledges of plant materials of economic and aesthetic importance are most welcomed and will be published as promptly as possible. Material of lasting interest appearing in related journals will be reprinted as available. Publications received for the Library will be reviewed and made available to members after publication of the reviews. These books are designated "Library" following the prices in the book reviews. Reviews of private collections will also be accepted and published. These books, however, are not available for loan to members of the Society.

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Bodger Seeds, Ltd.

[See page 149]

Cosmos 'Radiance'.

New Strains of Cosmos

Cruise to Scottish Gardens

DR.¹ AND MRS. J. M. COWAN

For the Cruise to Scottish Gardens which began on May 7th the T.S.S. "Lady Killarney" carried about 180 passengers, some 45 of whom had embarked the day before at Liverpool. Of the rest about equal numbers came by buses from Edinburgh and from Glasgow and in their own cars to embark at Ardrossan on the Ayrshire coast.

A great attraction on the first day was the Cruise's own miniature Rhododendron Show on board, of many excellent specimens which had been brought for the occasion by the Earl of Stair, Sir George Campbell of Succoth, Mr. Michael Noble and Colonel Horlick. Perhaps the most outstanding of these was a magnificent truss of *R. Lindleyi* which seemed to perfume the whole lounge. The exhibit was much admired and in the evening short talks were given about it and questions answered.

Having rounded the Mull of Kintyre and passed through the Sound of Islay, the ship anchored off the Island of Colonsay on the first evening at about 10 p.m. Some invited guests disembarked in a launch to spend the night at Kiloran with Lord and Lady Strathcona. Early next morning the remaining passengers went ashore and all the Island's transport came into action to con-

vey them two-and-a-half miles to the house—a jeep, a Land Rover, the estate shooting brake, a fleet of old Glasgow taxis, the school bus and some private cars.

The house is a very beautiful one of simple dignified architecture, harled in a lovely pale shade of pink, with a loggia on one side of it, where refreshments were served for the whole party. In front of the house is a fine terraced lawn and on it are two large specimens of *Rhododendron ponticum* which were planted by King Edward VII and Queen Alexandra to commemorate their visit to Colonsay in 1902, during their West Highland tour in the Royal Yacht.

The present Lord Strathcona inherited the property in 1926, but it was not until his return from India in 1930 that he was able to begin the extension and development of the gardens which before that time consisted mainly of the kitchen garden and the formal garden surrounding the house.

Although the climate of the Island is mild and the average annual rainfall only about 47.5 inches, fierce Atlantic gales sweep across it, often laden with salt spray, so that, in planning a garden there, the first consideration had to be given to the planting of shelter. Fortunately in the last century many hardwood trees and much *Rhododendron*

¹Royal Botanic Garden, Edinburgh. Manuscript transmitted after the 1953 Cruise.



Colonsay House, showing terraced lawn in front.

ponticum had been planted and these provided some protection, but the systematic planting of shelter belts was not really begun until 1929-30. These consist mainly of Sitka Spruce, Larch, *Pinus insignis* and *Cupressus macrocarpa*, but there are also protective hedges of *Griselinia littoralis*, *Olearia macrodonta* and Escallonias, and some shelter is provided by many other rather tender shrubs such as *Tricuspidaria lanceolata* and *Desfontainea spinosa*.

Part of the Sino Valley, Colonsay.



The garden is situated in a hollow and this tempers a little the force of the gales, but other serious threats from which it has not been possible to provide much protection are rabbits and sheep. Consequently it was, at first, mainly Rhododendrons that were planted and many of these came from Lady Strathcona's father, the late G. W. E. Loder (later 1st Lord Wakehurst), and the late F. R. S. Balfour of Dawyck, outstanding ones being, as one would expect, many magnificent specimens of different forms of *R. Loderi* and its hybrids and of most of the big-leaved Rhododendrons, especially *R. sino-grande*, *R. Falconeri* and *R. 'Elsae'*. In fact a small valley in the wood, which was only planted from 1937 onwards, has so many large and well-grown specimens of *R. sino-grande* that it has been called the "Sino Valley." In it, as well as those already mentioned, were flourishing specimens of *R. arizelum*, *R. fictolactum*, *R. Macabeanum*, *R. Hodgsoni* and *R. basilicum*.

There is also a winter garden well planted with groups of the small early-flowering Rhododendrons and *Hamamelis mollis* which must make a lovely show in the beginning of the year, when the garden seldom experiences more than ten degrees of frost.

In the kitchen garden shrubbery we saw many other interesting plants including large Echiums, *Notospartium Carmichaeliae*, *Dacrydium Franklinii*, *Myrsine africana*, *Osmanthus Delavayi*, *Myrtus Luma* and species of *Drimys* and *Pittosporum*. Most of these have come from Scilly, the gift of Colonel Arthur Dorrien-Smith, D.S.O., and are doing quite well, though some of the rarer and more tender ones from the same source did not survive. Two relics from earlier days, before 1930, were *Dracaena* and *Chamaerops*.

In another sheltered spot it was a particular delight to see an unusually tall *Embothrium lanceolatum* glowing with a profusion of scarlet flowers and near it a large tree of *Prunus serrulata tibetica* was most attractive with the sun shining on its very glossy trunk. Several Magnolias have grown well, but *Magnolia Campbelli*, though 20 feet high, has not yet flowered.

The time allowed us was all too short for more than a cursory glance at the unique and interesting features of this beautiful garden, but it was some compensation to be taken back to the jetty at Scalasaig by a longer route which enabled us to see most entrancing views of a lovely bay and of the crofts and machair on the Island as well as a glimpse of the small Island of Oronsay to the south of Colonsay.

In the afternoon we sailed northward through the Sound of Mull, passing Ardornish Castle and Tobermory, the capital of Mull, and then round the rocks of Ardnamurchan Point, the most westerly point on the mainland of Scotland, and through the narrows of the Sound of Sleat to anchor after dark near Kyle of Lochalsh.

Next day we had a morning of almost unbelievable beauty, sailing in brilliant sunshine past the magnificent Torridon Mountains on the mainland and, on our other side, the Cuillins of Skye, with their rugged peaks still speckled with snow.

At mid-day we dropped anchor in Loch Ewe and after lunch were ferried ashore in a motor fishing vessel and the ship's boats, to be present at the ceremony in which Lady Elphinstone, on behalf of the National Trust for Scotland, formally accepted from Mrs. Mairi T. Sawyer the magnificent gift of Inverewe garden. Besides ourselves there were many other visitors who had come by car to witness the ceremony and it was a moving experience to hear the impressive speeches made by Lady Elphinstone, Lord Wemyss and Mrs. Sawyer. Lady Elphinstone spoke very warmly of this garden "unique in Nature's response to the thought and care lavished upon it. A place which was almost once a bare rock." Lord Wemyss pointed out that this was the first property accepted by the National Trust for Scotland purely on its merits as a garden and it was fitting that the Trust's first Gardens Cruise should have come to their first garden property. Mrs. Sawyer regretted that this should be the year for the ceremony just after the garden had suffered such severe damage as it had not experienced in the last 40 years. No less than 262 very large trees had been

blown down by the gales last winter and all the leaves ripped off a great many Rhododendrons. A wide strip of the garden seemed to be almost laid bare and it was a most distressing sight, but fortunately other parts had not suffered so severely and the amazing thing to anyone seeing the garden for the first time was not that so much damage had been done by the recent gales, but that so many rare and tender plants had survived and indeed had ever been coaxed into growing in so exposed a situation.

As at Colonsay, of course, the most urgent need, when planting was begun in 1865 by Mrs. Sawyer's father, Mr. Osgood Mackenzie, was for windbreaks and yet more windbreaks, but Inverewe, being on a narrow peninsula, had one advantage over Colonsay in that rabbits and deer could be almost completely excluded by running fences right across the peninsula.

But this garden is so well known and the National Trust for Scotland has published such an excellent illustrated guide to it, written by Mrs. Sawyer herself, that there is no need to enumerate again the impressive list of rare treasures to be found there. Some of these, however, one can never forget—the great variety of Rhododendrons interspersed with the shining white trunks of specially selected silver birches, the large New Zealand tree ferns, *Dicksonia antarctica* and, perhaps most unforgettable of all, the large bed of *Myosotidium nobile*—the giant forget-me-not from the Chatham Islands off New Zealand—with its huge glossy leaves and large clusters of brilliant blue flowers.

Mrs. Sawyer's kindness and highland hospitality were so great that she even entertained us all at a most delightful tea in her house and in a marquee, and it was a happy ending to the day that she herself and other guests dined on board at the invitation of Captain Wright.

On Sunday morning the "Lady Killarney" sailed again in perfect weather back to Kyle of Lochalsh and up Loch Duich where we had an impressive view of the Five Sisters of Kintail, magnificent peaks on the Kintail estate which now belongs to the National

Trust for Scotland. Later we continued our return journey as far as Tobermory where we anchored in the bay for the night, having arrived too late to go ashore. In the afternoon, as if the most beautiful scenery in Western Scotland was not entertainment enough for us, a large crowd who gathered in bright sunshine on the foredeck had the additional pleasure of hearing an interesting informal talk by Mr. R. D. Trotter on the discovery and introduction of different tulips, anemones and snowdrops into Britain. To many of his audience it was exciting news that they could have snowdrops flowering in their gardens all the winter if they planted the different species which he enumerated and described.

In the evening Lord Wemyss gave a short talk on the National Trust for Scotland, and Lady Elphinstone on the activities of its Gardens Committee of which she is convener. A film of some of the Trust's properties was shown, followed by one taken by Mr. E. H. M. Cox, of Inverewe, Crathes, Bodnant and other gardens.

Next day our first visit was to Iona, passing on the way there close enough to Staffa to have an excellent view of Fingal's cave with its basaltic columns, but in order to land on Iona we had to travel over two miles in small boats and for this journey we were thankful for the continued fine weather. Dr. George Macleod conducted a tour round Iona Cathedral, then came aboard with us and after lunch, as we proceeded, gave an interesting address on the history of Iona, expanding the earlier remarks he had made in the Cathedral.

At about 4 p.m. we anchored in Loch Melfort and were soon ashore visiting the beautiful garden of Sir Bruce and Lady Campbell at Arduaine, a house for which a superb situation had been chosen, overlooking the lovely sea loch. In the garden we were impressed by the shrub and herbaceous borders with their great variety of rare plants, the Primula-lined stream and pond and the Woodland garden where we found a very large collection of Rhododendrons many of them tender and only to be seen in the most sheltered gardens. A very fine plant

of *R. Griffithianum*, 24 feet in height, was in full bloom, but a particularly large *R. giganteum*, famous for being the first of this species to flower in Britain in 1937, had chosen this year to have a rest, though it had flowered many times since the first. However, a large *R. Falconeri* was flowering profusely and also some good hybrids such as 'Penjerrick' and 'Dawn's Delight' and a number of "Stonefield Seedlings," particularly interesting because they were self-sown offspring of some of the famous Hooker Rhododendrons growing at Stonefield. A special feature of the Arduaine garden is a number of very large plants of *R. zeylanicum* grown from seed brought home from Ceylon by Sir Bruce Campbell's father, and there is also an excellent *R. sino-grande*.

We remained at anchor in Melfort Bay until the morning and were privileged to have Sir Bruce and Lady Campbell on board for dinner, as the Captain's guests.

The following day we sailed south through the Sound of Jura. We passed the Island of Gigha owned by Colonel Horlick, who was on the Cruise, and rounded the Mull of Kintyre. Some excitement was added to our previously calm sailing by the blowing of an easterly gale which reached some considerable force by the time we arrived at Brodick at about 4:30 in the afternoon. However, not even the most elderly of the passengers were deterred from braving the rigors of the rough sea going ashore in the small ship's boats and of an even more adventurous return journey, but we all realized that to have missed seeing the wonderful garden of Castle Brodick would indeed have been a major tragedy. Buses met the boats and took the passengers to the Castle where they were most graciously received by the Duke and Duchess of Montrose.

The company was divided into four groups, the first to come ashore being labelled "energetic" and we began by climbing a small hill about a mile from the Castle to look down on a veritable forest of *R. giganteum* and other big-leaved Rhododendrons growing to perfection in a sheltered hollow. We then returned to the Castle and encountered the other groups who had started

in different directions but had not gone so far afield, one group beginning with the interior of the castle and its perfect old furniture and interesting collections of antiques of many kinds from all over the world.

The Castle stands high above the sea and faces south, the slopes below it being clothed with conifers, beeches and other common hardwood trees of magnificent stature, beneath whose shelter grow an unsurpassed collection of *Rhododendrons* and other shrubs and trees, too numerous to mention here, which are too tender to grow out of doors in any less favoured garden. These included *R. Dalhousiae*, *R. Lindleyi*, with its very fragrant flowers, Kingdon Ward's *R. Macabeaeanum*, a good yellow form of this species which earlier had been covered with flowers, *R. bauhiniiflorum*, another discovery of Kingdon Ward's with yellow flowers belonging to the *Triflorum* series, *R. exasperatum* with its large, rounded, copper-tinged leaves and bristling petioles, a big clump of *R. Johnstoneanum*, one of the *Maddenii* series, with white, scented flowers and, closely related to it, *R. Taggianum*. The rare *R. Kyawi* has flowered several times, and *R. magnificum*, Kingdon Ward's so-called 'mystery plant,' flowered here for the first time in Britain. Special mention should also be made of a large tree of *Acacia melanoxylon* which was smothered in white balls of flowers, and a particularly good specimen of *Menziesia lasiocalyx* flowering profusely.

On the slope just below the front of the Castle huge masses of *Azaleas* of every hue, which in some gardens are almost overpowering in their unrelieved brilliance, had their perfect setting with a background of tall and sombre trees.

Among smaller plants worthy of note were the giant *Lobelia gibberoa* from Kenya, a clump of unusually tall *Lilium auratum* and the gesneraceous *Asteranthera ovata*, with its red flowers and prostrate habit, covering some 20 square feet of perpendicular rock in a moist spot. In the water garden *Primulas* and *Irises* of every kind grew in great profusion and the wall round the formal garden was gaily dotted with patches of the purplish-pink flowers of *Erinus alpinus*,



Inverewe, part of rock garden with a tall Cordyline.

called the Roman Wall Plant because it was supposed to have been introduced to this country by the Romans.

It seemed unbelievable that most of this dream garden had been planned and planted by the Duchess within the last 30 years and it was hard to tear ourselves away after so short a visit, but the Captain, with an eye on the worsening weather, was anxious to see us all safely aboard again and to move to

Inverewe, looking towards the head of the bay.





Ardnaine House

a more sheltered spot for the night. The visit of the Duchess and some of her guests to the "Lady Killarney" for dinner had, unfortunately, to be cancelled and, indeed, it was none too easy for us to climb up the companion ladder on to the ship, even when our boats were once more alongside after a severe tossing.

To ensure a quiet night, we crossed to the shelter of the Ayrshire coast and the enter-

Ardnaine, showing the shrub and herbaceous border, looking towards the wild garden.



tainment for our last evening on board was a symposium, with questions, on plants of good garden merit, consisting of a series of interesting 5-minute addresses. Lady Moore described so well the merits of *Viburnum grandiflorum*, *Ribes laurifolia* and *Rodgersia pinnata superba* that everyone not fortunate enough to have them already was longing to make good the omission. Mr. Slinger inspired us with a desire to have a heath garden with a succession of flowers the whole year round, beginning in January with *Erica carnea* 'Winter Beauty' and 'Rose Pink' and finishing in December with *E. carnea* 'King George,' after ringing the changes with others which he enumerated.

Lady Burnett of Leys, who must have found it difficult to select favourites from her variety at Crathes Castle, spoke first about the showy *Senecio Clivorum* 'Othello' with bronzy leaves and brownish yellow flowers, which seeds itself so freely that she is inclined to regard it almost as a tiresome weed. Her other selections were the Ligtu and Chilean hybrids of *Alstroemeria*, the roots of which she told us should be planted deep and the flowering would then be good in the third year; *Staphylea holocarpa rosea*, one of the most beautiful shrubs flourishing in her garden, and *Anchusa myosotidifolium*. Miss Field of Quarry Wood, with her wide experience of Lily growing, gave a most instructive talk on their cultivation, emphasizing the need for drainage and describing the signs and symptoms of the virus diseases to which they are subject and how to avoid them. Mr. Balfour Gourlay talked about the unusual Mexican genus *Puya* and of his finding and introducing of *P. Berteroniana* which is grown so successfully by Colonel Dorrien-Smith at Tresco in the Scilly Isles. Mrs. Philip Hart from Portland, U.S.A., spoke of natives of her country which we are able to grow here, *Iris Douglasiana*, *I. innominata*, and *Erythroniums*. Mr. R. D. Trotter of Flithity, Inverness-shire, gave a particularly useful and interesting talk on Crocuses and Cyclamens, Dutch Crocuses derived from *C. vernus*, *Crocus aureus* yellow with three green veins, *C. speciosus* which starts flowering in September and continues for 6 weeks, *C. nudiflorus*, *C. chrysanthus*, *C. laevigatus*, which

fortunately mice cannot eat, and *C. Tomasianus*, *Cyclamen neapolitanum*, whose roots grow from the top of the "bulb," *C. europaeum* and *C. coum*.

On the last morning we sailed towards Tarbert on Loch Fyne where we had hoped to land in order to see the famous garden of Stonefield Castle, which is now a hotel, with its unique collection of Himalayan Rhododendrons, many of them raised from seed collected by Sir Joseph Hooker about 1850. But when we approached the shore it was too rough to anchor and land the whole party in safety, so that Stonefield was viewed only from a distance and there was nothing for it but to make our own way back to Ardrossan where for most of us the Cruise ended at about 3:30 p.m., a few continuing on to Liverpool and disembarking next day.

From the start of the Cruise the happy atmosphere and warm friendliness of the company had become more and more apparent, but it could hardly have been otherwise amongst garden lovers, many of whom

were already known to each other from previous tours and for whose enjoyment so many things were contributing this time, brilliant weather, superb scenery, gardens of unique beauty and interest where much gracious hospitality was lavished upon them. But it must not be forgotten that the Cruise owed its great success most of all to the many weeks of careful and imaginative thought and arduous labour that had been put into the planning and organising of it, the very high standard of which was only in keeping with what we who know the National Trust for Scotland and its Gardens Committee have learned to expect from its administrators. We must remember, too, how much was done for our comfort and the smooth running of our numerous activities by the kindly and ready co-operation of Captain Wright and the courtesy and efficiency of the whole crew of the "Lady Killarney." As we reluctantly parted, I am sure we all hoped we were saying "au revoir" and not "goodbye" to the "Lady Killarney" and the many friends with whom we had travelled.

A Hardy Eucalyptus

H. H. FISHER

For a genus as large as *Eucalyptus*, consisting of over 600 species, there is not a very wide range in hardiness among its species as compared with a genus like *Ilex* or *Quercus*. Although the eucalypts are mostly tropical to subtropical, Bailey's *Standard Cyclopaedia of Horticulture* describes eleven species as being frost resistant. Five of these supposedly tolerate minimum temperatures of 20° to 15°F. W. J. Bean in *Trees and Shrubs Hardy in the British Isles* discusses only the four species that survive to some extent in Great Britain, while Alfred Rehder's *Manual of Cultivated Trees and Shrubs*

describes but one species, *E. gunnii* Hook. f., and to that he attributes doubtful hardiness in his Zone VII. From a limited review of the literature, it appears to this writer that the hardiness range of the eucalypts is not fully known. The eighty-five species in the Boyce Thompson Southwestern Arboretum in Arizona and the forty-seven species in the Lux Garden, administered by the Los Angeles State and County Arboretum, are two of the larger collections in this country, but neither suffers temperatures low enough to eliminate all of the species.



Plants of *Eucalyptus niphophila* showing the curved stem and bushy habit.

At the U.S. Plant Introduction Garden, Chico, California, fifty-six species are growing. Table I lists the twenty-four most frost-resistant ones of that collection, together with their reaction to minimum temperatures of 12° and 17°F. It may be observed that *E. camaldulensis*, *E. dives*, *E. macarthuri*, *E. nicholii*, and *E. viminalis* showed little or no injury at 12° F. This might indicate that they would be able to withstand even lower temperatures. *Eucalyptus microcarpa*, however, which showed only slight damage at 17° temperature, suffered severely at 12°. It would appear from this that 17° is about the limit of its hardiness. *Eucalyptus gunnii* and *E. trabutii* showed no ill effects at 17° but were slightly injured at 12°. The critical temperature

for the last two species may lie in the 12° to 17° range.

In the summer of 1939 seeds of a eucalypt were sent to this country presumably for the first time. This was *E. niphophila* Maiden & Blakely, the Snow Gum. These seeds were assigned P.I. No. 134073, but the introduction did not become established. Another unsuccessful attempt was made in June 1944. Three years later a packet of seed of this same species was received from Canberra, Australia, and assigned P.I. No. 159215. These seeds produced plants at the U. S. Plant Introduction Garden, Glenn Dale, Maryland.

Except for the fact that *E. niphophila* was a species new to this country, it attracted little attention. According to

W. F. Blakely, *A Key to the Eucalypts*, however, the Snow Gum forms the limit of tree vegetation on Mt. Kosciusko, southwest of Canberra near the Victorian border at 6500 feet altitude, and is strictly alpine in its environment. There it reportedly flowers profusely from December to February.

In *Eucalypts for Planting* (FAO Forestry and Forest Products Studies No. 11. Columbia University Press. September 1955), a list of *Eucalyptus* species is arranged in order of decreasing resistance to cold. At the head of the list is *E. niphophila*, recorded as resistant to -8°F. at Charlotte Pass, Australia. The question was raised, could this species be hardier than any of the others now in this country?

In 1949 plants of P.I. No. 159215 were planted outdoors at Glenn Dale. They are still growing and have endured temperatures as low as -1°F. with several exposures to 7°F. Injury from these temperatures seems to be limited to the tips of the branches and a little leaf burning. This is true, however, of many young plants that tend to improve in resistance to cold as they mature.

The Snow Gum is depicted in Figure 29 of *Eucalypts for Planting* as a tree 25 feet high and spreading 50 feet with many crooked trunks. This is in its native state on Mt. Kosciusko and appears to be a rather old specimen. Blakely *A Key to the Eucalypts* agrees with the illustration by describing the plant as a small, crooked alpine tree or mallee, 3 to 20 feet high, with smooth, white, deciduous bark. At Glenn Dale only juvenile growth has been observed. Here the plant retains its shrubby habit, as shown in the accompanying illustration. The bluish, leathery, evergreen foliage widely spaced on yellow stems should provide an interesting contrast for the usual greens in the background plantings. Although climates more rigorous than that of Maryland may prove too severe, *E. niphophila* should find a place in the gardens of the milder southeastern states.

The main handicap, as with all eucalypts, is that propagation is limited to seeds.

Under stimulus of these observations, arrangements were made to have more seeds of the Snow Gum collected at Mt. Kosciusko and sent to this Section in August 1954. Plants from these seeds (P.I. No. 220246) are growing at the Garden and plans have been made to test further their hardiness.

TABLE I.—Cold-Resistant Eucalypti at U.S. Plant Introduction Garden, Chico, California.

| Species | Temperature ($^{\circ}\text{F.}$) ¹ | Injury |
|----------------------|---|---------------------------------|
| <i>algeriensis</i> | 12 | slight (leaves and branch tips) |
| <i>amygdalina</i> | 17 | slight |
| <i>angulosa</i> | 17 | slight |
| <i>baueriana</i> | 12 | slight |
| <i>botryoides</i> | 17 | slight |
| <i>camaldulensis</i> | 17 | none (little leaf browning) |
| <i>camaldulensis</i> | 12 | slight |
| <i>cinerea</i> | 17 | none |
| <i>coccifera</i> | 17 | none |
| <i>dives</i> | 12 | none |
| <i>exserta</i> | 17 | none |
| <i>gunnii</i> | 12 | slight |
| <i>gunnii</i> | 17 | none |
| <i>haemastoma</i> | 17 | none |
| <i>leucoxylon</i> | 17 | moderate (on leaf surface) |
| <i>macarthuri</i> | 12 | none |
| <i>melanphloia</i> | 17 | none |
| <i>microcarpa</i> | 12 | severe |
| <i>microcarpa</i> | 17 | slight |
| <i>nicholii</i> | 12 | none |
| <i>numerosa</i> | 12 | slight |
| <i>pauciflora</i> | 17 | none |
| <i>redunca</i> | 17 | slight |
| <i>rubida</i> | 17 | none |
| <i>stuartiana</i> | 17 | none |
| <i>trabutii</i> | 12 | slight |
| <i>trabutii</i> | 17 | none |
| <i>viminalis</i> | 12 | none |

¹On January 12, 1937, 12°F. was recorded and on January 11, 1949, 17°F. was recorded. January 1937, was the coldest and had the most snow in the history of that station (since 1905).

The French Hybrid Grapes

H. C. BARRETT¹

In the past several years a relatively "new" class of grape varieties has come to the attention of fruit growers and gardeners. This "new" class of grape varieties owes its origin to the plant breeders of France, who, by their persistent and diligent efforts, have created a new race of grapes with many distinctive characters not found elsewhere in the grape family. In their country of origin, France, these grape varieties are known collectively as *les hybrides producteurs directs* (the hybrid direct producers), but in North America they are known as the French hybrids to differentiate them from the American hybrid or bunch grape varieties so widely grown in eastern North America.

Because the French hybrids are new to the gardeners and fruit growers of this country and because most of these grape varieties have been grown for only a few years even in the test plantings of Experiment Station vineyards, it is believed that a bit of information on their origin and the most promising varieties for this country would be helpful to those who may wish to grow some of these grape varieties. The great majority of these varieties have been grown in North America only since the end of World War II and a very few of the older varieties have been grown in Experiment Station vineyards since around 1904. Aside from these few earlier varieties less than a decade has passed in time to evaluate their behavior and adaptability to our climatic conditions. This period of time is probably of too short duration for an adequate test under all of the varied conditions encountered, but it has served to indicate that some of these varieties are promising and worthy of wider testing. Fewer still are the promising varieties which appear to have distinctive commercial possibilities, but this in itself should cause no concern for the amateur horticulturist, the

gardener or the plantsman who wishes to explore some of the surprises that the world of grapes has to offer for his or her pleasure and enjoyment.

History and Origin

To understand why the French hybrids came into existence and the background for their development in France, one has to go back to the blackest days in French viticulture when the scourge of phylloxera, downy mildew, oidium (powdery mildew) and black rot were plaguing the French vineyardists and threatening to exterminate vine growing in France, then as now, the greatest grape-growing country in the world. Phylloxera, caused by a tiny root louse, *Phylloxera vastatrix*, attacked the root system of the highly susceptible French vinifera varieties and by their puncturing of the root cells to suck out the plant juices progressively caused the decline in growth and vigor until death of the plant resulted. This minute insect pest and the damage it caused was sufficient in itself to ruin the vineyards except in certain areas unfavorable to its attack—but to add to the misery and despair of the growers came still other pests to attack the above-ground portions of the vine.

Downy mildew caused the complete loss of the blossom clusters and fruit, depending upon the season of infection. The leaves were destroyed by this fungus which produced spores by the millions for fresh infections until the vines stood bare long before autumn frost. Oidium or powdery mildew caused cracking of the berries so that they shrivelled and rotted, while black rot destroyed the fruit and blossom clusters leaving for the vineyardist nothing but rotted berries and shrivelled mummies.

All of these pests came originally from North America, probably upon wild or cultivated American grape varieties that had been imported to Europe at different

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times by botanists, plant collectors and other students of plants.

The whole situation appeared hopeless as nothing was known about these pests beyond their botanical or entomological classification in the case of phylloxera. Quite by accident, Millardet, one of the greatest French viticulturists and scientists, observed that vines along a roadside, sprayed and smeared with an evil-appearing mixture of copper sulphate and lime by a vineyardist to discourage passersby from eating the fruit, were remarkably free of downy mildew despite severe damage to the unsprayed vines. Here, then, was a preventive treatment for downy mildew, the worst of the introduced fungus diseases. Powdery mildew yielded to dusting with sulphur and black rot yielded to the evil-appearing mixture of copper sulphate and lime discovered by Millardet. Today we are all familiar with this mixture, the universally known Bordeaux mixture, named after the region near Bordeaux, France, where Millardet first made that historic discovery.

Other observant viticulturists in France noticed that some of the wild American grape species and a few of the cultivated American varieties either suffered no visible damage from phylloxera or resisted its action for longer periods of time than the susceptible vinifera varieties, and thus the first clue to combatting phylloxera appeared. By grafting the French varieties on the roots of the resistant American vines, the damage caused by phylloxera was averted and the French vineyards were rapidly reconstituted on resistant root stocks.

All of this was well and good and the world owes France a great deal for solving a series of problems that were of great economic importance, but all of these sprays and grafting techniques added to the cost of growing grapes. Other French viticulturists, thinking ahead of the present, looked about for an answer to these problems that would not require the great amount of money, labor, and equipment

needed to spray and graft grapes. The answer lay in the ways and laws of Nature. For thousands of years the wild grapes of North America were hosts to their parasites, these various fungus diseases and the root louse, phylloxera. Throughout this long period of evolution, those grape vines which resisted their attackers survived and in turn begot offspring which were subjected to this same vigorous selection of the fit and the rejection and subsequent death of the unfit—the susceptible types. The vinifera varieties, on the other hand, had evolved in Europe and southwestern Asia without this selection for resistance because these diseases and phylloxera were not present in the Old World until introduced into Europe in the nineteenth century by Europeans.

At first the French viticulturists imported all of the cultivated American grape varieties in the hope that some of these would be satisfactory for table and wine production, but it became apparent after a few years that none of these was equal to the French vinifera varieties in the qualities desired. Furthermore, the majority of these American varieties were either selections of *Vitis labrusca* or hybrids between *V. labrusca* and *V. vinifera*. Unfortunately, *V. labrusca* was native to a portion of North America where the climate and particularly the soil were unfavorable for phylloxera and consequently this grape species was only slightly better in resistance to the insect than *V. vinifera*. Combining species of little or no resistance to this insect produced offspring of comparable resistance and, when grown in areas favorable to phylloxera such as central and southern France, the vines quickly died or became sickly and unthrifty. The resistance of *V. labrusca* to fungus diseases varied from very poor to fairly good and, when combined with *V. vinifera*, gave offspring that were intermediate in resistance, that is, a little better than the susceptible vinifera parent but less resistant than the labrusca parent. In addition, the "foxy" flavor of the labrusca ancestor produced a wine that was highly disagreeable to European

palates. Likewise, the tough, pulpy flesh and "foxy" flavor of the fresh fruit was a very poor substitute for the fine, crisp, tender flesh of the vinifera table varieties with their refined, delicate flavors. The labrusca varieties and their hybrids possessed size of berry, lacked resistance to phylloxera and fungus diseases, but were especially deficient in quality.

There existed many other wild American grape species which did have very high resistance to phylloxera and the fungus diseases, did not possess the extremely disagreeable "foxy" taste and aroma, but did lack the berry size of *V. labrusca* and *V. vinifera*. More important than the lack of size, however, was the superior resistance of their hybrids with vinifera as compared with the labrusca and vinifera hybrids.

The French vineyardists after careful study and testing largely abandoned the labrusca types and their hybrids and began to study the other native American grape species with intense interest. Great quantities of wild grape seeds and propagating wood were sent to France by nurseries, plant collectors, travelers and others in this country as well as by French plant collectors who came over to North America for that purpose. The major effort in this collecting activity occurred in the lower Mississippi valley, especially in Texas, Indian Territory (now Oklahoma), Missouri, Arkansas, and Illinois, because in this region more wild grape species grew in abundance and the diseases and pests of grapes were most prevalent and destructive in North America. A wide difference in soil types and extremes of climate further insured the greatest possible diversity of forms within the various species for study and testing.

While it is true that the primary reason for collecting wild American grape species was to discover forms better adapted to the soils in certain areas of France and with better affinities for the vinifera scion varieties, there also existed a considerable interest in hybridizing these wild types with the vinifera varieties to produce

producteurs directes (direct producers). This term "direct producer" is used in France to designate a variety grown on its own roots or direct in contrast with a grafted vine in which the scion or fruit-producing portion of the vine is grown on a rootstock or *porte greffe* (graft bearer).

With this background of the state of viticulture in France as it existed in the late 70's and early 80's, one can understand why Eugene Contassot and many of his countrymen were interested in American vines. In 1882 M. Contassot, an amateur viticulturist in the town of Aubenas, France, received a shipment of grape cuttings from a grape collector in Neosho, Missouri. This collector was Herman Jaeger, an amateur grape breeder and collector who searched the area of southwestern Missouri, eastern Oklahoma, northwestern Arkansas and northeastern Texas for the best specimens of wild grapes for use in his breeding experiments. Jaeger made his selections from the thousands of wild grape vines that grew in this area, took cuttings from these selections or moved the original vines to his grounds near Neosho, where he studied them for their disease resistance and other characters of horticultural value. A few of these selections he used in his breeding work, the main objective being the production of varieties derived from pure wild species which would resist the diseases so prevalent and destructive to cultivated American grape varieties in the area where he lived and worked.

In this shipment of cuttings to Contassot were two of Jaeger's best seedlings derived from his breeding work, Jaeger 70 and 72. These selections were made by Jaeger after crossing Jaeger 43, a female selection of *Vitis Linccumii* of great health and vigor with large, attractive clusters, and a male seedling selection of Jaeger 60, a female selection of *Vitis rupestris*. The parents of Jaeger 70 and 72 were regarded by Jaeger as the best selections of these two wild species, *V. Linccumii* and *V. rupestris*, ever found by him in his search for wild grapes.

These cuttings were grafted by Contassot on older bearing vines in his small vineyard and presently they bore fruit. Contassot was immediately impressed by the relatively large size of the fruit of Jaeger 70 and the health of the vine, so he crossed it with the vinifera varieties in his vineyard or saved the seeds from open pollinated clusters. Since Jaeger 70 was a self-sterile variety which produced no viable pollen and was thus open to pollination from the vinifera varieties in the vineyard blossoming at the same time, all the seeds produced were true hybrids. Because he lacked a suitable place to grow seedlings, he gave the seeds of Jaeger 70 to two of his friends and neighbors, Georges Couderc and Albert Seibel. From these seeds given to them by Eugene Contassot, the first French hybrids were selected from the resulting seedlings, Couderc numbers 71-03, 71-04, 71-06, 71-20, 71-60, 71-66 and the early Seibel numbers such as 1, 2, etc.

Georges Couderc, who has gained even greater fame for his breeding work with grape rootstocks and studies of phylloxera resistance, began his breeding experiments around 1878 in a garden of five hectares (approximately twelve acres). He was a tremendously energetic worker and it is estimated that he grew from 300,000 to 400,000 seedlings during an extremely active lifetime of breeding grapes! Add to this the thousands of seedlings grown by Albert Seibel in his breeding work and it will give one reason to pause in admiration and reflection for these two most prolific of the French grape hybridizers. Albert Seibel, a contemporary and student of Couderc, was a practical and intelligent vineyardist who was also interested in grape breeding, especially the production of hybrid direct producers. These two men were the great pioneers in the development of the French hybrid grapes, but still other French breeders contributed their share to this great breeding work. The names of Maurice Baco, Bertille-Seyve, Castel, Gaillard, Victor Ganzin, Humbert, Jurie, Kuhlmann, Malegue, Millardet, Oberlin, Peage, Roy-Chevrier, Rouget and others,

many of whom were contemporaries of Couderc and Seibel, are found in the earlier contributions to this work. Continuing this work on into the present time are found even yet the names of Couderc and Seibel of a later generation and other breeders such as Burdin, Galibert, Joannes-Seyve, Landot, Meynieu, Perbos, Ravat, Rudelin, Seyve-Villard, etc. Thus the future looks bright for even finer things may be expected to appear as the work goes on without end.

Characteristics

To characterize a class of grapes such as the French hybrids is not an easy task because of the variations between varieties in a given class. However, there are certain characters which serve to distinguish this class of grapes as a whole from the American hybrid or bunch grape varieties as exemplified by Concord, Niagara, and others of the most common and widely-grown varieties in eastern North America.

The most noticeable feature of the French hybrids is the lack of "foxiness" that most of the American varieties possess in varying degrees of intensity. "Foxiness," that peculiar combination of flavor and aroma which is thought to be very desirable by some people and equally disliked by others, is absent from the present-day French hybrids. In pasteurized grape juice and grape jelly, this "foxy" flavor is not held objectionable by most people, but to those who prefer grapes in the fresh state, as dessert or in the form of fermented juice, this flavor and aroma are usually very distasteful. Especially to European palates or to those who have been accustomed to the mild, refined flavors and aromas of vinifera grapes is this character noticeable. The French hybrid varieties have inherited the more refined and subtle aromas and flavors which closely approach these qualities as they are found in their European or vinifera ancestors. Indeed, the majority of the French hybrids possess very neutral flavors as a group, much like the vinifera wine-grape varieties. Intense or otherwise unusual flavors in wine

grapes are not usually desired in the fresh fruit because fermentation can change these flavors into wines of undesirable qualities. It must be emphasized that the French hybrids, with the exception of only a very few of the newest varieties, have been bred for the production of wine and it is perhaps only by chance that several of these varieties which originated prior to these latest few table varieties happen to be excellent table grapes as well.

The French hybrid varieties possess a thin, often adherent skin which is not objectionable in eating as is the tough, astringent skin of Concord. They possess a tender but firm flesh which separates from the relatively small seeds; a high percentage of soluble solids, largely composed of sugars, in the juice; a medium to high acidity. Most of the *labrusca* types and their primary hybrids have a rather tough, stringy flesh which is often astringent around the relatively large seeds. Too often many of these *labrusca* types possess relatively low percentages of sugars which deceive the untrained palate into believing that they are high in sugars, whereas in reality the apparent sweetness is accentuated by low acidity.

Many of the *labrusca* types "shell" from the cluster at maturity, that is, the berries become easily detached from the pedicels and the fruit drops from the clusters at maturity or after handling and harvesting. In this respect, the French hybrids are much better because the berries are more firmly attached and resist handling better without damage. Cluster and berry size vary considerably in the French hybrids just as they do in the American varieties, but in general the French hybrids have larger, more compound clusters and generally smaller-sized berries than the American types. There is also a tendency for the berries in the French hybrids to approach the ovate form more readily than the spherical form of Concord and others of that type.

The vegetative characters are very different from the American types and are

quite noticeable to the most casual observer. The aspect or growth type of most French hybrids is more compact with upright, erect-growing shoots. A very few, chiefly the earlier hybrids of *V. vinifera* and *V. riparia*, exhibit the trailing procumbent type of growth so common in the American hybrids. The shoots have relatively shorter internodes, larger average diameters, and smaller, more numerous leaves with sharp, pointed teeth and more distinctive margins and sinuses. Also, the young developing leaves are often quite shiny or "varnished" in appearance and in the majority of cases lack the pubescence or wooly hair of the young canes and growing tips of the American types.

One of the most interesting features found in the French hybrid varieties, and one of potential economic value, is the ability of many varieties to produce a commercial crop from secondary or tertiary buds in the event that frost or freezing has destroyed the primary bud or its developing shoot and flower clusters. In regions subject to unseasonable frosts in spring or extreme temperature changes in winter, there would be considerable value in such characters because it might mean the difference between a reduced but worthwhile crop or no crop at all. Few American varieties will produce anything beyond a few small clusterlets if the primary buds or shoots developing from these buds are destroyed.

Perhaps the most important feature of these French hybrids from the economic standpoint is their high level of resistance to downy mildew, *Plasmopara viticola*. The French breeders have incorporated mildew resistance from the wild American grape species into these hybrids to a degree that is not found in any of the American varieties to date. Not all of these hybrids have equally high mildew resistance and a few of them approach the lower mildew resistance of the American varieties, but as a class they are notable for their resistance to downy mildew. In their resistance to black rot, *Guignardia bidwellii*, the French hybrids

compare favorably with the American hybrids, that is, the level of resistance is only mediocre to poor. This is not surprising when we consider the fact that these French varieties were not selected for resistance to this fungus at all. Black rot has been a relative rarity in France for the last forty years or so, despite a beginning of almost epidemic proportions during the first few years after the introduction of the fungus into France in 1885. Resistance to powdery mildew, *Uncinula necator*, and anthracnose, *Elsinoe ampelina*, is high with a few exceptions.

The resistance of the French hybrids to Phylloxera, *Phylloxera vastatrix*, has been the subject of considerable misconception and misunderstanding in this country. Many have assumed that the hybrid direct producers, as the French hybrids are called in France, are exactly what the name indicates and are grown direct or on their own roots because of high resistance or immunity to phylloxera. Unfortunately, this is not the case because with few exceptions the resistance of these hybrids to phylloxera, when grown under soil and climatic conditions very favorable to the insect, is not great enough to be economically profitable. Under such conditions the vines will become dwarfed, decline in vigor and production or otherwise exhibit the symptoms of phylloxera injury. The term "direct producer" then is a misnomer because virtually all of these varieties are grown on suitable rootstocks in France, not only because of the phylloxera problem but because of the increased yields obtained on adapted roots.

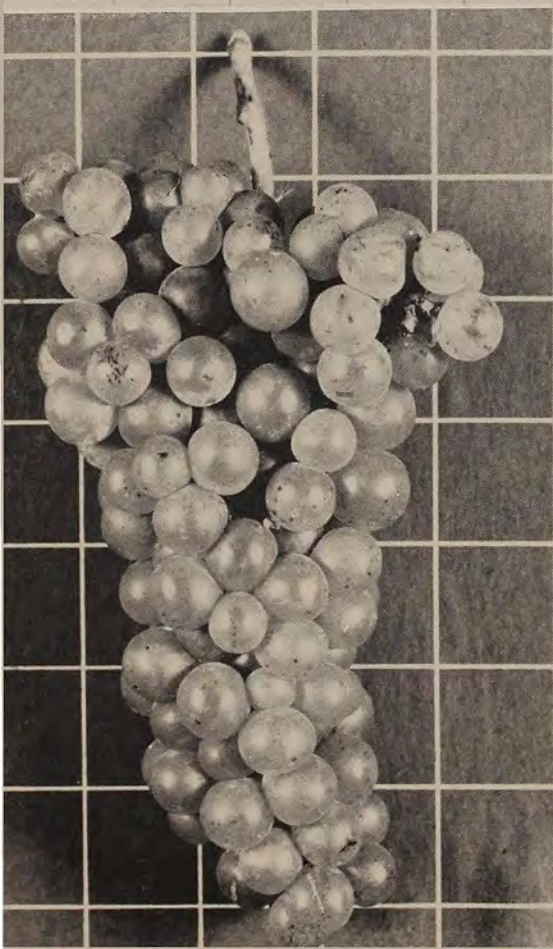
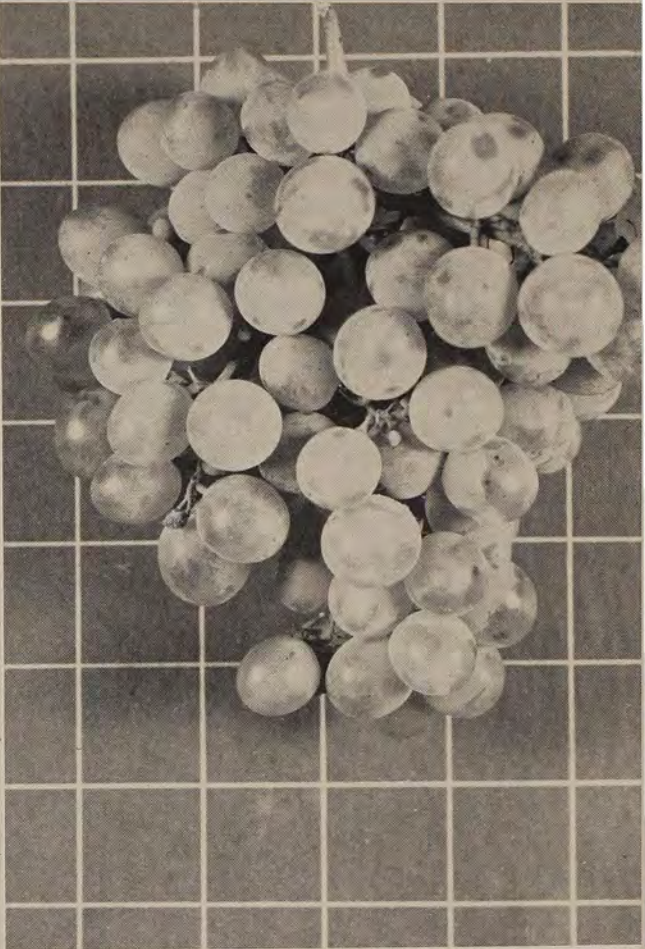
In the eastern, humid areas of North America, we have a different set of conditions and as yet not enough time or tests have been made to determine what effect phylloxera may have on these varieties here. Since grafted vines of the highly phylloxera-susceptible American varieties are somewhat of a rarity in this region, these varieties are widely grown ungrafted. It is not likely that the French hybrids with their considerably higher phylloxera resistance would experience

undue injury from the root louse wherever the American varieties thrive. The problem of evaluating phylloxera damage to American grape varieties has never been adequately investigated in eastern North America, and it has generally been assumed that our climatic conditions are relatively unfavorable to phylloxera. This appears to be largely true in the Middle West and Northeastern States, but no experimental evidence is at hand to substantiate or disprove this assumption. In the Southeastern and Gulf States and in Texas, phylloxera and other root troubles are much more serious and prevalent than farther north, and it may be prudent to investigate growing the French hybrids on adapted rootstocks in any serious plantings in such areas.

A few words on the hardiness of the French hybrids may be of interest to those who live in very cold regions with high, drying winds and relatively dry, deeply frozen soils in winter. These conditions are very difficult for any plants and, since no large-scale tests of any but a handful of the French hybrid varieties have been made in areas of extreme winter temperatures, little can be said on this subject at the present time. Here in central Illinois, where more of the French hybrid varieties have been grown for the longest period of time, most of them are hardy but a number of them are not. The average winter in this latitude can reasonably expect -10° or -15° Fahrenheit with a minimum of -19° Fahrenheit experienced since the test planting was begun. A few varieties have been hardy in South Dakota, northwestern Iowa and southern Minnesota without winter protection. Several otherwise promising varieties have experienced some winter injury here after severe winters and it would be wise for prospective growers to proceed with caution before investing any large sums of money on varieties of doubtful hardiness, especially in areas of climatic conditions similar to central Illinois and northward.

Suggested Varieties

The varieties of the French hybrids are very numerous. No accurate tabulation



or listing of all of them has ever been made, and we can only surmise that out of the hundreds of thousands of seedlings produced from the early 1880's to the present perhaps upward of a thousand or more were promising enough in one respect or another to be fairly widely tested by vineyardists in France. A considerable number of varieties have been eliminated after testing in France and undoubtedly a great many more will be eliminated in the future. In this country, somewhere between three hundred and four hundred French hybrid varieties are growing in Experiment Station vineyards, but only a few of this number are likely to prove of some value here.

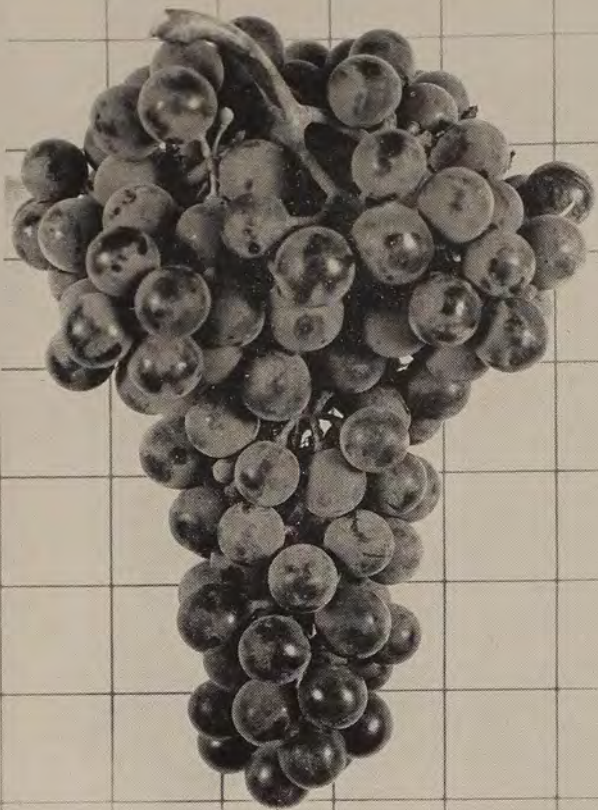
It must be stressed that the varieties listed here are recommended for trial only. Although these varieties appear to be promising in central Illinois, they may do better or worse in other areas. However, as of the present time, the following suggested list is our best estimate of the varieties most likely to prove the most satisfactory for table and wine uses under reasonable care. A few other varieties believed to be of approximately equal merit have been omitted because they have not been grown as long in our test vineyard.

Seyve-Villard 23-657—Late midseason black. Clusters are very large—up to 15 inches in length, shouldered, fairly loose to moderately compact, long with medium, oval jet-black berries. Vine is ultra-vigorous, very productive, hardy and moderately healthy. Primarily a red wine grape. Has a very high sugar content and makes a good red wine. The foliage is very ornamental with very dark green, "varnished," finely cut leaves. Suggested for trial in areas of similar climate to central Illinois and farther south.

Seyve-Villard 12-375—A midseason to late midseason variety with large to very large, heavily shouldered, broad, moderately compact clusters of above medium, oval berries of golden yellow. The vine is very vigorous, healthy, hardy, and productive. The flesh is crisp, tender, firm, with a good flavor of pure vinifera character, and adherent skin. While this variety makes a very good white wine, it is also a good table grape of neutral, sweet flavor. This variety, in the author's opinion, is the most outstanding French hybrid of them all when all factors are considered. In fact, it is probably one of the greatest hybrid grapes produced anywhere by the hand of man. This variety is deserving of the widest possible trial because of its many good points in fruit and vine. Highly recommended.

Seyve-Villard 5-276—Early midseason. Has medium large, shouldered, long, very compact clusters of below medium, spherical, yellowish-green berries. The vine is moderately vigorous to vigorous, hardy, healthy and very productive. Attains a high sugar content and makes a very good white wine. This variety deserves wide trial and should prove of value in the North because of its relative earliness and hardiness.

Seyve-Villard 12-309—A late midseason to late variety with large to very large clusters; shouldered, tapering with elongated oval, pinkish-yellow, medium berries. Flesh is crisp and tender with adherent skin and neutral flavor. Primarily for its good white wine but pleasant eating. The vine is very vigorous, healthy, hardy, and very productive.

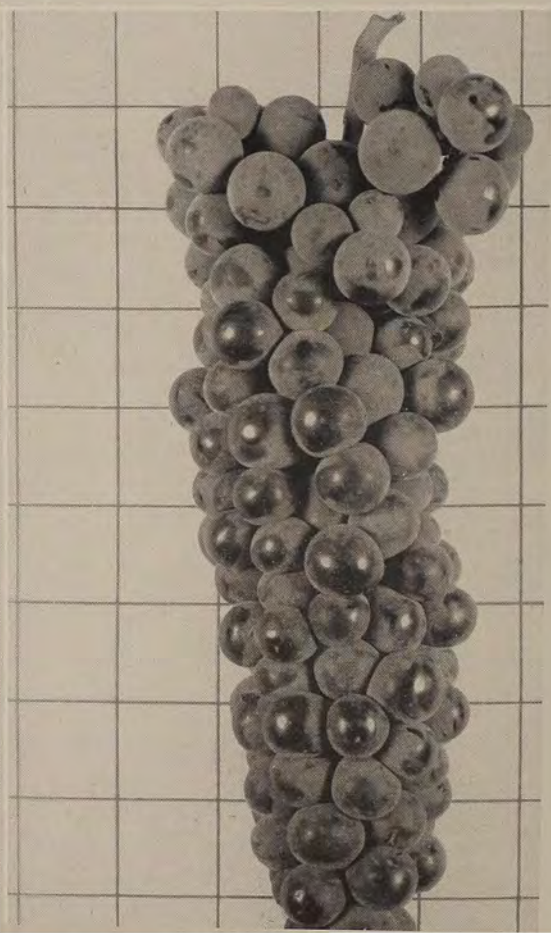
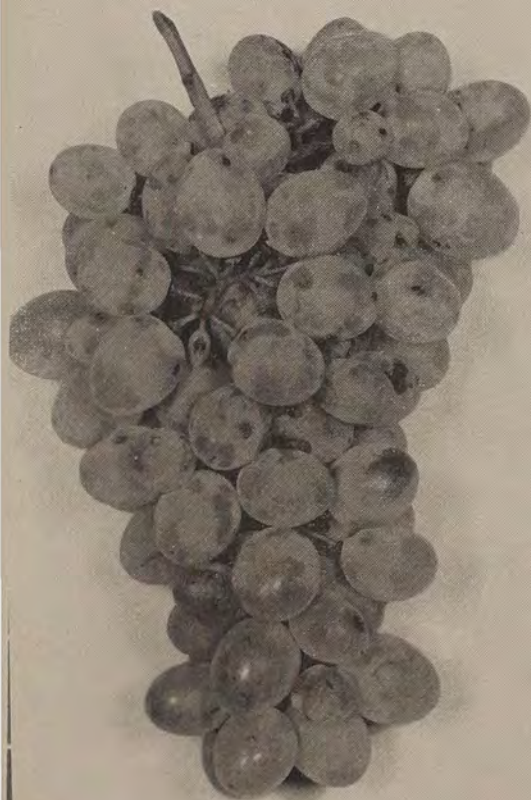
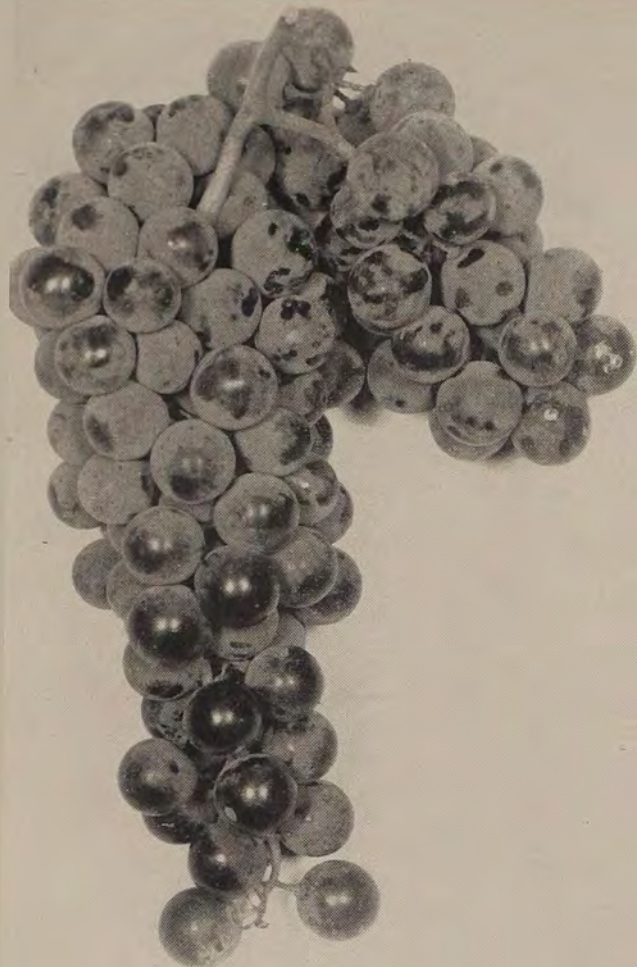


Joannes-Seyve 26-205—A late midseason variety with large, shouldered, medium compact clusters of medium, spherical black berries. A very vigorous, healthy vine of high production. A very good red wine grape and the fruit clusters will hang on the vine until frost without damage.

Seibel 8745—An early midseason black with medium large, compact clusters of medium, slightly ovate berries. Vine is moderately vigorous, healthy, very hardy, and very productive. Here it does much better than its famous sister, Seibel 7053, which is so widely grown in France. Seibel 7053 is a weak grower here and very susceptible to downy mildew and black rot. Makes a good red wine and is promising for trial in cold areas of the North.

Joannes-Seyve 23-416—Early midseason. Has large, long, moderately compact to slightly loose clusters with oval, pink to light red berries with a peculiar spotted appearance. Vine is vigorous, healthy, hardy, and moderately productive. A very attractive table grape but useful for white wine also.

Seibel 14664—An early midseason variety with large to very large, tapering, very compact clusters and very large, elongated oval, yellow berries. This variety is exceptionally beautiful in its fruit and in addition is probably the best table variety in the French hybrids. The flavor of the fruit is similar to Dattier de Bayrouth, one of the choice vinifera table varieties, and it has a slight muscat flavor like Dattier also if the vines are not overloaded. The vines are very vigorous, healthy, very productive and moderately hardy. Ripe rot (*Botrytis cinerea*) is often troublesome on this variety in years of high rainfall and humidity but can be successfully controlled by spraying with Captan. Another feature of this vine is the very attractive foliage of fine cut teeth, dark, shiny green color and a "varnished" appearance of the young developing leaves.



Bertille-Seyve 5563—A late midseason black with large, compact, shouldered, attractive clusters of medium berries. This is also a red wine grape and recommended for its rugged, hardy vine of exceptional health, vigor and production. The fruit keeps well on the vine.

Couderc 71-20—A late midseason variety with medium, shouldered compact clusters of medium, black berries. A very good red wine grape with a vigorous, healthy, hardy vine of high production. One of the first French hybrids and still widely grown in France. Always a reliable producer and a rugged vine.

Seibel 9110—An early midseason white variety of exceptionally beautiful fruit. The clusters are large, tapered, slightly shouldered to shouldered, compact to moderately compact with medium large, pointed oval or egg-shaped berries of beautiful golden yellow. This variety is an excellent table variety with thin, adherent skin, tender, crisp flesh of pure vinifera character. The sugar content is high and it makes a very good white wine also. The vine is vigorous, moderately healthy (slightly subject to downy mildew of the foliage in some years), hardy, and productive. Promising and deserves a wide trial

Bertille-Seyve 2667—an early midseason black variety with large to very large, long, compact clusters of medium, black berries. Primarily a red wine grape. A vigorous, productive vine of superb health and perfectly hardy here. The berries begin to color very early, long before complete maturity and will hang on the vine in good condition until freezing weather.

Seibel 1000—An early midseason black with medium-large compact clusters and medium berries. One of the hardiest of the French hybrids; has withstood -35°F. in South Dakota without injury. Has a vigorous, healthy, productive vine. One of the oldest French hybrids and still a good one for producing red wine. Has been planted considerably for wine in New York and Canada. Should not be planted in low-lying areas with very moist soil as it is subject to a physiological disorder in which some of the berries remain green without maturing. A very promising variety for those who live in the North where most varieties winterkill.

Seibel 5279—A very early variety with large, long, slender clusters of medium large, golden-yellow berries. This variety is one of the very earliest to ripen here, often during the last week in July in warm years, and is the earliest good quality table variety. The texture of the flesh is tender and crisp but too soft to ship or withstand rough handling, hence is recommended only for the home garden. The sugar content is high also and it makes a very good white wine. Should be sprayed carefully for black rot as it is quite susceptible to this disease. Very promising for the far North as it is hardy in northwestern Iowa and probably farther north.

Seibel 8357—A late midseason black with large, long, compact clusters of medium berries. This is the most promising teinturier wine variety tested here. It produces a wine of almost inky black color of highest quality. The vine is vigorous, healthy, hardy, and productive. For those who wish a deeply colored wine for blending, this variety is also very promising. High sugar content and the clusters keep well on the vine without loss until cold weather.

Seibel 11803—A late midseason to late variety with very large, shouldered, tapering, moderately compact to compact clusters with large, round-oval berries of light to dark red, depending upon exposure to the sun. This variety is a very good table grape if properly grown because of its crisp, firm but tender flesh, high sugar content, appearance and size. If pruned properly, the vine is vigorous, healthy, hardy and extremely productive. This variety must be pruned very short because of its extreme fertility; often each shoot will produce four large clusters. Makes an excellent white wine also. The foliage is exceptionally attractive with large, fine cut, dark green leaves of beautiful form. Unless properly pruned and not allowed to overbear, this variety may be disappointing.

Seibel 13053—A very early variety with medium large, slender clusters of medium, spherical black berries. The vine is very vigorous, healthy, hardy, and productive. One of the earliest varieties to ripen here, usually in early August although the berries begin to color in mid-July. Not a table variety but, ripening as it does when grapes are scarce, it is pleasant eating. Primarily useful for making a very good red wine. Promising for trial in northern areas because of its earliness and hardiness. Subject to bird damage.

Seyve-Villard 23-18—Late midseason. Has large to very large, tapering, shouldered, moderately compact clusters of medium large, short oval, black berries. While primarily a red wine grape, the tender, crisp, sweet flesh is pleasant eating when fully mature. The vine is vigorous, healthy, productive, and hardy. The fruit hangs well on the vine without loss until freezing weather. Slightly subject to black rot.

The Term and Category of Cultivar

GEORGE H. M. LAWRENCE

During the last five years, a word unfamiliar to many horticulturists has crept into our terminology. It is "cultivar": a word that denotes both a category and a term. By some it is treated in either instance as an unnecessary evil, one to be ignored, rejected, bypassed; by others it is considered superfluous and meaningless; but for an increasing number—more especially in other countries—it is a very real category, not at all new, and one having biological significance. The category and the term deserve better treatment. For this reason, better understanding of them is needed.

A brief review of this and related categories should help to see all in proper perspective. The species is the basic unit of classification. Its scientific name is written in Latin, and is called a binomial, for it is a name of two words—the generic name, such as *Rosa*, plus the specific epithet, such as *canina*, with the binomial expressed as *Rosa canina*. Species vary. These variants for centuries have been known to English-speaking peoples as varieties. From this usage the botanist created and gave formal designation to a category whose Latin name is "varietas," and which is universally abbreviated "var." Modern botanical nomenclature dates from the time of Linnæus,

more specifically from the date of the publication of his two-volume work, "Species Plantarum," in 1753. In that work he recognized the category variety, but usually prefixed his varieties with letters from the Greek alphabet (such as α , β , γ , etc.) instead of var.

A study of the origins of the plants designated by Linnæus as variants shows more of them to have been of garden than of spontaneous origin. For this, and for other reasons, some horticulturists have held that, if there is a substantial biological difference between the "variety" of botanists and that of gardeners, then priority of usage would leave it with the gardeners, and would place on the botanists the responsibility of finding a new term for their species-variant as it occurs in the wild. The botanists have not done so, and because their literature is so extensive and is the product of formal nomenclatural procedures of long-standing, it is not to be expected that they will. It is best to forget that alternative. If it is agreed that a biological difference does exist between the variety of the botanist and that of the horticulturist, then the horticulturist must seek the new term.

How does the variety differ from the cultivar? In nature, plants are generally populations—that is, groups of individual plants growing together. Different

¹Reprinted from *Baileya*, Vol. 3, No. 4, December, 1955, by permission of the Author.

populations may occupy different kinds of habitats and yet may have so many features in common as to be considered components of a single species. If a hypothetical plant species is composed (let us say) of three population-groups occurring in three different habitats—alpine, grassy-meadow, and desert—it may be that each of the three populations has been growing in its area and environment for hundreds of centuries, although originally each migrated to its present area from a common source. Before this migration took place, the characters by which we now recognize the three populations to be a single species were present, and were a part of the genetic makeup. They are heritable characters.

Individuals were able to survive during the period of migration, provided that they were sufficiently different from their ancestors to compete successfully in the new environment. Continuation of this migration required, furthermore, that the new generations be able to compete successfully against all opposition, and to reproduce by seed. By these means the areas that the species occupied expanded and moved outward from the point of origin. Plants not having the vigor and other characters essential for success in the new environments died, and, as they did so, some of the characters of former generations were lost. Many generations of inbreeding, during which the accumulated adaptive characters became more or less fixed by genetic combinations, resulted in changes in the appearance of the plants—changes of sufficient magnitude for the different populations to be recognized as distinct varieties. As the three hypothetical environments (referred to above) became more different, so did the appearance, in some degree, of the three populations.

These different populations of a species are usually capable of interbreeding freely. When they do interbreed, hybrids between them are produced. Similarly, individuals within a population interbreed freely and the population itself is perpetuated. These individual plants

are usually as potentially variable in their genetic composition as is one man from another. This variability may be observed in every sexually-reproducing population of wild plants.

Let us assume that the three populations of this hypothetical species grow and flourish, but are unknown to any man until a botanist "invades" the desert area, and on this first trip finds and collects only one of the three populations. He presses and dries it, and makes note of its salient features and location. When he examines his collections later, he finds this plant unlike any known before and, after careful study, correctly concludes it to be a new species, and names it *Fiscus aridus*. The dried specimen he has prepared becomes the type of the species. The place where it was collected is known as the type station or locality. On a second trip, the botanist ascends a mountain not far from the arid region of his new species of *Fiscus*. There he finds the alpine variant of this species. Because it is that same species, it must have the same binomial (*Fiscus aridus*), but since he considers it to be varietally distinct, a distinguishing epithet must be given it. He names it, then, *Fiscus aridus* var. *alpinus*. In order to distinguish the original, desert form from the new var. *alpinus*, the code of nomenclature specifies that it be called *Fiscus aridus* var. *aridus*. Perhaps later the third variant, of the moist meadow habitat, is found and named *Fiscus aridus* var. *aquaticus*. Together the three varieties comprise the species.

It is only by chance that the botanist has found the arid-habitat form before the alpine and meadow forms. Biologically, it may be that the last variant occupies an environment more nearly like that of the population that was ancestral to the three, and hence its characters may have changed the least from those of the ancestral form. If so, this is the biological type of the species. Thus we note that the nomenclatural type of a species (in this case, *Fiscus aridus* var. *aridus*) may or may not be the biological type. All

three compose the species; a description of the species must include the characters of them all.

Before the era when men like Darwin, Mendel, and DeVries established the doctrines of evolution, this biological concept of a species could not exist. Botanists then described the first population encountered as the species, and, while recognizing the later-discovered variants as allied to this species, treated them as appendages, as something to be tacked on to the original species. Thus, the description of the species was not enlarged to include the variants as they were discovered. In most contemporary horticultural literature, including Bailey's "Hortus Second," and the "Manual of Cultivated Plants," the description accompanying the binomial is usually only that of the typical variant of the species—the varieties have been added as appendages. It is only very recently that taxonomic botanists have recognized the biological significance of these matters. It is not yet time to impose similar pe-lanties on every garden lover. Nevertheless, the informed plantsman should be aware of these things.

The significant feature of the category variety as used by botanists is that it usually designates one of two or more natural populations of a species; individual members of a population interbreed freely with one another and reproduce the population by means of seeds, though among the individuals there may exist a greater variability of characters than is at first apparent.

The plant that a horticulturist calls a variety is usually a product of the garden. It does not represent a self-perpetuating population of wild plants. When grown from seed, it usually represents a selection, chosen for particular attributes, or it is produced by seed from parents or ancestors that have been selected and bred for particular qualities. In general, it has no counterpart in the wild, nor could it long survive there without reversion to an ancestral type. When

one individual does not differ significantly from another because the heritable grown from a commercial seed packet, features have been more or less stabilized for that generation by controlled breeding. It does not represent a freely interbreeding population perpetuating itself for a large number of generations. Furthermore, many—probably most—of the so-called varieties of the garden are perpetuated not by sexual means (i. e., by seed), but by asexual means, such as by cuttings, grafts, or division. These asexually maintained sorts are clones. Like the seed-produced cultivated varieties, they are biologically markedly different from the varieties of the botanist. All of the thousands of cultivated so-called varieties of gladioluses, dahlias, irises, or apples, to mention a few, are clones.

The question arises, if it be agreed that there is a marked biological distinction between the variety of the botanist and that of the gardener or farmer, of why it is necessary to accept two categories. Very frankly, it is not. Botanists, agriculturists, and gardeners have managed for centuries with only the one category, *varietas*. Even the most sanguine proponents of the category "cultivar" do not expect the man in the street or of the home garden to switch from referring to his flowers as varieties to calling them cultivars. The object of this recognition of the category of cultivar, as being biologically distinct from the variety, is to provide a more precise nomenclature for those persons who require or will use this precision. The category has been recognized among vegetable and seed producers and others in Europe for over half a century. In the Scandinavian, Germanic, and Slavic literature it is designated as "stamm" or "Sorte" or a linguistic variant of those terms. This is true of many listings in European seed catalogues, as well as of those in encyclopedic works. Certainly it is important to know whether a variant will or will not come reasonably true from seed. It is equally important to know whether it must be propagated asexually. This

information is indicated by recognition of the distinctness of the category cultivar. The importance of the category to the horticulturist increases with his own increase in plant knowledge. Whether it be appreciated or not by all of us, the category of cultivar is with us. It is entrenched in Europe and the number of adoptions in American literature increases steadily. Its adoption in the International Code of Nomenclature for Cultivated Plants follows a careful study of the situation, and evidences consideration of its recognition and adoption by plantmen.

The category, by definition, is to be applied to lines highly selected to a standard type, to clones, and to all garden variants which have originated or are maintained in cultivation and which would not usually be given names in Latin form. A clone is a single plant of a cultivar. That is, from a particular cultivar there may be selected any number of clones, or only a single clone may be named. If the clone is a mutant or sport taken from a wild plant, it automatically becomes a cultivar as soon as it is severed from its "parent" and brought into cultivation. Conversely, some populations that maintained themselves in the wild as botanical varieties may prove to be cultivated subjects by direct transfer to the garden. For these, perpetuated by seed produced by random and free breeding, the category of *varietas* (variety) is retained. Plants in the garden but of this origin are treated as members of botanical categories. In some genera, the cultivated components of a species may include varieties, cultivars, and clones.

The term to be given this category, now becoming known as "cultivar," has also been challenged. In fact, in one early provisional draft of the present Code it was treated as "hort. var." (horticultural variety). It has been agreed in nomenclatural discussions at the international level that the term must be based on Latin. This ruled out the terms "Sorte" and "stamm." All persons concerned acknowledged the category to

represent a cultivated variety. Historically, the term appears to have originated with L. H. Bailey, who wrote in 1923 (*Gentes Herbarum* 1: 113-114):

The cultigen is a species, or its equivalent, that has appeared under domestication—the plant is cultigenous. I now propose another name, cultivar, for a botanical variety, or for a race subordinate to species, that has originated under cultivation; it is not necessarily, however, referable to a recognized botanical species. It is essentially the equivalent of the botanical variety except in respect to its origin.

Some people in this country have used the term "Hort. form" for this category. It is currently used in some of our government publications. This is admission of the validity of the category. The problem, if there be one, is that of accepting a name. That of cultivar is euphonious. It is free from ambiguity. It serves a purpose.

Material for "Hortus III," following the International Code, is based on the acceptance of the category and of the term cultivar. Likewise, the term clone (abbreviated to cl.) is also used when appropriate. It is in a reference work of this character, or in a check-list of fancy-named plants, that the value of these distinctions is paramount. By examples of this type, the professional horticulturist is provided an added tool for his use. The term is gradually becoming adopted in catalogues of American specialists. There is no reason why producers of general seed or plant catalogues must adopt it. Certainly, the vernacular use of variety is not going to be displaced in the foreseeable future. Those wishing to retain it will continue to do so without impeding the gradual increase in preparation and use of a more precise literature. At the same time, we all recognize that a change in the old order is occurring, that this change is being accepted, and that for those who strive to add greater precision to our horticultural literature, this change reflects progress.

New Strains of Cosmos

S. PERCY LANCASTER¹

Cosmos were brought to India from Mexico in 1846-1847—an exhibit of “a new annual from Mexico called Cosmos” is recorded in the description of a Flower Show sponsored by the Agricultural and Horticultural Society of India in that year. Until 1925, there were only three typical varieties of Cosmos in India—white, pink, (Rhodamine pink) and crimson (Doge purple or very close to it). During that year, the writer observed a pink Cosmos in which the red dot at the base of the ray petals was slightly larger than normal. After a careful selection had been made, the plants showing this variation were pollinated with crimson. Zonal types appeared, and finally in 1933-1934, this new type called ‘Alipore Beauty’ was distributed quite freely in India. This work was continued. The garnet-red zone on pink began to appear in deeper and also paler shades of pink. Cross breeding in real earnest was begun and carried out.

About this time, seeds of ‘Alipore Beauty’ were sent to Bodgers, the great California seed house. By crossing with their own hardy types, they were able to introduce and to market in 1948 the strain which they named ‘Radiance.’

At present, we have in India several strains of ‘Alipore Beauty’ differing from one another in the depth of pink and in the width of the zone.

Using a white as seed parent and pollinating with ‘Alipore Beauty,’ we ob-

tained ‘Aurora Borealis’ which is white with a zone of pink or sometimes a pale mauve pink. The characteristics of this strain do not hold well and frequently revert.

Among the seedlings that appeared in the first batch of crossbreds, one of the pinks lacked the basal dot. Working with this item, we have, by crossing and selection, created ‘White Eye’ in which the zone is white. There are several shades of pink with this distinct white collar, but the darkest pink will be the final choice.

‘Bright Eyes’ has been developed from ‘Alipore Beauty.’ First, there is a zone of white and then a zone of pale red which, however, breaks into streaks going upward to the ends of the petals.

Another variation in the original crossbred seedlings was a deep pink with a single white line in some of the petals. Two of these forms from different plants were crossed and, in due time, “striped” forms appeared. The striping can be seen only when viewed from a few feet away.

Seedlings from the striped forms frequently produce a “Picotee,” but this does not repeat itself in following generations.

Many petal variations have appeared among the crossbred seedlings. Some white petals were almost square and others had a rounded tip. Some of these forms had deeply notched petals and from them has come ‘Frills,’ in which each petal is divided into three narrow filaments giving the flower a distinctive appearance.

The latest development is the ‘Sheaf’ form, which first appeared in 1951-1952. Very few seeds formed, and it was not

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Manuscript transmitted by Ralph S. Peer, Los Angeles, 1956 recipient of the *Veitch Memorial Medal* from the Royal Horticultural Society, London, “for his outstanding services to the Camellia Plant.” *Ed.*



Cosmos 'Sheaf'



Cosmos 'Frills'



Striped form of 'Alipore Beauty'

until 1954-1955 that as many as fifty seedlings were available. The foliage and growth of this strain are quite distinct. The stems are generally sturdier and the foliage forms a massive head. The leaves, instead of being placed opposite on the stem, grow in a single spiral. The first flower resembles 'Ranunculus,' single or semi-double. When it fades, dozens of thin stems, which apparently have been waiting for this moment, quickly produce a bunch of flowers. Seeds are produced, but very sparingly. Often one solitary thickened sickle-shaped seed from a flower is the rule, when normally one would expect twenty to thirty. The writer can account for this variety only by calling to mind certain experiments with Colcochine carried out in 1950.

Owing to the limited space available, it has never been quite possible to breed these Cosmos true to type. Every year some new variations appear and, while these are carried forward, few oblige by reappearing again. We cannot carry forward seeds from these failures (which might give the desired result a year or two later) because of lack of space.

Some work has also been carried out with doubles, starting with seeds of the "anemone flowered" strain in which the

disc petals are about a quarter inch above the guard or ray petals. We now have strains that show a crest three-quarters to one inch above the guard petals. Doubles resembling Zinnias have no disc petals but all have been converted to pistillate form and are reflexed. These flowers measure an inch and a half to two inches in diameter. Types which we refer to as "chrysanthemum flowered" have larger flowers and the guard petals protrude beyond the reflexed disc petals. The "cactus crested" forms have the disc petals deeply divided and irregularly raised about the crest. Our "giant flowered" strain has blossoms two and a half to three inches in diameter with crests beautifully formed and reflexed.

As indicated above, many of these double Cosmos are distinctive in character especially as to the foliage and growth. Quite often the leaves are much wider than normal and sparingly produced. I am doing my utmost to fix a form which I call 'White Crest' in which the guard petals are deep pink or pale crimson and the crest of course white. This is a striking combination. The doubles contain many of the variations found in the single types. There are striped forms and one resembling 'Alipore Beauty.'

The Zoysia Lawn Grasses

H. R. HALSEY

To a transplanted and thoroughly acclimatized Yankee in the South it is a delight to look upon our Zoysia lawns and smile in recollection of those days when our national experts in horticulture, landscaping, gardening and agronomy explained the lack of greensward in the South as due to the extreme heat and long dry spells during the summer months throughout the Southern States. "The soil and adverse climatic conditions make it inadvisable to try to establish a turf similar to the turf of northern lawns," was an almost universal dictum. "The traditional barren yard swept clean of all vegetation for generations" was long accepted as positive proof that lawns were practically impossible in the South.

The fact that in pioneer days a barren and clean-swept yard was neater and safer, especially from snakes and fire, than any other kind of surrounding area was not considered by northern writers

who were accustomed to blue grass pastures and lawns of their section. These pastures and lawns were a part of the prosperity of industrial development and agricultural progress in the North long years before the impoverished South could recover from the ruin and desolation of The War Between the States. Without manufacturing, without capital, with cotton farming almost the only industry and with the impossible problem of the freed slaves, natural victims of the carpet baggers, the South could hardly consider lawns a very important item. Bermuda grass did relieve the situation somewhat, because its aggressiveness and the region's congenial climate made it the most ubiquitous plant of the region. For years the few lawns of the South were of Bermuda or carpet or St. Augustine grass and such weeds as mixed readily with them. The attempts to introduce Kentucky blue grass and the various mixtures developed by seedsmen of the North

failed generally. A few mixtures of grass seed concocted in the South were put forward, but Bermuda grass remained the only generally successful southern lawn grass until more recent importations arrived.

Most of the lawn grasses used in America were not natives of this country. Even Kentucky blue grass, annual blue grass, most of the bent grasses, Bermuda grass, the rye grasses were early introductions. All of them have long since escaped into congenial environments where they are able to outdo their competitors. One very interesting importation made in 1918 was the seed of Centipede grass collected by Frank Meyer on his last exploration trip. David Fairchild, in that fascinating autobiography, *The World Was My Garden*, called this "Meyer's grass," and referred to its wide use in Florida. In the hands of competent planters this grass made fairly good lawns in Georgia and Alabama also. Vegetative reproduction was necessary for years after its introduction, but several years ago seed became available for retail purchase.

In 1902, Dr. Fairchild himself had sent to America from Japan a turf of the Japanese lawn grass, *Zoysia japonica*, which went from Washington to Florida and was propagated there vegetatively for lawn use. Within recent years the seed of this grass has become available to the public.

The increasing interest in lawns was stimulated by many different agencies, such as our national and state departments of agriculture and their experiment stations, our university schools of agriculture, garden clubs, newspapers and magazines, the examples set by golf clubs and municipal golf courses, and very largely the commercial interests of dealers in seeds, nursery stock, garden and lawn supplies, and landscape architects and contractors. The tremendous number of new houses and fine commercial and public buildings has created a natural market for

lawns that has in turn excited these dealers to expansion and increased activity. The vision of profit in this activity has at times caused opposition to the customer's interest. Grass seed sold every year is much more profitable than grass plants sold only once to a customer. A turf selling at twenty-five or forty-five dollars a square yard is much more profitable than grass plants sold only once to a customer. But an excessive price does far less harm to a customer than does unsupervised planting by untrained men without the slightest interest in the result of their work.

Today the South has some of the finest lawns in America. These are not to be found so frequently on the large estates as in the front yards of small homes in every city of the region. It was not then any miraculous transformation of soil and climate that brought beautiful lawns to the South. It was rather the return of prosperity, the importation and development of new grasses, and the education of home owners to the possible results that could be obtained. Among the most convincing arguments in recent years has been the surpassing beauty of *Zoysia matrella* lawns.

During the nineteen thirties there were three species of *Zoysia* grass grown in the United States: the *japonica*, the *matrella*, and the *tenuifolia*. These were introduced by plant explorers of our national Department of Agriculture, who collected sod and seed from various parts of Asia and the South Pacific. The writer has not been able to satisfy himself completely about the origins of earlier introductions. These grasses were, however, allocated to the South and tried in Florida, Alabama and Georgia under various auspices and with varying degrees of interest. For none of them was seed available in any appreciable quantity and the slow process of vegetative reproduction discouraged most of the commercial interests. But the three species did find their fields of usefulness and their limitations.

All of the *Zoysia* grasses have a mass of interwoven roots spreading from rhizomes or stolons to make an exceptionally uniform turf. The *japonica* blades are flat and rather stiff, varying in width from about three to five millimeters. The *matrella* blades are somewhat more flexible and their width runs from slightly over one to three millimeters. The *tenuifolia* is by far the softest and finest and shortest bladed of the genus.

Of these three, the *tenuifolia*, or Mascarene grass, is the most attractive in appearance, but the least satisfactory for lawn use. It does not survive cold weather. It buckles and wrinkles in growth. Its root system is rather shallow. It is used to some extent in Florida and southern California, but in very limited areas.

The *japonica*, or Japanese lawn grass, is the most aggressive of the three, the most hardy, and the least attractive in appearance. It covers ground more rapidly than either the *tenuifolia* or the *matrella*, and has a root system deeper than the *tenuifolia*, but not so deep as the *matrella*. Its coarse blades have the appearance of straw during the winter, but it is superior to most of the non-*Zoysias* for lawn use in its own area.

Zoysia matrella, or Manila grass, has a root system forming a very thick and tough turf, unsurpassed for wear resistance, and thus for children's play areas, by any grass known. In most soils the mature turf of several years' growth will run four to six inches in thickness and will weigh over a hundred pounds per square yard. If the soil is sandy most of it can be shaken out, reducing the weight to about twenty pounds to the yard, or even fifteen. The spread of this species is mostly by stolons. The arching of these stolons into the air and back to the ground is a never-failing source of interest to the new *Zoysia* lawn owner. The nodes from which roots strike into the soil are at about half-inch intervals as against one to two inches in *Zoysia japonica* or in Bermuda grass. The resulting root system is, then, naturally more dense.

At present *Zoysia matrella* is by far the most widely used of the genus. It was somewhat slow to gain the universal acceptance that was predicted for it, since there was no great campaign back of it and the building boom had not yet developed to turn public attention to improving the home grounds. But after World War II was over, this grass gained rapidly, becoming the most talked-of grass in the South, and taking over in city after city as its beauty and permanence and freedom from care repaid the hard work of establishing the turf. And even where the expense and difficulty of securing a *Zoysia* lawn made property owners turn to other grasses, the effect of the successful *Zoysia* in setting a standard of excellence became evident. Lack of seed made necessary the planting of sprigs or plugs of *Zoysia matrella*, as had been the case with *Zoysia japonica* and Centipede grass. But the success in commercial production of seed of the latter two made them much easier to plant. The *japonica* seed requires preliminary treatment to secure germination—as by exposure to full sunlight of seed and wet sand or vermiculite for a week or two—but it is easy to secure complete coverage of an area within a single season by broadcasting the mixture. Seed production of the *matrella* is too scant to make profitable its collection. Nevertheless, about 1950 several large seed companies were fooled into offering *Zoysia matrella* seed in their catalogs. The stories of the cause of failure to receive the supply of this seed were amusing, but they did lead to many a question regarding the origin of the hoax.

The zonal range of *Zoysia matrella* was at first thought to be limited to the "Deep South," but it is growing now in Ohio, New York and Connecticut, among other more northern states. It is seldom advisable to draw sharp zonal limits for any plant that can survive a good freeze. Nearly every garden enthusiast has at some time grown plants that were once recognized as impossible for his region. And nearly every gardener has lost well established plants to "this year's very un-

usual weather." It is not so much the severity of the winter weather that limits Zoysia as it is the brevity of the growing season. The slow growth of *Zoysia matrella* requires two summers in Minnesota to accomplish what it can do in one summer in Georgia. The *Zoysia japonica* grows much faster than the *matrella* and is able to survive a longer and colder winter. Several lawns of Meyer Zoysia, a strain of the *japonica*, are reported flourishing in the Detroit area.

During the early years, the cost of Zoysia sod was high and the method of planting was not economical. Few nurseries produced it, and transportation costs were a severe restriction on shipping the sod with its soil. Twenty-five dollars a square yard was paid for the turf during the thirties—equivalent to about fifty dollars now. Chopping this into pieces four by four or six by six inches and planting at twelve-inch intervals meant a material cost of at least three dollars a square yard of lawn. Sprig planting was tried and proved so successful in spreading the material over a much larger area and thus in speeding up the increase of stock that it became almost universal. But sprigs require more work. The requirement of more labor as labor became more unavailable forced many a planter to consider a return to block or to plug planting.

In the planting of Zoysia grasses, preparation of the soil is very important, not because of any need for special soil of high fertility, but because it can ease the job of planting, speed the coverage, and reduce the cost of subsequent care. Rotary tillage of the entire area to a depth of at least four inches is desirable. Grasses generally thrive best in a soil of about pH 6.5 reaction. Humus in the soil is desirable and can be incorporated at the time of tilling, but the use of top soil or manure containing weed seeds will probably hinder the Zoysia more than it will help unless the prepared soil is sterilized with steam or Dowfume or treated with some such chemical as Crag Herbicide or Cyanamid or Vapam. The Dowfume may

be difficult to apply in adverse weather, but it produces a field that remains weed-free long enough to give the Zoysia an excellent start. Weed seeds will get in later, however, with wind and birds and squirrels and human feet.

Fertility of the soil is not so important as the first dealers in Zoysia grass and suppliers argued. Any good complete fertilizer can be broadcast, about twenty pounds to the thousand square feet, and tilled into the soil. A starter solution of any good soluble fertilizer is worth using as a wetting agent in which to soak the sod to be planted. The sprigs of grass vary in size with the different operators, from three inches of a single stolon or rhizome with roots and shoots to a small handful of the material. The important thing about the planting is to get the roots down into the soil without drying out, and a portion of the stems up in the air. It is fatal to cover the whole plant, although Bermuda grass is very effectively planted by covering completely. To make easy the planting of Zoysia sprigs, the tilled soil is furrowed with a pointed hoe, about two or three inches deep and at intervals between the furrows of from six to ten inches, depending on the type of Zoysia grass and the plan for its growth. Probably the most frequently used interval for the *matrella* planting has been ten inches. Sprigs torn from the moist sod are dropped into these furrows at intervals of not more than ten inches, and the soil on both sides of the furrow is packed about the roots and lower portion of the stem.

After the planting, the soil must be kept moist. At this stage deep wetting is not necessary, but the rapidity of growth depends very largely upon the continuous supply of moisture to the sprigs. This need continues throughout the time required to cover completely the area planted, but, after the lawn is established, *Zoysia matrella* is unusually drought resistant. An established Zoysia lawn is a paragon of lawn virtue, requiring less water and less fertilizer, less weeding and

less mowing, less edging and less worry than any other grass known. Its beauty is surpassing, its permanence has not been challenged. No diseases or insect enemies have yet made any serious threat. The only disease of *Zoysia matrella* I have seen in fourteen years of observation has been the fungus fairy ring, and that was a single case apparently not of much consequence. It is well to remember, however, that new diseases and pests do from time to time remind us of the vulnerability of all life.

The best time of the year to plant *Zoysia* is undoubtedly just before warm and moist weather sets in, but, since long time forecasting is not generally successful, the planting in Georgia is done at almost any time of the year except in freezing weather. Once the sprigs are in the ground, the average winter weather of this state does not harm them. The lowest temperature I can recall experiencing in Atlanta was five degrees Fahrenheit, which followed by a day or two my planting of a garden path now covered by a beautiful *Zoysia* turf that grew from that planting.

Fertilizer on the established *Zoysia* lawn need not be more than twenty to thirty pounds per thousand square feet applied in early spring, except that shaded areas, where trees or shrubs compete with the grass for plant food, should have several applications during the growing season. If more vigorous exercise of the lawn mower is desired, fertilizer can be applied much more frequently. During the first season of growth to cover the lawn area, however, frequent light fertilizer applications are decidedly beneficial. These can be two or three pounds of the new urea 38, or of the same amount of ammonium nitrate or twice that amount of sodium nitrate per thousand square feet, applied as frequently as one likes.

Mowing of the *Zoysia* lawn is done during the first year chiefly to keep the weeds down. If there are few weeds, if

weed killers have been used, the mowing may be postponed. But an unmowed *Zoysia* lawn is never so attractive as is one cut to uniform height. The slow growth of *Zoysia matrella* grass unfortunately led to some unscrupulous advertising and selling of "the miracle grass that never needs mowing." It usually takes several years of experience with *Zoysia* to bring the lawn owner to a satisfactory decision regarding the height and frequency of cutting. This grass will flourish under mowing to less than one-half or more than three inches. A longer cut affords somewhat more of the luxurious "nap" of the carpet, but the shorter cut is neater in appearance and freer from the danger of exposing a loss of color at the stem base following a decided change in mowing height. Frequency of mowing must depend on the rapidity of growth and the lawn owner's standard of judgment.

Resistance to wear is a remarkable feature of the *Zoysia* lawn. But that very characteristic entails a disadvantage. The soft and juicy blades of Kentucky blue grass are easily damaged, but they are also easily mowed. The tough blades of *Zoysia* offer much more resistance to cutting, and for lawns of any but the smallest size a power mower is a necessity. Either the reel mower or the flat blade mower (frequently advertised as the rotary mower, as though the reels did not rotate) will do a satisfactory job, but the tremendous demand for power mowers has produced too many of them without convenient adjustments. Cutting height is usually difficult for the average home owner to adjust, although it can be made easy. Carburetor adjustment on too many mowers is unnecessarily awkward. Such mower design as necessitates professional service for the slightest change must limit the market for that design.

In using a power mower on a *Zoysia matrella* lawn, it should be noted that the flat blade mowers tend to ride on top of the grass and therefore to make less of a cut than the heavier reel mowers appar-

ently set for the same cut. The great mass of close-growing blades of *Zoysia matrella* is so much thicker than the fewer blades of non-*Zoysia* grasses as to remind one of the difference between a beaver and a rabbit fur. Reel mowers used in making a big cut, e.g., from two inches down to one-half inch, may stall repeatedly unless the engine is well over two-horse power per twenty inches of width. On the other hand, the flat blade mower seldom stalls.

The *Zoysia* grasses are not evergreen except where there is no frost. The *matrella* loses its color after the first severe frost, usually a few weeks after Bermuda grass has become dormant, and it does not regain the green until after the freezing weather has made its last appearance for the year. During the winter season many *Zoysia* lawns are kept clean cut and swept with a decidedly attractive appearance not unlike a beige rug. The care required to keep the rug free from fallen leaves and twigs and other debris is not inconsiderable. In case the price is too high, it is possible to console oneself by allowing a light leaf covering to keep the *Zoysia* partially green throughout a mild winter.

Overseeding the *Zoysia matrella* with rye grass can produce a winter rye grass lawn, but the same amount of care devoted to the beige carpet will produce even more satisfactory results. And rye grass does delay the recovery of the *Zoysia* in the spring. Annual blue grass frequently establishes itself in the open spaces of an unfinished *Zoysia* lawn, and it is even more objectionable than rye grass in interfering with the growth of the *Zoysia*.

The *Zoysia* grasses must not be covered for any length of time during their growing season. While a light leaf mulch during the winter may keep the grass green, a heavy mulch during the summer will kill it. Thus top dressing is dangerous to *Zoysia* grass. A very light top dressing can be used with extreme caution early in

the growing season, but the grass must not be completely covered at any point. It is well to remember that weed seeds are constantly falling from the air and that they germinate and grow more easily on top dressing than upon *Zoysia* grass blades.

The clippings of *Zoysia matrella* are unlike most grass clippings in that they do not readily decay. They should be removed from the lawn unless they are very short. Since they do not ferment and heat rapidly in piles, they can be used as mulch for many shrubs. In the compost pile they need chemical aid to produce humus within several years. It is easy to see why *Zoysia* grass is then so poor a forage crop. Cattle find it unpalatable and quite difficult to digest. But what a thatched roof it should make!

One characteristic of *Zoysia matrella* that is somewhat unique is its very slow but steady spread over a concrete walk. In the course of several years it may cover such an area to a distance of a foot or more away from the soil in which it is growing. The soilless area will be thoroughly covered and the mat of *Zoysia* can be lifted from it, cut loose, and planted on top of any good soil to grow vigorously. This very slow spread to an adjacent area keeps the *Zoysia* grass from becoming a troublesome invader of gardens. One or two easily performed edgings a year will keep it in check. The rate of spread for *Zoysia matrella* is usually counted as five inches a year, but it can be made greater than that, and for the *japonica* it is almost always greater. The length of time required for a new planting to cover its area is determined largely by the initial delay after planting before the plants begin sending out their runners. After these runners start, the filling in does not take very long.

Observation of this initial delay in the growth is liable to lead one to the conclusion that the sprig planting can never produce a lawn so quickly as will the planting of blocks or plugs of the turf. But records kept of many plantings have

shown that this is not true. Blocks of the vigorously growing turf, cut four inches square, will, of course, spread faster than single stolons dried before planting. But plugs made by a two-inch plug cutter have been, in my experience, slower to start and spread than sprigs kept moist and properly planted. In one situation, however, the plugs show a decided advantage. That is in the planting of *Zoysia* grass in an established lawn of Bermuda grass. Sprigs have a slimmer chance of success against competing grass than have the plugs. But in any case, turf plugs, to be most valuable, should be cut from a clay-grown *Zoysia*, never from sandy soil.

The variation in amount of *Zoysia matrella* turf used to plant a given area is very great. Closer planting and larger sprigs do speed up the area coverage, but not in proportion to the quantity of material. The most frequently used ratio has been one square yard of the sod to forty square yards of lawn area. This permits sprigging at ten-inch intervals. But by using three-inch single sprigs, it is possible to cover as much as one hundred and twenty-five square yards at six-inch intervals both ways. The labor cost involved in planting is so much greater in this case that any economy of material may be lost in the waste of labor.

Complete sodding of the lawn area is a common practice in many cities. The quick result in an established lawn finds many a home owner willing to pay the much higher price for his lawn. With no grass is the advantage of the finished lawn so great as with *Zoysia* grasses. The cost of *Zoysia* sod, however, has been so great as to make this solid sodding rather unusual. But with the increase in number of *Zoysia matrella* nurseries scattered throughout the *Zoysia* area and the decrease in price of the sod, that method of establishing a *Zoysia* lawn is becoming more common, for the labor cost is much lower. In these days of soaring labor and disappearance of such non-unionized help as the yardman, that saving may be critical. It is probably fortunate that the great increase in the number of men who have

reached the age of retirement has given the nation a growing and inexpensive labor force to keep their own lawns and gardens in better shape than ever.

For complete sodding, the soil should be prepared as for sprigging, and the quarter-yard squares of *Zoysia* sod placed upon it with two to four inches of space between squares. After completing the placement, tamp or roll the sod into the underlying soil. If this does not fill in the spaces between squares, such filling should be done with loose soil or sand. The stretch of the sod after it is taken up from the nursery, together with the margin of a few inches between squares, may permit coverage of an area a quarter larger than the total area of the sod used.

In contrast with this immediate effect of complete sodding, the time required to establish a *Zoysia matrella* lawn from the date of sprigging varies with the weather, the season, the location, (soil, light, tree root competition), and with the care given to the planting. Under normal conditions, coverage can be expected in one year, but it is possible in six months, or it may take three years. The latter is unusual and seldom occurs today. Excessive shade, deficient plant food, excessive weed competition, deficient water supply, or silting from the wash of a slightly eroded soil are the most probable faults in unusually slow growth. For in spite of the fact that *Zoysia matrella* grass is better able to endure shade than almost any other lawn grass, it does grow much more slowly in the shade than in full sunlight. Sometimes advantage can be taken of the shade tolerance in establishing *Zoysia* in a Bermuda grass lawn. The Bermuda suffers from lack of sunlight more than does the *matrella*. But if a lawn contains too many trees with low-hanging branches and heavy foliage, it may be necessary to trim back the lower branches to let the *Zoysia* have sufficient light. In general, it is worth remembering that much of the inhibition to lawn growth caused by trees is from the greediness of the tree root system for both food and water. Double the supply available to the grass by frequency

of application rather than by an increased amount applied at one time.

For its proper zone, though, is *Zoysia matrella* an ideal grass? The answer to that question must depend upon your ideal. If you want a grass that is green in winter as well as in summer, *Zoysia* will not do. And neither will any other grass now known. If you want a grass that "crowds out all weeds," but will not invade your garden and crowd out all flowers, *Zoysia* is nearer to your demand than any other, but it will not crowd out oak trees or many other plants out of place in your lawn. Squirrels do not consider the oaks they plant as weeds, nor do the winds hesitate to scatter onion seed from your neighbor's lot to yours or even from yours to your neighbor's lot. Chickweed, annual blue grass, and wild onion seem to succeed for a brief period during the early spring in growing upon the uncut *Zoysia*, but the mower easily holds them in check until the *Zoysia* and the hot weather finish them for the summer. Many people who have read and believed wildly exaggerated advertising (e.g., "Throw away your mower") find the need for care of a *Zoysia* lawn a rude shock. Their demand for an utterly care-free lawn is thoughtless in that the features they demand are contradictory. For instance, we ask for a stiff-bladed cushion carpet of grass to walk upon, but must have a firm non-resistant turf to let the golf ball roll. We must have fast coverage of the planted area and slow growth of the lawn to be edged and mowed.

No plant is perfect from the standpoint of every user. Improvement in some of the characteristics of *Zoysia matrella* has long been sought by various methods. Close observation of fields of this grass has been tried by many growers in the hope of finding some special strain that might be better than the common run. Among other grasses, this has been successful, as in the case of Merion blue grass, the various strains of bent grasses, and, among the forage grasses, of Alta fescue and Kentucky 31 fescue. Several growers of *Zoysia matrella* advertised the

differentiation of strains for special purposes. The very scant supply of seed that could be secured from the plants made difficult the efforts to grow new *Zoysia matrella* plants and to select from these the more promising strains. But with infinite patience this was done by growers without the resources of research laboratories. Although some finer leaved and more beautiful turfs were produced by this method, they seemed to possess the common fault of very slow recovery from winter dormancy, in contrast to the early greening of the common strain of *matrella*.

About 1952 a new *Zoysia* grass came into the market with considerable fanfare. This was called Meyer *Zoysia*, Z-52, and was offered in small quantities by nurseries in the vicinity of Washington, D. C., at a price that approximated forty-five dollars a square yard. The species was not mentioned in the advertising or in the publicity, but examination of the sod showed it to be a *japonica*, though of much finer blade than the common run. Rapid growth to exceed that of the *matrella* was stressed, and the greater zonal range used as an appeal. With radio, television and national magazine publicity, the advertising campaign found a tremendous response and led many a purchaser to the expectation of a quick, easy *Zoysia* lawn simply by plugging in to any area, grass covered or bare, one-inch plugs cut from the thin sod sold.

The Meyer *Zoysia* is a greatly improved strain of the *japonica*, capable of making a very handsome turf during the growing season and lacking the loose straw appearance associated with the common *japonica* during the winter. It can be distinguished instantly from the *matrella*, however, by its coarser blade, and in the autumn by its earlier discoloration. Its spring recovery is excellent—almost simultaneous with the *matrella*. It does not thrive so well in the shade as does the *matrella*, but the faster growth with full sunlight tends to exaggerate this difference. The mature turf is not so thick as that of *matrella*.

According to the service bulletin of the National Better Business Bureau, dated February 27, 1956, the Meyer Zoysia was selected from plants grown from seed by the United States Department of Agriculture in 1941 and developed by the Department, the United States Golf Association and Agricultural Experiment Stations. It was named for Frank Meyer, plant explorer, introducer of Centipede grass. The director of the U. S. G. A. Green Section during the years of initial promotion was Dr. Fred V. Grau, who was chiefly responsible for the success of that promotion.

In the spring of 1955, another new Zoysia was released to nurseries for propagation, this time a hybrid cross between the *japonica* and the *tenuifolia*, named Emerald Zoysia. In 1956, newspaper advertisements have offered the new grass for sale, the price quoted being in terms not of square feet or yards, but of area that can be planted with the amount sold for the amount charged. "Enough sprigs to plant 150 sq. ft. on six-inch centers \$4.95; enough to plant 1200 sq. ft. \$24.95."

Emerald Zoysia is an excellent grass. It has a beautiful color, as have all of the Zoysias when growing vigorously. It has a leaf slightly finer than that of the *matrella*. It grows faster than the *matrella*, but does not grow so tall. Its stems are shorter than *matrella* stems and this may reduce the discoloration that can follow "scalping" with the mower. Its shade tolerance seems to be good. It forms a thick wear-resistant turf and has shown no susceptibility to disease or insect enemies. In short, it appears to have the good qualities of *Zoysia matrella*, to be slightly finer leaved and to be a faster grower. If its cost were the same, I would use Emerald Zoysia in planting any new yard of my own except one bordering a garden which I wanted to remain free from invasion as long as possible. Characteristics of the Emerald to watch are shade tolerance and drought resistance. It is possible that years of experience may reveal some decided advantages or disad-

vantages of this hybrid compared with the common *matrella*. And years of propagation will certainly reduce the price. The zonal range for Emerald Zoysia has not yet been determined, but there is at present no evidence that this grass will not succeed wherever any Zoysia may be grown.

The production of Emerald Zoysia was a triumph of research in plant breeding. *Journal of Agronomy* in 1952 printed part of a thesis submitted for the degree of Master of Science at the University of Maryland by Ian Forbes, Jr., on the subject of Chromosome Numbers and Hybrids in Zoysia. This study was carried on during the academic years 1947-1948 and 1948-1949. The exceedingly interesting account of the investigation of all possible combinations of cross breeding of the three species set me to rummaging among my old files for notes taken at the University of Chicago in 1905. One lecture in particular I wanted to find—on The Physical Basis of Heredity, delivered by a visiting biologist. (Today he would probably be known as a geneticist). This was not my field, but as a would-be physicist I listened to dozens of lectures in other fields that might throw some light upon the riddle of the universe. My search was in vain. Termites had preceded me and destroyed many a file. But memory of one statement by that lecturer remains. After summing up the known facts of that day regarding chromosomes and the Mendelian ratios of inheritance, the speaker remarked that many if not most of the questions he raised would probably have to be answered by "research workers not yet living."

Dr. Forbes is at present research agronomist of the United States Department of Agriculture at the Coastal Plain Experiment Station, Tifton, Georgia. From that station have come several remarkable results of research carried on by Dr. Burton and his staff. The development of different Bermuda grasses: Coastal, Suwanee, Tiflawn, Tiffine, Tifgreen, has shown some of the things that

can be done in breeding and selection of special purpose grasses.

All of the new lawn grasses, like most of our improved plant life in America, have been secured for us by our national Department of Agriculture, but it is only natural that the non-agricultural products should be soft-pedaled in comparison with the trees and fiber plants and the food-stuffs for cattle as well as human beings. Few of us realize the extent of plant exploration and importation of new plants, and growing and selection and plant breeding that is carried on by this Department. In the *1948 Yearbook of Agriculture, Grass*, one section, devoted to the Search for Better Grass, contains two chapters of decided interest: The Breeder's Ways and Means, and Developing Grasses for Special Uses. The close co-operation of the Department with the United States Golf Association Green Section and the Crop Improvement Associations of the country there mentioned has succeeded in introducing the new lawn grasses to general use much more rapidly than would be possible without such help. This is in sharp contrast with the utter inadequacy of the means available to the Department only a decade or two earlier for securing commercial production of new foods made available by the Department. But it has caused some criticism by nurserymen who learned belatedly that they were not among the original list of commercial propagators. Too frequently this has resulted in refusal to accept the restrictions of the Crop Improvement Association and a decision to rely upon the nurseryman's own reputation for care in producing stock of the highest standards, for the restrictions involve a delay of a year or two or even more, and it is during the very first few years that supply is scarce and demand relatively high. The possible profit drops sharply with the increase in the supply and the decrease in price obtainable. But the very nurserymen who thus rebel after careful weighing of the Association's restrictions will generally admit that the Crop Improvement Association is probably the best device that can be set up

for giving the public better plant products.

In our search for an ideal grass, we have to realize that many of the desiderata are incompatible. Evergreen, shade tolerant, heat and drought resistant—fine. We may not be able to secure such grass, but at least we are extending the limits in that direction. But when it comes to speed of coverage and lack of aggressiveness in taking over a garden, it would seem necessary to breed a certain amount of intelligence into the grass to produce the proper discriminatory powers. If you can't have both, which do you want? Speed of coverage is important the first year. Slowness to invade is important forever after.

The production of plants made to order is a fascinating possibility. Cross pollination of the easily controlled garden flowers is practiced by thousands of "hybridizers" among the garden enthusiasts of the world. We in America have not reached the stage long ago established in Japan of bringing forth new and utterly unique forms of ornamental plant life. We have been too busy developing other things that we considered more useful. If the energy that has gone into the development of our automobile or our telephone industries had been turned into the production of grass and flowers, we might have a wonderful lawn and garden for every home in America, but we certainly would have fewer homes and more hay than we would know what to do with!

We have reached a time in our national life, however, when we can consider the beauty of our homes and parks, our cities and countryside, of vital importance. Our physical environment is not simply the concern of the very wealthy, and of garden clubs, and of old men, and of professional landscapers. It is a matter of national pride, of state and city and neighborhood pride, and, above all, of personal enjoyment in adding beauty to our own property. For this purpose the *Zoysia* grasses are proving of immeasurable value.



A cluster of 'Herbert,' one of the largest, finest-flavored, and most productive blueberries.

The Big Six Blueberry Varieties for Northern States

GEORGE M. DARROW¹

Dr. F. V. Coville began his blueberry breeding in 1909. It resulted in the introduction of the first named variety, the 'Pioneer,' in 1920; and to date twenty-nine varieties, fourteen since Dr. Coville's death, have been named as a result of

his work. Probably no others will be named, though at least two others have proved especially valuable as parents, one for high flavor and the other for large size. Those termed the "Big Six" were all introduced recently, and are



A cluster of 'Blueray' blueberries, which ripens eight to ten days after 'Earliblue.'

productive. The chief fault of the variety is its tight cluster.

'Bluecrop' is the third in season. Its berries, next to 'Berkeley,' are the lightest blue, and their size is large throughout the season. The bushes are very hardy and drought-resistant.

'Berkeley' is fourth in season and the berries are the lightest blue of all high-bush varieties. They are very large, firm, and crisp, with a mild sweet flavor.

recommended to replace earlier introduced varieties. In the areas from Maryland to New England and west to Michigan and in the Pacific Northwest, these six cover a long season—in the Washington, D.C., area from about June 10 to August 1.

The six northern varieties, listed in order of maturing, are characterized as follows:

'Earliblue' is the earliest and replaces the older 'Weymouth,' 'Cabot,' and 'June.' It has large, light-blue berries that do not drop.

'Blueray' is the second earliest and should replace 'Rancocas' and 'Stanley'; its berries are much larger than those of either. They do not crack as do 'Rancocas' and have much finer flavor. The 'Blueray' bushes are also very hardy and

'Herbert' is a bit the largest fruited and best flavored, with a flavor that appeals to all. 'Herbert' bushes are also very hardy, but its berries are slightly softer than those of the other 5.

'Coville' is the latest. Its berries are also the most tart, and they hold on the bushes the best of all except 'Earliblue.' The berries become less tart as they mature so that late-picked ones are fine flavored. 'Coville' and 'Herbert' berries are better than the others for pies.

All of these six varieties can be seen in bearing in New Jersey, New England, and Michigan. In summary, 'Earliblue' berries are earliest, 'Berkeley' the lightest blue, 'Herbert' the largest; 'Berkeley,' 'Blueray,' and 'Coville' berries are almost as large and 'Earliblue' and 'Bluecrop' only slightly smaller; 'Herbert' berries are the finest flavored.

Another set of five—'Angola,' 'Croatan,' 'Wolcott,' 'Murphy,' and 'Scammel'—is suggested for Eastern North Carolina and adjacent areas but is not recommended in Maryland or northward.

¹Principal horticulturist, Horticultural Crops Research Branch, Agricultural Research Service, U.S. Department of Agriculture.

All photographs provided by that office.



A five-year-old bush of 'Earliblue' blueberry from which five pints of ripe berries were picked at one harvesting.



A close view of a pint of ripe 'Earliblue' blueberries — the earliest northern variety.



'Rubel' blueberries



'Berkeley' blueberries

'Rubel,' the finest selection of wild blueberries, averages less than half the size of the sweet 'Berkeley.'



'Dixi' blueberries



'Coville' blueberries

The 'Coville' has proved to be one of the best commercial varieties and is probably the most planted of the Big Six. These two varieties are sister plants; both were selected by Dr. Coville, but the 'Coville' was not introduced until 13 years after the 'Dixi.'

All-America Selections

W. RAY HASTINGS

In the height of the depression of the thirties, All-America Selections was born, in 1932. Seedsmen were looking for anything to save their business, to keep from dropping their help who could find no jobs elsewhere, to bring back their trade.

Garden, home and farm magazines were filling their few garden pages with most anything of news value. Many articles were appearing that had no practical value, in fact were causing disappointment because garden items seemingly recommended, and there was plenty of time and practical use for gardening, were impossible to obtain. Some writer had seen or heard of a plant in South Africa and another had obtained a bulb of gladiolus or a rose plant from Australia, so the garden writers created a demand for these new things. They could not be purchased. Advertisers and the horticultural industry, as well as the publications, suffered.

No seed firm could know of all the good novelties before introduction. They were kept secret until ready to release the few good ones and all the others. Plant breeders seldom were recognized. It cost more to promote a new variety or cultivar than the introducer could hope to get out of it.

Introductions were frequently confined to one firm and only a pittance of seeds, bulbs or plants was available for distribution. If an article appeared in praise of a Hastings' introduction, all the rival firms, particularly those who advertised in that publication, had good reason to be aggravated. The editor or writer may have seen a novelty but probably described it as given to him by the introducer.

Times were hard. We couldn't afford to check on the various breeders and growers in Europe, California, and elsewhere every year, even if length of season permitted. If we thought we had something special from some other originator, our policy was to try it in our own trials be-

fore offering it. So, we frequently lost out on its introduction. Sometimes we were glad. What could we do to get dependable novelties, not only for our firm but also for the other seed firms as well? What could we do to get dependable news, and they must have news to keep reader interest, in the publications? A few newspapers were beginning to see the advantage of a regular garden column. Garden clubs were becoming popular.

Unlike the Royal Horticultural Society, with trials at Wisley to represent England's climatic conditions, in America we have many soil and climatic requirements. For dependable guidance to American gardeners, we would need a number of trial locations. And, instead of bringing in a few judges when most of the asters were in bloom, we wanted to know their all-season behavior, early, medium or late bloomers, disease resistance, length and quantity of bloom under the various seasonal and sectional conditions. Recommendations could be general or perhaps sectional.

We could not afford to establish such trial grounds, pay for their upkeep and judging. We had to use established trial grounds where their heads or directors grew standard varieties for comparisons and had good general knowledge of either flower or vegetable varieties already in commerce. There were few such judges with trial grounds.

Besides, perhaps without exception, we were told that plant breeders would not send us their prized prospects before introduction. They were held under lock and key, so to speak. We could only try.

Regardless, All-America Selections was started with ten vegetable judges and ten flower judges, each with trial grounds and all, then, within the seed industry. They were sponsored by the Southern Seedsmen's Association. Other sections were represented in associate memberships but the American Seed Trade As-

sociation added its endorsement and co-sponsorship at its next annual convention. Since A.A.S. was to be governed by the judges, not by the seed associations, each judge was carefully considered before endorsement. Naturally, the trade has to have confidence in the judges or it would not submit entries for the trials.

The A.S.T.A. Executive Committee could not name a substitute for any of the twenty judges in whom they would have more confidence. No entry fee was charged. It was world-wide competition in these outdoor trials. A voting point system was developed, based on comparisons with the best strains of similar standard varieties. This system is still in effect, explanations being changed but slightly, although point requirements for award consideration have been raised a couple of times.

We were amazed at the number of entries received. If I remember correctly, the second year of trials brought 250 entries, 101 vegetables and 149 flowers. All samples had to be equally divided, packed under kind, type and number only for identification. All judges' reports were due by October 1st and winners were expected to be introduced as such on January 1st, established as the birthday of all new varieties.

Telegrams and telephone calls usually got all reports in by about October 10th. Wires and cables verified stocks available and asked for photographs. If without reasonable stocks for wholesale distribution, winners were carried over for the next year's introduction. The chairman even advised on prices, believed reasonable and acceptable for cooperative promotion by seedsmen. Many things were new in this manner of distribution and this operation had to be satisfactory to the originator or entrant and to the retail dealer to get his promotional help.

New trial grounds and judges were gradually added. A couple were dropped for not properly attending to their trials, which are inspected and reported. A.A.S. now has twenty-three vegetable judges and twenty-six flower judges. Newly elected judges are provisional until both their trials and their reports are favor-

ably acted upon by the nine directors.

While largely run by the Chairman for several years according to By-Laws and Regulations under a Constitution adopted in 1935, regular officers have been elected annually since 1940. In 1948, a Charter was granted and it became a non-profit educational horticultural corporation.

Since 1935 it has been supported, except for trial entry fees, from voluntary subscriptions from the seed industry.

In 1935, A.A.S. adopted a By-Law inviting similar testing and screening of other horticultural materials. Since each specialty would necessitate a different set of judges and financing, it was believed that those commercial firms most interested should be responsible. A.A.S. was being flooded with requests to include roses, gladiolus, chrysanthemums, dahlias, iris, perennials, fruits, berries, shrubs, etc., in its testing.

There is a latent demand from gardeners for such testing and dependable recommendations. The horticultural trade as well as gardeners are confused with the hundreds of new introductions each year.

The Men's Garden Clubs of America, several years ago, passed a resolution asking for such as All-America Selections pre-introductory testing and screening of all plant material. For more sensible and satisfactory gardening in America, greater popularity of the different kinds, I believe that such screening will continue to develop.

All-America Rose Selections was organized January 8, 1939 at Chicago and has promoted winners since 1940.

All-America Camellia Selections had its organization meeting in New Orleans a few years ago.

All-America Gladiolus Selections organized in Cleveland and had its first trials in 1953. Two beautiful new glad winners were introduced January 1, 1956. There are thirty gladiolus trial grounds, with forty-eight entries in 1955.

All-America Chrysanthemum Selections organized in 1954 and trials were started that year. Winners, after two years of trials, may be selected next year. There are fourteen trial grounds at present, with more to be added. Over twenty

trial grounds applications are under consideration. In all, there are now some one hundred thirty trial judges for the several All-America garden subjects.

All-America Selections, with forty-nine judges, now requires two years to complete trials. Entries being mostly annuals, judgment may be made with indicative trials in one season. However, from germination failure, freeze, flood or what not, unless a fair trial is obtained the first season, the judge runs a repeat trial the second year. Sometimes, seeds of the nearest variety for comparison are sent along to plant with the entry. Unless claimed entirely distinct, judges are notified of similar varieties with which to compare the entry. Claims for the entry, as disease or drought resistance, keeping qualities, size, vigor, yield, earliness, etc., are specified to the judges especially to check carefully, not to take for granted.

After a fair trial, if the kind can be grown satisfactorily at his location, the judge votes his points according to behavior at his location only. No points are voted to an entry unless a judge believes it adapted, sufficiently different to be given a new name and is worthy of introduction. One or two points may be given for such worthiness and desirability. If believed of minimum award worthiness, he may give three or four points and also recommend a bronze medal award. Silver medal merit would call for five to seven points and, if especially outstanding, a gold medal recommendation would call for seven to ten points.

The judge's comments and notes, with comparisons of similar kinds, should bear out his voting points. He also notes whether it is recommended for garden or commercial use or both. He may recommend it, without award, for regional or for special purpose uses, such as canning or freezing or shipping uses in vegetables.

The nine directors, elected by the judges, meet in January to go over the tabulation of points, recommendations and comments. Bronze medal or minimum award requires an average of three points from every reporting flower judge, also bronze or better recommendation from at least half of those judges. Four

and a quarter points average and two-thirds recommendation are required for silver medal consideration. Six and a quarter points and two-thirds recommendation are needed for gold medal consideration. Judges cannot vote for entries from their own firm or institution. Their entries are allowed pro-rata points as voted by the other judges.

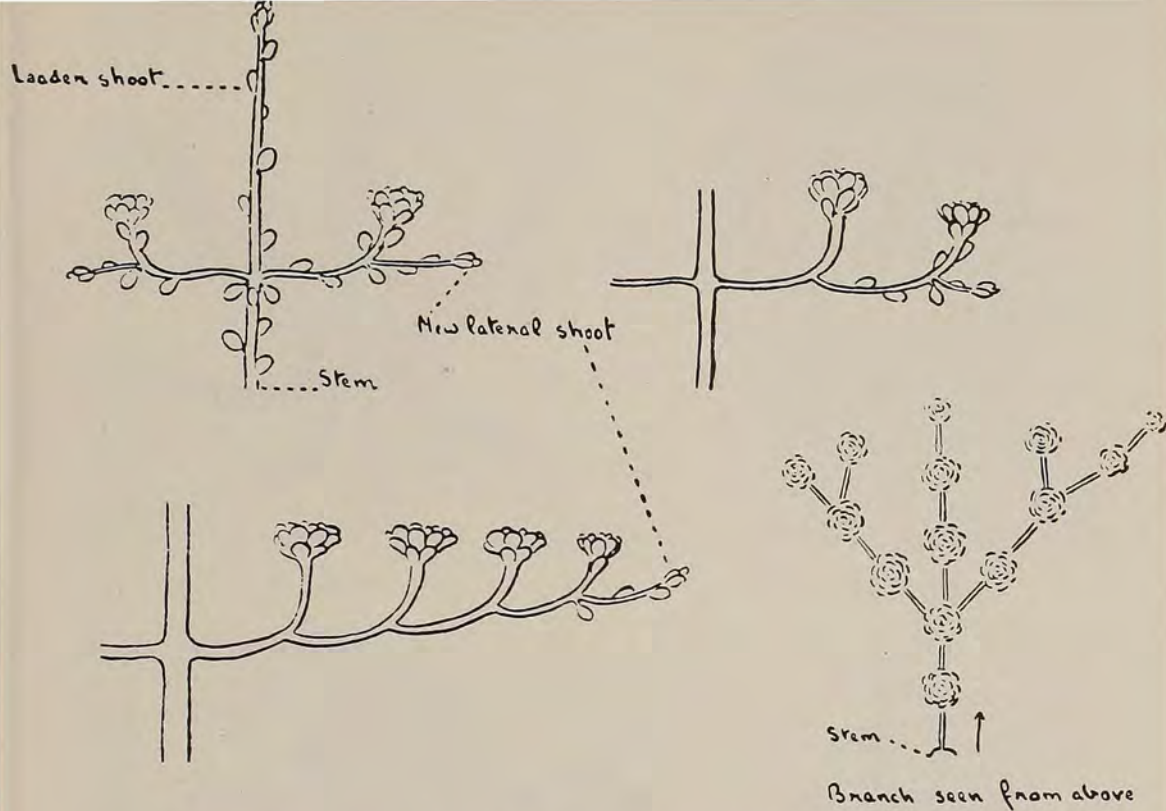
We usually know whether an entry will win or has a chance to win after first-year trials on annuals. Entrants are notified of their entry status as soon as possible. If a likely winner, we must know of seed stocks on hand for increase planting and the estimated amount for wholesale distribution at introduction. Meanwhile, we try to have colored seed packets produced for seed displays, color and black and white pictures for publications and television and motion picture strips.

All retailers selling seeds have equal opportunity of getting original stocks for their customers and are urged to advertise and otherwise help to promote these more worthy new varieties, for their own profit and prestige as well as for more interesting and satisfactory gardening in America.

If an originator or discoverer has a winner, it is accepted and successfully introduced through this cooperation of trade and press. More than a thousand publications with some eighty million distribution, radio and television carry our releases to the public.

This screening provides most valuable guidance to the trade and to the public. It encourages hybridizers with recognition and help on meritorious varieties, discourages introduction on most of the others. A.A.S. does not publicize or otherwise disparage non-winning entries to the industry or the public. It reports results and judges' opinions on non-winners only to their owners for their information. Trial grounds are open to everyone for inspection, noting and photographing at all reasonable hours.

We hope this coordination of variety research makes gardening and planting more interesting, profitable, satisfactory and popular. Everybody benefits and there are millions of new homes and families that need dependable guidance.



Text-Fig. 14. Diagram of Terminalia-branching.

(From E. J. H. Corner's *Wayside Trees of Malaya*.)

Six Sterculias

EDWIN A. MENNINGER

If an engineer had undertaken to design a tree, the result would have been the Panama Tree—so called because it is the national tree of Panama and because from its Indian name "Panama" the republic derived its title. It is a giant shade tree, sometimes to 120 feet, with accordion-plaited leaves that may be as large as 24×36 inches. The flowers have no petals but the bell-shaped 5-lobed calyx is reddish and wooly outside, dark red and greenish yellow within. Botanists call this tree *Sterculia apetala*. Although there are a hundred kinds of *Sterculia* trees in tropical countries all over the world, only two are often planted in Florida; four others are seen rarely.

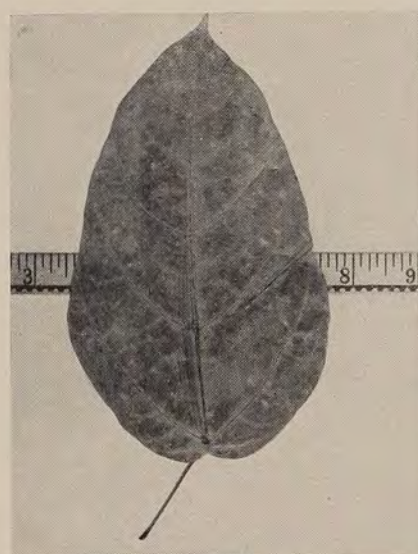
The Panama tree's design is its most striking feature. It is conical in shape, so the long branches are at the bottom and the short ones near the top. Its branches are in layers, like spokes of a wheel. Each individual branch arranges its branchlets on the top side only, in erect structures that are the framework of pyramidal clusters of leaves. It is as if a branch grew out horizontally from the tree a ways, turned up to put on a few leaves, then sent out a forward extension that grew horizontally some more, turned up to put on a rosette of leaves, and so on. This form of growth of tree limbs, observed in many tropical trees, is termed "Terminalia-branching."



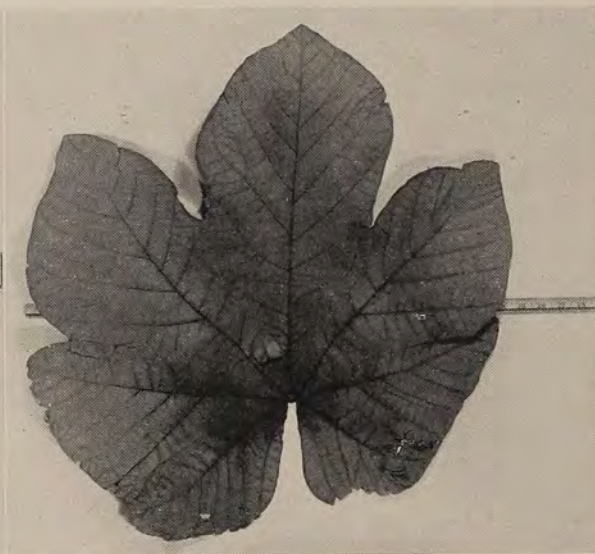
Sterculia tragacantha



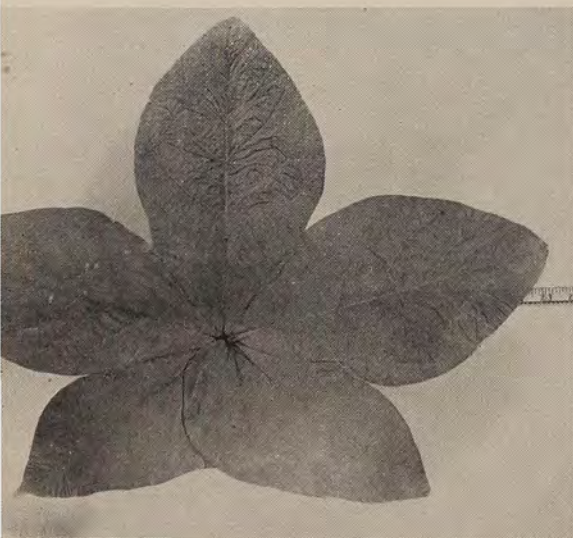
Sterculia colorata



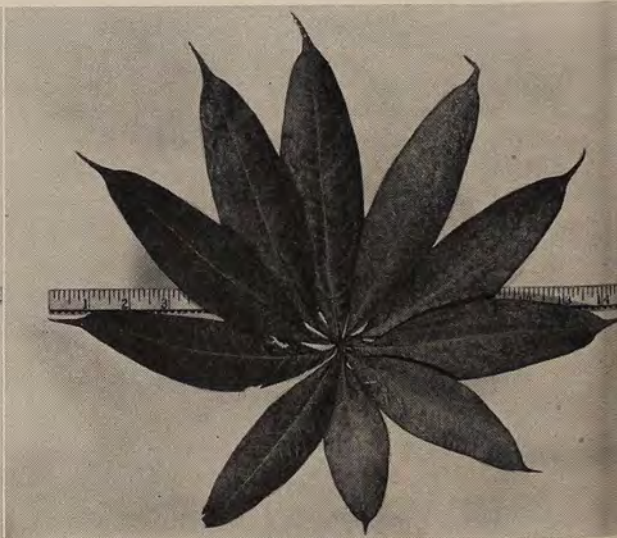
Sterculia sp. (D.F. 235)



Sterculia sp. (P.I. 73070)



Sterculia apetala



Sterculia foetida

It derives this name from the genus *Terminalia* which provides many examples of this peculiarity, as illustrated by the diagram reproduced from Corner's *Way-side Trees of Malaya*. The symmetry of the Panama tree does not stop here. Each cluster of leaves is so arranged that the bottom, the middle-sized leaves are half way up with shorter stems, and the top leaves are tiny with very short stems. Each leaf, instead of lying out flat and producing a lot of shade, hangs like a tent, its big lobes plaited around the central point where the stem attaches. The reason for the tent form is soon apparent; the leaves are so shaped and so hung that not one of them shades the leaf below it; all of them get full sun. And similarly, no branch above shades the branches below. Nobody but God or an engineer could have thought of that!

The second *Sterculia* tree, grown in Florida for its magnificent foliage, is best planted in parks away from human habitation, because its reddish flowers not only are not pretty but they have an offensive odor. It might be well here to explain that *stercus* is a Latin word from which the name of the genus was derived, and its English equivalent is manure. To emphasize the tree's most striking point, the botanists call it *Sterculia foetida*. The fruit of this tree, like a baseball, is yellow green with a brilliant pink blush on the "sun side." It bursts open at maturity to exhibit a deep red interior and jet-black seeds.

There are four other *Sterculia* trees to be found in Florida, all rare. One is *S. tragacantha* from West Tropical Africa, with brilliant scarlet, velvety seed pods; it is a big tree to 80 feet with huge buttresses and trunk, and its purple-red flowers in the leaf axils in January when the tree is leafless make it a conspicuous object on the landscape.

Dr. David Fairchild found this tree in West Africa thirty years ago, sent seed home, and in his book *Exploring for Plants* made this note: "On the outskirts of one of them (clumps of undergrowth near Konakry, French Guinea) stood a tree of *Sterculia tragacantha*, Mind., whose velvety pods were as brilliant as those of the *Cnestis* we had seen the day before, only these were scarlet instead of crimson. Should this tree be adapted to street culture, some day these masses of color may please other American eyes than mine."

Dr. Fairchild similarly was responsible for the introduction of a *Sterculia* tree, still unidentified and known only as D. F. 235, from the islands of the South Pacific. He wrote about this tree in the January 1952 issue of the *Bulletin* of the Fairchild Tropical Garden:

"On February 19th, 1940, when Anne Archbold's Junk *Cheng Ho* was anchored in the famous straits of Lembeh on the East Coast of Celebes, the members of the Fairchild Garden Expedition cruised about looking for trees that would grow on or near the seashore.

"Among the seeds collected there was a handful of pretty brown ones, which I shelled from a brilliant scarlet pod that I took to be the pod of a *Sterculia*.

"Ten years have passed, and only to-day have I come into the possession of a potted plant; one grown in the Fairchild Tropical Garden from a seed of a tree now fruiting in Colonel Montgomery's garden. A bunch of its fruits attracted the attention of the guests at one

S. tragacantha—a large, spreading tree. The clusters of brilliant red seed pods warp open to expose the black seeds, putting on quite a show. Leaves are up to 6 x 8 inches, without lobes. *S. sp.* (D.F. 235)—a handsome strand tree found by the Fairchild Tropical Garden expedition of 1940 growing over the salt water on Lembeh Island, Celebes. Its large pods turn bright scarlet when ripe. *S. spetala*—with its plaits smoothed out until the bottom lobes overlap. These leaves sometimes are three feet across.

of the Flower and Fruit Shows in the Fairchild Tropical Garden.

"Attached to this plant is the tag numbered 235 F. G. Ex.

"Perhaps I may be pardoned for the pride I share with the other members of that expedition in the success of these trees in South Florida, and will be excused for publishing this verbatim account of the discovery of this beautiful *Sterculia*. I am copying from my notes taken at the time, Feb. 19th, 1940.

"*Sterculia species*.

"As we collected from the launch along the cliffs of Lembah Island in the Straits of Lembah, I saw a handsome tree of this species growing out over the salt water; its branches not five feet from the water. It was in flower, and had green pods the size of a green almond fruit and quite as fuzzy. The edges of these fuzzy fruits were turning red and a single fruit had ripened and turned a brilliant scarlet, showing what a handsome thing the tree will be when in ripe fruit. Koorders gives two species only that are native of Minahassa but does not describe them: *S. halmaherae*, Schaff, and *S. minahassae* N. Sp. aff. *S. comosa*, Wall. This may be one of these. Worthy a place near the sea coast of Florida.

"I have felt for a long time that special attention should be paid to the floras of the tropics, for we have a very long coast line, many hundreds of miles of which are blessed with a mild, almost tropical climate. People are crowding into the lands that border these beaches, and are keen to have about their houses trees and plants which will survive the salt sprays which kill so many plants. This tree fruits in the winter season, and it is as beautiful when in pod as that other *Sterculia*, (*S. foetida*), which has already made something of a stir among flower-arrangement ladies. I hope that this plant immigrant from the Fairchild Garden Expedition will find a special place on our strands.

"This rather terse description does not give the keen thrill of discovery I felt on first seeing this gorgeous pod, and imagining it as it might some day be in Florida."

The third *Sterculia* sometimes found in Florida is a medium-sized deciduous tree from India, usually called *S. colorata* but in some reference books known as *Erythropsis colorata*, and in other books as *Firmiana colorata*. Its flowers are more brilliant than are to be found on other members of the family and it becomes a most striking ornamental. Benthall: *Trees of Calcutta and Its Neighborhood* describes the blossoms: "The foliage is shed during the cold season, after which the tree stands bare for several months, but in March a number of stiff, erect clusters of narrow flowers appear at the ends of the twigs, and give the bare branches a strange and cheerful beauty. The stalks of the flowers, as well as the unopened buds and the flowers themselves, are densely covered with scarlet or deep orange down, giving the whole clusters the look of a mass of coral."

One other *Sterculia* tree should be mentioned to make this report complete on species in cultivation in the United States, although too rare to count. In the United States Department of Agriculture Plant Introduction Garden at Coconut Grove, Florida, are two very large old trees, still unidentified, known only as P. I. 73070, grown from seed collected in West Africa by Dr. Fairchild in 1927. Neither of these trees has been known to flower or fruit here, and vegetative propagation has not been possible, but they do produce some enormous leaves, one of which is pictured. Flower arrangers are especially interested in these. The record on P. I. 73070 reads:

"Collected near village of Dablo, between Akkra and Winneba, Gold Coast. A large handsome tropical tree with large deep green leaves and pods the size of apples."

A Book Or Two

Succulent Plants.

300+ pages. Illustrated. \$9.00. (Library).

The Cultivation of Succulents.

104 pages. Illustrated. \$2.50. (Library). Both works by H. Jacobsen, translated from the German by Vera Higgins. Published by Ernest Benn, Limited, London, distributed by John de Graff, Inc., New York. 1955.

First printed in German in 1933, *Succulent Plants* became a standard work even before it was translated into English. The author, H. Jacobsen, is Curator of the Botanic Garden at Kiel, Germany, and a keen student of succulent plants with a very large collection of the plants available for study in the Kiel Botanic Garden. The English translation was made by Vera Higgins, M.A., who is a prolific writer in her own right on Cacti and a student of the other succulents.

In Jacobsen's book the genera of the succulent plants are arranged alphabetically regardless of family which makes for ready reference. 151 genera and 1091 species are described in its 300 pages and 277 species are illustrated with very clear black and white photographs. The book is cloth bound.

Neither this book nor the three volumes of Jacobsen's later work are to be considered as a complete description of all known succulent plants but the species described are the ones that are available to collectors in Europe or in the U.S.A.

Cultural directions for each genus is given and where any given species requires special culture that information is also given with the specific description. The scientific names of the plants are used exclusively as common names usually have only local significance.

For more detailed information on cultivation of succulent plants the reader is referred to: *The Cultivation of Succulents*. This is a 104 page book, cloth bound which includes chapters on: Imported Plants, Seed Production, Propagation by Seed, Vegetative Propagation, Succulents in the Open and Pests and Diseases.

All of the cultural directions in this book are for the European climate and apply equally to the eastern and northern portion of the United States. W. Taylor Marshall, Director, The Desert Botanical Garden of Arizona, Tempe, Arizona.

How to Grow Fuchsias.

Frances Howard. Lane Publishing Company, Menlo Park, California. 1953. 80 pages. Illustrated. \$1.50.

Shortly after the Fuchsia "arrived" at another peak of popularity several years ago, Miss Howard authored this very helpful little book. It is deserving of a late mention because it contains many fundamentals to guide the amateur in his start towards successful Fuchsia growing.

Expertly covered are the usual sections on history, culture, propagation, landscape and indoor uses, and the recommended varieties. Robert Blanchard is responsible for the many line illustrations of unusual quality and detail. M. E.

A Garden Handbook of Ornamental Plant Material for the Greater Washington (D. C.) Area.

The Men's Garden Club of Montgomery County, Maryland. 1956. 100 pages. \$1.15 postpaid from Barr C. Miller, chairman of distribution committee, 2326 25th Street, Southeast, Washington 20, D. C.

This is a concise, realistic handbook for the new suburbanite just starting into gardening in the Greater Washington, D. C., area. It is directed specifically to garden problems in that locality, is written by 19 local residents, many of them nationally eminent specialists in various horticultural fields, and is based on actual local experience.

Frank warnings as to what not to grow start the book off. General articles on soils, fertilizers, and mulches, landscaping the small suburban home, shade tolerant plants, perennials, annuals and biennials, and lawns are accompanied by specialty articles on such reliable groups of azaleas, hollies, chrysanthemums, iris, gladioli, dahlias, daffodils, and small hardy bulbs.

Culturally risky groups as the newer rhododendrons, camellias, lilies, and hardy summer phlox are dealt with honestly.

For the beginning gardener the book is worth more than a dozen of the common horticultural volumes filled with enthusiastic and graceful literary efforts of garden writers who spend their week-ends in *Esquire* sports togs and operate out of libraries.

The book is a completely revised and greatly enlarged edition of a similar handbook successfully published a half dozen years ago. The project should be duplicated by many other communities throughout the country.

The New Greenhouse Gardening For Everyone.

Ernest Chabot. M. Barrows and Company, New York, New York. 1955. 252 pages. Illustrated. \$4.75. (Library).

"This brand-new book by this country's most popular writer on greenhouse gardening is the only up-to-date handbook available for enthusiasts who want maximum results with minimum efforts when they garden under glass. Richly illustrated, it covers everything from the simplest coldframe to practical-purpose greenhouses.

"Culture for some 569 varieties is given in *Plants for Cut Flowers*, *Flowering Plants in Pots*; *Orchids*; *Bulbs*; *Hardy and Tender*; *Flowering Shrubs and Perennials*; *Flowering Climbers and Twiners*; *Foliage Plants*; *Cacti and Succulents*; *Vegetables and Fruits*.

"There are also invaluable tables and charts with blooming dates for a multitude of flowering plants. The late Mr. Chabot shares with you his years of practical experience with the problems of growing plants from cuttings, of potting, pest and disease control, and automatic growing."



U.S. Air Force

A Hinoki Cyperus (Chamaecyparus obtusa) measuring about 25 inches in height in the reviewer's nursery. This specimen is about twenty years old.

Bonsai. Miniature Trees.

Claude Chidamian. D. Van Nostrand Company, Princeton, New Jersey. 1955. 96 pages. Illustrated. \$3.95.

This review is written by an amateur and is intended only to bring this most fascinating subject to the attention of others, who, if interested in the mystery of plant life and have a desire to create something that can be a constant source of pleasant relaxation and enjoyment, may find the answer in Bonsai. Bonsai is not exclusively reserved for any particular race, creed or walk of life. It is open to all who have a love of the great out of doors and especially the tree.

Mr. Chidamian has done an excellent job of accumulating in one book the general principles of Bonsai growing to suit the needs of the amateur. In his own words "Bonsai are planted in philosophy, shaped by art and grown with love."

His book clearly tells of the origin of Bonsai in China ages ago, the adaptation by the Japanese and their subsequent perfection of this intriguing art, and gives step by step the information needed to assist anyone who might be interested to make their own beginning at growing these beautiful tiny trees and suggests many ways in which they might be used in American homes and gardens. Once the beginning has been made, the amateur is on his own. That, the reviewer feels, is where most amateurs want to be. Even should he work, grow and train for years without creating a masterpiece, who could take from him the many wonderful hours of tending, contemplation and inner satisfaction of having had a part in shaping these minatures of nature. It remains as in the poem *Trees*, by Joyce Kilmer, "that only God can make a tree." By applying the general horticultural techniques of plant growing, patience, study and contemplation, man can, however, help to shape the trees to the size and shape desired. That Bonsai growing and training is a slow and never ending process is one of its best features, also the fact that each plant requires its own particular care and so definitely reflects the moods of the grower and trainer that these trees can

not possibly be mass produced, so will inherently retain their artistic and philosophical value.

The book by Mr. Chidamian is well illustrated with photographs of specimen plants and carefully drawn sketches to explain the principles of planting, pruning, wiring and displaying Bonsai. On displaying of Bonsai for decoration of the home and garden, he very definitely points out that if a Bonsai is any good at all it should be displayed alone and not be surrounded by figurines and lifeless props. "So great," he states, "is the magic of these tiny plants that they transcend time, place and creed, their beauty is universal, and there is no decorative style that cannot be enhanced by their natural beauty."

Bonsai are classified by size, shape and number of plants and trunks. By size, large 26-40 inches, medium 12 to 26 inches, small 7 to 12 inches and miniature under 7 inches. Next by numbers of plants in each pot and number of trunks to each plant, then by shape upright, slanting, cascade or gnarled and twisted. There is almost no limit to the different types of trees which can be satisfactorily trained as Bonsai. Obviously there are some with extremely large leaves and fruit which would not be appropriate since the object of Bonsai is to reproduce as nearly as possible a replica in miniature of those wonderful old trees of nature. The size of the plant and root system can be maintained at almost any size desired. However, the leaves and fruit in most cases persist in their natural habit.

Some of the trees recommended are as follows: In the evergreen group, there are the cedars, cryptomeria, cypresses, juniper, pines, spruces, and yew. Of the deciduous trees, the beech, birch, elm and maples are generally the most popular. Also included is a long list of flowering plants and others that are equally desirable for their fruits and berries. Yes, even plants of the grass family such as bamboo, palms and reeds are used occasionally for Bonsai with very good effect. Of course, naturally developed and stunted plants make the finest, most highly prized Bonsai because they are at once so old and real-

istically shaped. Since these are not always available, a trip to the local nurseries usually will yield several plants suitable for training as Bonsai. It must be remembered that since the object of Bonsai is to duplicate the natural, mature tree, the normal nursery stock of densely branched and nearly perfect, symmetrically shaped plants would not be suitable, rather look for plants that have a few strong branches and shallow, well developed root systems.

After being acclimated to the growing pots, these can be pruned or wired in the desired shape. Other methods of securing material for Bonsai are planting from seeds, rooted cuttings, and layering. Sometimes grafting is used but generally the scar of the graft remains so prominent that it is undesirable.

For those who cannot wait to have fine specimen Bonsai, Mr. Chidamian gives the necessary information needed concerning application, for importation processing and the limitations imposed by the U. S. Department of Agriculture. "Actually," he says, "the plant quarantine may be a blessing in disguise, for because of it many more will make Bonsai for themselves, many more will find the real secret of Bonsai that cannot be bought with money."

Pots are to "Bonsai," he explains, what frames are to pictures. They are a vital part of an artistic composition, and just as a fine frame enhances and projects the painting it holds, so the right pot complements and completes the Bonsai it contains. Bonsai pots range in size from 2 to 25 inches in diameter and from 1 to 10 inches in depth. They are always relatively small and shallow. Bonsai pots should be of a subdued color to symbolize earth and rocks to complete the picture of a true object of nature. Young plants are generally potted in new unglazed containers while old plants rate old, highly glazed and expensive pots of soft color.

To keep the trees healthy, pots with adequate drainage must be used.

About soil: The basic requirement of course is one which can hold the greatest amount of food and water and at the same time afford perfect drainage and aeration. The ideal potting soil is composed of four



U.S. Air Force

A fourteen-year-old Douglas Fir in the reviewer's collection measures about twelve inches in height.

basic elements, hard clay subsoil, loam, sharp sand or small gravel and humus. Proportions of each element vary according to the natural habitat and age of the tree, the locality in which grown and to a great extent the grower's own conception of what he thinks best.

Bonsai are grown in the smallest container possible, consistent with the size of the plant. Natural trees and those dug from nurseries are successively root pruned and repotted over a period of a few years to smaller pots to develop a compact, shallow root system.

Before repotting is commenced, all the necessary materials for completion should be on hand. The pot into which the tree is to be placed, new soil, tools for pruning the roots, a location which is protected from the wind and sun and water to be applied as soon as the repotting is done. It is necessary to protect the newly re-

potted tree from strong sun and wind for at least two weeks to allow the soil to become set firmly and for new root growth to start.

The best style for Bonsai is nature's style; the best shape nature's shape. Bonsai growers must constantly study the way each tree grows in nature, and then try to capture these forms in their "bonsai."

The Japanese sum up the qualities of a good Bonsai as follows: first the trunk, second the branches, third the roots. These three things in perfect proportion make the true Bonsai.

Mr. Chidamian explains in detail the methods used to shape Bonsai by pruning, pinching, and wiring. He goes on to give many helpful suggestions about how to water and feed Bonsai. Since they are grown in such small containers they dry out rapidly in extremely hot weather and the limited amount of soil in most cases is soon depleted of the basic nourishing elements needed for strong healthy growth.

Other publications available on this subject are Norio Kobayashi's *Bonsai-Miniature Potted Trees* (Tokyo, Japan Travel Bureau, Vol. 13, 1950), Alfred Koehn's *Notes on Bonsai* (Tokyo Foreign Affairs Association of Japan, 1952) and the Brooklyn Botanic Garden's *Handbook on Dwarfed Potted Trees* (Brooklyn, New York 1953.) Of these, Mr. Chidamian, in the preface of his book says "Even the recent appearance of several small books on Bonsai has proved a disappointment and although well illustrated and written by experts, are all too brief and set to English that is more often quaint than clear." Having read the three books listed above before I had the opportunity to read Mr. Chidamian's book, the reviewer feels that his criticism of these books was unnecessarily severe. Let me hasten to add that he has done a truly outstanding work of consolidating the information contained in these publications and, by adding his own experience and knowledge of Bonsai growing, has accomplished his

purpose of putting the available information into one book. Anyone having the slightest interest in or curiosity about Bonsai will find the answers in Mr. Chidamian's book. His closing words, "No other potted plant grows old so gracefully, increasing in beauty and value with the years. Indeed, Bonsai are a permanent investment in beauty, a priceless heritage, a living bit of immortality."

JOHN A. DORMAN

The World of Plant Life: Second Edition.

Clarence J. Hylander. The Macmillan Company, New York, New York. 1956. 653 pages. Illustrated. \$8.95. (Library).

The World of Plant Life, which has grown into a classic since its first publication in 1939, has been thoroughly revised by the author and brought up-to-date in its botanical nomenclature. This is a comprehensive survey of virtually every common American plant which is not only a guide to plant identification, but also a storehouse of information on the origin of cultivated plants, the economic importance of plants, and the relation of plants to their environment and to each other. Included are 190 full-page illustrations from photographs and over 700 line drawings selected by the author from his own collection.

Chemistry and Uses of Pesticides.

E. R. deOng. Reinhold Publishing Corporation, New York, New York. 1956. 334 pages. Illustrated. \$8.75. (Library).

So fast and widely—almost explosively—has the pesticide field grown in the last two decades that there is now need to invent a name, comparable to the other "ologies," to accommodate this new science and technology. It would have to be a term of wide scope, embracing various branches of chemistry, physics, mechanics, biology, and the art and science of agriculture. Any book short of encyclopedic, would necessarily be limited in coverage to one or two of these disciplines or to a small sampling of all of them.

This book, which is the second edition of the author's *Chemistry and Uses of Insecticides*, takes the latter approach, with emphasis, however, on chemistry and entomology. In its generous literature citations it opens the way to wider horizons in all these fields. The author's name, so widely known among all workers in the pesticide field, is a sufficient guarantee of authentic and up-to-the-minute treatment of this complex subject.

F.A.W.

The Complete Book of Gardening and Lawn Care.

Will Peigelbeck. Random House, New York, New York. 1956. 144 pages, mostly pictures. \$2.95. (Library).

Anyone who has the courage or temerity to write a "complete" book in the garden field is asking for trouble. And, anyone who hopes to write for the beginner has another problem. Add to this an attempt to deal with the whole United States, even if only by suggesting U. S. Department of Agriculture first frost maps and aid from state experiment stations and County agents, multiplies his trials again.

Mr. Peigelbeck comes off rather well on the whole and his own brief four-paragraph beginning should be read with care and full attention.

The pictures, except for a few too obviously posed by non-gardening models, are clear and instructive. The text is simple, readable, and should provide no problem of understanding. But 144 pages are too few for all the subjects he brings up and some of the chapters are of so little value as to be almost useless. If, however, he accomplishes, as we believe he does, his aim to prove that gardening is no mystery, but a very rewarding part of living, his book should be a success, most immediately useful to those who live in regions where gardening is already widely practised and the beginner can find some "old hand" in time of trouble.

B. Y. M.

The Royal Horticultural Society Dictionary of Gardening, Second Edition and Supplement.

Edited by Fred J. Chittenden and second edition by Patrick M. Syngé, with specialists. Oxford University Press, Amen House, London, England, 1956. 4 vols., 2316 pages and supplement, 1 vol., 332 pages. Many line illustrations. Large crown, 4 to., in double columns. Price \$60.00, Supplement separately \$10.00. Available in U.S. through Oxford University Press, New York, New York.

The second edition of the original four volumes, published in 1951 and reviewed in *The National Horticultural Magazine* for July 1953, is not a revision but a reprint of this immensely valuable work. Black faced "A"s have been inserted to indicate that additional matter is to be found in the Supplement. Owners of the first edition can without loss limit their purchase to the Supplement alone.

The Supplement is, of course, new. It is divided into two parts. Part II contains new species, revisions of some genera, corrections, references to illustrations in *Curtis' Botanical Magazine*, cross references to many popular names, and about three dozen additional articles covering a wide range of subjects from abscission to wilting. Part II of the Supplement, particularly its descriptions of new species and of revised genera, makes the Supplement a requisite for the serious gardener who possesses the original volumes.

Part I of the Supplement contains lists of recommended varieties of cultivated flowers, fruits, and vegetables. Horticultural varieties, that is, the cultivated clones and hybrid groups and strains arising from selection and hybridization, were largely ignored in the four original volumes.

The editor of the Supplement emphasizes that the lists are not intended to be complete but rather lists of the "best and most reliable varieties which are available . . . or likely to become available within the next year." Presumably, "best," "most reliable," and "available" embody evaluations solely from a British viewpoint. To an American gardener the lists are in some instances of slight value and this is not primarily because of differences in climatic conditions. Even a gardener in the Pacific Northwest would look askance at some of the lists.

The specialist in hollies or blueberries would draw a blank. The American daffodil specialist would be interested in the list of 130 or so varieties, mainly recent British introductions of trumpets and large cups with the other classes and miniatures largely ignored, but would remain unconvinced of the value of the list for garden purposes here. The American rhododendron specialist has access to lists that are better suited to his needs and contain more data in the American Rhododendron Society's new volume on *Rhododendrons*, 1956. An equivalent comment would be pertinent with respect to the lists of camellias and crabapples. The apple and strawberry grower would find himself in a strange and unknown world but the rose grower would be at home. The American daylily specialist would be unenthusiastic about the daylily list as a whole and the evergreen azalea specialist likely would not survive the shock. Even the lily specialist would be puzzled. Our new tree peonies and peony species hybrids are apparently unknown to the compiler of the peony list.

The lists on the whole emphasize the differences here and abroad in experience with some of the newer plant materials and in their availability. Nevertheless, the discriminating gardener will uncover much in Part I of the Supplement to entice him.

It is intended to revise the Supplement from time to time. Hopefully, it would be well if the financial success of the *Dictionary* proved sufficient to permit integrating Part II of the Supplement into the main volumes another time.

F. P. L.

Register of New Fruit and Nut Varieties 1920-1950.

Reid M. Brooks and H. P. Olmo, with the assistance of cooperating horticulturists. University of California Press, Berkeley, California. 1952. 206 pages. \$3.00. (Library).

This is the first compilation of verified information on the origin and principal characteristics of new fruit and nut varieties originating in North America. It lists and briefly describes 1,106 varieties of fruit and nuts introduced commercially to the trade during the last thirty years. This book gives fruit growers information of new and valuable varieties and will prove of fundamental importance to fruit breeders.

The following facts are given for each variety: correct varietal name with synonyms; originator's name and address; date of commercial introduction; plant patent number with name of patentee, date, trademark name, parentage; and the most valuable characteristics of the variety.

Most of the material was previously issued in separate lists in the *Proceedings of the American Society for Horticultural Science* from 1944 through 1950.

The Wonders of Seeds.

Alfred Stefferud. Harcourt, Brace and Company, New York, New York. 1956. 119 pages. Illustrated by Shirley Briggs. \$2.75. (Library).

"Bow a little to the seed
That knows so much, and hath no need
But soil and dew and a warm ray
From the bright smile that wakes the day."

Alfred Stefferud is the very capable editor of the Yearbooks of Agriculture, issued by the United States Department of Agriculture.

For one who has never thought much about plants, but who has an urge to learn, this little book should be just the trick. It is easy to read and has an abundance of explanatory figures. Although not specifically stated, it was written for children. That fact, however, should not keep the parents from at least glancing through the pages. There is much to attract the eye and the fancy.

If the youngsters can be separated from their own interests and occupations, especially the television, long enough to be induced into reading these few pages, there is every chance that their viewpoint might be enlarged. Certainly, if read with attention, the child is bound to gain a permanent impression about plants and that would add up on the credit side of the ledger even though the impressions were not strong enough to turn all the readers into future gardeners or botanists. If this and equivalent books for the other aspects of nature had been available earlier, perhaps we would not have the present desperate shortage of scientists. The truth, not often officially admitted, but nevertheless true, is that the average course in botany (high school or college) is so deadly dull that the students are forever after soured on the subject.

The book teaches not only botany, but also history and ethnology, which is as it should be. Without plants there would be no people and, of course, no civilization, a fact too often overlooked in the present day of atom bombs.

W. Andrew Archer

Anemones.

Roy Genders. Faber & Faber, Ltd., London, England. 1956. 123 pages, 16 photographic illustrations. \$1.82.

This brief volume is written by a British commercial grower of anemones of long experience. Consequently, the book is largely devoted to detailed cultural and other practices with respect to growing of anemones outdoors and under glass for cut flowers. Particularly is the author concerned with the Poppy Anemones, the de Caen race of single flowers derived from *A. tenuifolia* and the St. Brigid race of semi-double flowers derived from *A. latefolium*, according to the author. Taxonomists attribute both a *A. coronaria*.

Two chapters are given over to some anemone species for the garden. Special emphasis is placed on the need of most for a non-acid or limey soil but at the same time woodland conditions of shade and humus. Not too much help for the amateur outdoor gardener or specialist in hardy anemones.

F. P. L.

Plant Propagation and Garden Practice.

R. C. M. Wright. Criterion Books, New York, New York. 1956. 192 pages. Illustrated. \$4.50. (Library).

This is a review of all fundamental principles involved in plant propagation. Seed production, harvesting, germination, cuttings, layering, grafting, budding, division, etc. In simple language Mr. Wright has created an attractive text for beginning horticulturists and amateurs having an interest in basic methods. General instructions for the propagation of plants within each major plant group, i.e., bulbs, bedding plants, vegetables, house plants, trees, shrubs, etc., are followed by specific information for individual plants which are listed in alphabetical order. Twenty-two pages of photographs serve to illustrate adequately the progressive steps of methods described in the text. Also included is a short section on breeding and inheritance as well as an outline of pests and diseases related to plant propagation.

In comparison to James S. Wells' *Plant Propagation Practices*, Wright's book could be considered a semi-technical publication that is not primarily designed for professional horticulturists already versed in the theories and facts of plant science.

Walter O. Hawley

Soil Warming By Electricity.

R. H. Coombes. Philosophical Library, New York, New York. 1955. 116 pages. Illustrated. \$4.75. (Library).

Soil warming, like so many innovations in agriculture, was considerably developed during the war when it was found that, by use of electric cables, crops could be produced earlier, cheaper, and in greater quantity than by normal methods, both indoors and out-of-doors under cloches and frames. While the technique of soil warming is of special interest to the professional market gardener and the smallholder, its advantages will be enthusiastically appreciated by the amateur who is interested in producing flowers, vegetables and fruit earlier and more abundantly than our climate normally permits.

This book provides full information on the installation of soil warming equipment for greenhouse, cold-frame and cloche and includes a section on the financial aspect. It then covers, alphabetically, those crops which benefit most by soil warming and gives full details of the production of such crops—the selection of seeds or plants, the preparation of the soil and the installation of the cables. The book is based on five years of experiments conducted in Great Britain by the author.

The Camellia, Its Culture and Nomenclature.

The Southern California Camellia Society. Pasadena, California. 1956. 104 pages. Illustrated. \$1.50.

Those interested in culture and propagation, as well as those interested in camellia nomenclature, will find this book a valuable guide, and one well worth their while. From the first planting to the

various methods of propagation the instructions given are described in clear, step-by-step fashion and illustrated with fine pen drawings.

Many illustrations, some in full color, are found in the nomenclature section. This is a comprehensive listing, covering eighty pages, which describes accurately each variety of blossom.

Whether an amateur or a well advanced gardener, your pleasure and knowledge can be increased through this publication.

John C. Hillhouse, Sr.

A Guide to Home Landscaping.

Donald J. Bushey. McGraw-Hill Book Company, New York, New York. 1956. 293 pages. \$4.95. (Library).

Though the latest in landscaping, this has no part of that series which has been exuberant with modern design lavishly pictured and briefly described. Rather, with its line drawings, modest photographs and conservative approach the current "guide" is so arranged as to lead the present and/or prospective owner of a small property through the critical steps of choosing his site and locating the structure, then on through the stages of evolving a simple, usable, development plan for accommodating such trees, shrubs, flowers and "use areas" as may seem necessary. Plant culture is discussed in considerable detail.

As an extension specialist of Cornell University, Dr. Bushey is abundantly familiar with the problems of suburban and farm homes and, in presenting his solutions to these problems, he is eminently practical. As an outdoor man it is not surprising that he includes besides "Hobby Gardens," an excellent chapter on recreational possibilities of the home lot. While descriptive lists of vines, ground covers and woody plants have application primarily in the colder northeast, the principal information of this book can be recommended nevertheless for a much wider audience.

H. T. S.

The Hemerocallis Journal. 1956 Yearbook Issue.

The American Hemerocallis Society. Edited by Peggie Schulz, Minneapolis, Minnesota. 1956. (To members \$3.50 a year.)

This Tenth Anniversary Yearbook issue, Volume 10, Number 2, also being the quarterly May-June-July 1956 issue of *The Hemerocallis Journal*, is certainly a tremendous boost for the American Hemerocallis Society. Mrs. Schulz has done an impeccable job of gathering data from members of that individual plant society and designing a most attractive format.

The president, Mrs. Carl Marcue, Le Mars, Iowa, writes in her foreword message: " * * * You will find reports on our Society (an international non-profit organization devoted to the dissemination of knowledge on hybridizing and growing the finer varieties of daylilies); ways in which the members have worked to build the American Hemerocallis Society to its present stature; stories about new varieties; hybridizing and growing hints." And so one will.

The American Hemerocallis Society is the Inter-

national Registry for the genus *Hemerocallis*. This yearbook adds some 600 new names to this register. It also gives the details of registering new varieties.

The Old Shrub Roses.

Graham Stuart Thomas. Charles T. Bradford Company, Boston, Massachusetts. 1956. 224 pages. Illustrated. \$6.50. (Library). Printed in Great Britain.

One of the fascinations of the rose is its diversity of form, texture, color, and scent. It seems strange that this rich diversity, largely the result of intensive and complex hybridization during the nineteenth century, is now largely neglected, attention being directed almost exclusively to the limited field of Hybrid Teas, Floribundas, and Polyanthas. However, those desiring to grow the old roses are increasing in number. To those interested, whether on the basis of beauty, fragrance, hardiness, sentiment, curiosity, history or association, Mr. Thomas' book should be a welcome and valuable contribution. It is agreeably written, and characterized by enthusiasm, intimate knowledge of the subject matter, and a wealth of information.

The author describes old roses as "stalwart, thrifty shrubs, able to fend for themselves, bearing fairly good foliage; their flowers are borne in the utmost profusion at midsummer in colors from white through pink to violet, fragrant to an unbelievable degree, and showing a perfection of form evolved by skilled florists of the past; they thrive on a variety of soils and need little pruning."

The book is divided into two parts. The first part treats the origin, development, and culture of the rose, and includes reprints from the *Journal of the Royal Horticultural Society* of two papers by the late Dr. C. C. Hurst on origin and development from the genetic and cytological viewpoint. In the second part, the distinguishing characteristics of 159 old roses still in cultivation in England are concisely and expertly described. These roses are in the groups Gallica, Damask, Alba, Centifolia, Moss, and Bourbon. The final chapter contains notes on the old yellow roses and a few others.

Mr. Thomas classifies the Hybrid Perpetuals not as old roses, but as successors to them. What constitutes an "old rose" is necessarily an arbitrary decision. The Hybrid Perpetuals, which originated with "Rose du Roi" in 1816, and dominated the garden scene in the period 1840-1890 are by many so considered.

According to Mr. Thomas, the Hybrid Perpetuals "are from the old roses in style and quality." This is doubtless true of many, but, in my opinion, they should not be so disposed of as a whole. The author further states that the Hybrid Perpetuals have "virtually disappeared." This is not quite the case in the United States. Tenner in 1951 listed and described 113 Hybrid Perpetuals in his collection, and comparable collections exist, for example, in the Bronx Botanical Gardens and Elizabeth Park, Hartford, Connecticut.

According to the author, the book was written to shed light on the principal old groups. It is his hope to write another volume embracing the *Rosa rugosa* group, and some of the splendid species; also the newer races, such as the Musks, and Korde's new hybrids of *Rosa spinosissima*, *macrantha*, and *rubiginosa*.

Wilson Lynes

Recent Research Results

DONALD P. WATSON¹

Flavor of sweet corn: Most good gardeners for many years have known the importance of the freshness of the flavor of asparagus, green peas, and sweet corn. Recently, J. D. Winter, R. E. Nylund, and A. F. Legun, as part of a general study on the marketing of fresh sweet corn, demonstrated the reason for this fine flavor at the Minnesota Agricultural Experiment Station.

They harvested sweet corn, rushed half of it to the packing house, precooled it by icing, and kept it under refrigeration even in self-service racks in the stores. The other half was passed through the same channels of distribution and was stored under refrigeration only after it reached the store before it was moved to the display counter.

These horticulturists showed the precooled corn lost only .6% sugar in contrast to the corn that had not been precooled which lost over three times as much sugar in the first thirty hours. After thirty hours sugar loss from either treatment was negligible.

Using a numerical scale of from one to ten, with ten as the best flavor, precooled corn, both thirty and fifty-four hours after harvest, produced a score that was significantly higher in flavor than the corn which had not been precooled.

There was little sugar loss between thirty and fifty-four hours after harvest, but the flavor continued to decline over that period. It was shown, furthermore, that flavor was influenced more by variations in sugar content when the sweet corn was low in sugar than when it was high.

Relation of sugar content to flavor of sweet corn after harvest. *Proc. Amer. Soc. Hort. Sci.* 65: 393-398, 1955.

Corncob Mulch Improves Plant Growth and Yield of Roses: There has been some controversy about the merits of the use of ground corncocks as a mulch. With this in mind and because of the availability of large quantities of this material, William J. Carpenter and Donald P. Watson at Michigan State University have recently tested them, both as a mixture with the soil and with both two- and four-inch depth of ground corncocks on the surface. Using IBM cards clamped to the stems of each of 400 rose plants in the greenhouse, records were kept of the total number of roses, the total weight and length of all growth of both roots and tops over an eighteen-month period.

Soon after the application of the ground corncocks, either as a mulch or as a mixture, there was a reduction in the nitrogen level of the soil. This, in turn, reduced the amount of linear growth early in the experiment but after a period of eighteen months the greatest growth was found in treatments where either two inches or four inches of corncob mulch was used.

The number of flowers was increased substantially by the use of corncocks as a mulch or corncocks mixed with the soil. The best yield was obtained on the plants grown under a four-inch mulch of corncocks. Although the best flowers were produced during the fall and winter months, benefits from the mulch were more prominent during the spring and summer.

¹Department of Horticulture, Michigan State University, East Lansing, Michigan.

Growth of Greenhouse Roses as affected by Mulches and Mixtures of Ground Corncocks—*American Rose Annual* 1955: 45-54.

YIELD OF FLOWERS INFLUENCED BY CORNCOB MULCHES AND MIXTURES OF GROUND CORNCOBS
(80 plants per treatment)

| Period | Soil | Soil with 2" Mulch | Soil with 4" Mulch | Soil with 10% mix. | Soil with 20% mix. |
|-----------------|--------|-----------------------|-----------------------|-----------------------|-----------------------|
| July-Sept. 1951 | 904 | 886 | 946 | 972 | 1,020 |
| Oct.-Dec. 1951 | 506 | 611 | 611 | 590 | 581 |
| Jan.-Mar. 1952 | 464 | 491 | 529 | 536 | 541 |
| Apr.-June 1952 | 820 | 934 | 946 | 912 | 918 |
| July-Sept. 1952 | 810 | 968 | 1,000 | 877 | 911 |
| Total | 3,504* | 3,890 | 4,032 | 3,887 | 3,971 |

*No significant differences.

Sunlight Improves Keeping Quality of Cut Flowers: It has been shown at Cornell University by John W. Mastalerz that a reduction in light intensity was detrimental to the keeping quality of chrysanthemums. For testing, one half of the plots were covered with two layers of cheesecloth to reduce the sunlight for from 14 to 25 days just prior to cutting.

Effect of reduced light intensity of Gold Coast Chrysanthemums stored 50 days at 31° F. Left: One-half light intensity for 25 days before storage. Right: Full light intensity before storage. (Courtesy of John W. Mastalerz.)



Representative samples of chrysanthemums were cut from shaded and non-shaded plots and stored in moisture-proof "Leverpak" fiberboard drums, the drums being stored at 31° F. Other flowers were stored with their stems in water at room temperature to determine the length of life without storage.

Flower life after storage at 31° was seriously shortened whenever the prevailing light intensity had been reduced during the growing period. Chrysanthemums of the variety 'Gold Coast,' grown in full light and followed by a dry storage of from 35 to 37 days, remained in fresh condition for from 13 to 14 days, following storage, in contrast to seven days for those which had only half of the full sunlight. The life of fresh non-stored cut flowers grown under normal light was 15 days, while reduced light shortened the life to one day. The appearance of the flowers was severely affected by reduction in light intensity, especially if the storage period was longer than 35 days. It caused decay at the base of the flower heads, brown centers, and wilting of the foliage.

Soil Nitrate Levels, Light Intensity, Growing Temperatures and the Quality of Cut Flowers Stored at 31 Degrees F. *Proc. Amer. Soc. Hort. Sci.* 65: 483-492, 1955.



A List of Organizations Affiliated With The American Horticultural Society

American Association of Nurserymen
American Begonia Society
American Begonia Society, San Francisco Branch
American Begonia Society, Santa Barbara Branch
American Camellia Society
American Gesneria Society
American Gloxinia Society
American Iris Society
American Peony Society
American Rhododendron Society
American Rhododendron Society, Middle Atlantic Chapter
American Rose Society
Bel-Air Garden Club, Inc. (California)
Bethesda Community Garden Club (Maryland)
Birmingham Horticultural Society
California Horticultural Society
Chester Horticultural Society (Virginia)
Chevy Chase (D. C.) Garden Club
Garden Center of Greater Cleveland
Garden Center of Greater Cincinnati
Garden Club of Alexandria (Virginia)
Garden Club of Bellport, New York
Garden Club of Chevy Chase, Maryland
Garden Club of Danville (Virginia)
Garden Club of Fairfax (Virginia)
Garden Club of Indiana
Garden Club of Virginia
Garden Library of Michigan
Georgetown Garden Club (D. C.)
Hemerocallis Society
Herb Society of America
Holly Society of America
Houston Horticultural Society
Hunting Creek (Alexandria, Virginia) Garden Club
International Geranium Society
Iowa State Horticultural Society
La Salle Horticultural Society (Montreal)
Manitowoc Men's Garden Club (Wisconsin)
Men's Garden Clubs of America
Men's Garden Club of Montgomery (Maryland) County
Men's Horticultural Society (Tennessee)
Michigan Horticultural Society
Midwest Horticultural Society
Moline (Illinois) Horticultural Society, Inc.
National Capital Dahlia Society
National Capital Garden Club League
National Council of State Garden Clubs
Neighborhood Garden Club (Virginia)
North American Lily Society
Northern Nut Growers' Association, Inc.
Ohio Association of Garden Clubs
Perennial Garden Club (D. C.)
Pittsburgh Garden Center
Plainfield Garden Club (New Jersey)
Potomac Rose Society (D. C.)
San Francisco Garden Club
Southern California Camellia Society
Seven Seas Garden Club (Maryland)
Takoma Horticultural Club (Maryland-D. C.)
Talbot County Garden Club (Maryland)
Washington (D. C.) Garden Club
Worcester County Horticultural Society