Some observations of Ixora Hybrids that have been collected from all parts of the world are presented. Crossbreeding work done by Paul Swedroe, as well as results of grafting, are discussed. Results of grafting of several Ixora Hybrids on Parviflora rootstock has been observed to give far greater thriftiness in growth on a wider range of soils in South Florida. Grafted plants show a greater resistance to chlorosis and cold injury.

**Explorations**

Investigations in reference literature reveals that the Ixora is a genus of about 150 species of evergreen shrubs or small trees. These are mostly native of tropical Asia and Africa and extend to America, Australia, and the Pacific Islands. Many of the Ixora are considered to be of garden origin although they have received Latin names and can be raised true to type only by vegetative propagation. Search for named species presents a real problem since many appear to have been lost, especially during the years around World War I and World War II. The Ixora were used as house plants in England around 1870 and numerous varieties were developed between that time and the turn of the century. During twenty years of searching, correspondence and importations were obtained from such far away places as Singapore, Trinidad, England, Malaysia, Indonesia, by Paul Swedroe of Fort Lauderdale. Evidence obtained from all sources indicates that there are not less than 180 species of Ixora known to Indonesia and a minimum of 50 known in India. Very few of these have been seen in the United States. Efforts to collect plants have resulted in some frustrating experiences.

Seeds obtained from Singapore gave many failures. One much sought after species was traced for twenty years from its origin in England where it was developed in 1870 to Calcutta, India. This plant was finally located in 1960 and four importations were required from a nursery in Calcutta before the first living plant was successfully reared early in 1964.

**Collections and Hybridizing**

Persistent efforts of reading, corresponding, visiting neighboring countries, and importing seeds and live plants has resulted in a basic collection of several very desirable plants of the colors and growth habits needed for hybridizing. The ornamental horticulture industry can now benefit from the results of many years of importing and testing. New color variations have been developed that were not available previously. More vigorous growing plants, greater variations in growth habits, and in general a more reliable performance over a larger area of Florida than has been possible before can be expected of the plants now available. The varieties developed to date apparently represent only a sample of what can be accomplished in the future.

**Experiences with Grafting**

Experience gained from growing many of the introduced and developed plants over a period of years has been very valuable to the horticultural industry. The average homeowner and nurseryman has some difficulty in growing a good quality plant unless special soil preparations are made or special fertilizers and pesticides are used to combat natural enemies of the Ixora. Foliage chlorosis caused by mineral deficiencies, nematodes and other factors often limit the use of many of the better varieties in the landscape. In an effort to minimize the damage caused by the limiting factors, trials with grafting on various rootstocks were conducted. It was discovered as early as 1946 that the Ixora parviflora rootstock gave greater vigor, more resistance to chlorosis, and resistance to nematode damage to some of the weaker species and hybrids. This grafting operation, although more expensive than growing the plant on its own root, has been very successfully performed with a cleft graft on strong seedlings or rooted cuttings of the parviflora. Recent trials indicate that most available Ixora can be improved by grafting on this rootstock. It was also learned recently that greater cold tolerance can
also be expected from grafting certain varieties on parviflora.

It appears from latest observations that the parviflora rootstock will make it possible to grow most of the available Ixora on a wider range of soils and in a more diverse temperature range than ever before thought possible. One plant grafted on parviflora in 1946 is still growing nicely, even with neglect, on unimproved sandy soil known to be unsuitable for good growth of ungrafted varieties in the same area. The Ixora 'SUPERKING' have been observed to be incompatible when grafted on parviflora but most others have shown improvement when grafted. The use of parviflora rootstock has made it possible to produce standards in all colors.

**Observations of Some Ixora**

The following are a few of the more important observations of some of the Ixora in South Florida:

**A. White**

1. *Ixora colei*—An old English hybrid apparently developed of *I. coccinea x I. chinensis alba* parentage about 1870 by E. Cole of Manchester, England. Has massive flowers of pure white as large as 7½ inches in diameter when fully open. It blooms intermittently during early summer and late fall and remains in flower for a considerable length of time. It prefers shade or partial shade, has compact and low spreading growth and shows more cold tolerance than most Ixora. Does best on parviflora rootstock. Introduced by Swedroe’s Nursery in 1964 from Calcutta after being lost from England.

2. *Ixora 'HERRERA'S WHITE'*—A sport of *Ixora 'HERRERA'S PINK'* originating at Swedroe’s Nursery in Fort Lauderdale, Florida. Flowers are fairly constant blooming, of medium size and pure white. Growth habit is tall, upright, fairly compact characteristics. It is not compatible on parviflora but grows best on its own roots. It prefers partial shade.

**B. Yellow**

1. *Ixora 'GILLETTE'S YELLOW'*—Introduced into Fort Lauderdale about 1957 from Trinidad. Flowers the year around with light yellow clusters up to five inches across. It has upright growth habits. Leaves are medium to light green. Grafting on parviflora suggested to resist nematodes, chlorosis, and club-root problem.

2. *Ixora 'FRANCES PERRY'*—Hybrid of *I. 'GILLETTE'S YELLOW' x I. 'SINGAPORE NO. 1'* developed by Swedroe in 1963. Flower darker yellow than I. 'GILLETTE'S YELLOW' but same size and shape. More compact in growth, leaves broader and dark green. More rapid growth on own roots than when grafted on parviflora. Has promise of being best pure yellow.

3. *Ixora javanica flava*—Introduced by Swedroe in January, 1964 from Bangkok, Thailand. Flower color is apricot gold and florets are rounded as in *I. chinensis*. It hybridizes readily with *I. chinensis* from which numerous seedlings are being produced. It has extremely bushy growth habit and grows well on its own roots if properly planted.

4. *Ixora 'SINGAPORE NO. 1'*—A chance *I. aureo-rosea* seedling selection of about 1952 from Singapore. Flowers are orangish-yellow to pinkish as much as five inches across, with *I. macrothyrsa* like blooms. Leaves are large, medium green, giving dense, compact growth habit to upright growing shrub. Grows best in partial shade grafted on parviflora rootstock. Prolific blooming habit on slow growing bush. An excellent landscape plant.

   It is very susceptible to chlorosis on own roots but does well on parviflora. This variety has given parentage to some very promising seedlings.

**C. Orange and Salmon**

1. *Ixora 'ANGELA BUSMAN'*—A hybrid developed by Swedroe in 1963 by crossing *I. SUPERKING x I. SINGAPORE NO. 1*. Flower color is shrimp-pink to orange when first open but turns old rose as they age. Leaves are large and dark green. Grows well on own roots and slower when grafted on parviflora. Pot specimens bloom at very early age.

2. *Ixora 'LOIS SHORE'*—A seedling of *I. SINGAPORE NO. 1* originating at Swedroe Nursery in 1965. Flower color is soft orange similar to SINGAPORE NO. 1 in size. Growth habit is also similar to SINGAPORE NO. 1. It prefers partial shade. It has prospects of producing a very promising commercial variety useful for general landscape use.
D. PINK AND ROSE

1. *Ixora fraseri*—is probably of *I. ambonensis* x *I. chinensis* parentage. It was exhibited in England about 1874. Introduced in Fort Lauderdale about 1952. Flowers are in very large clusters, open buff-orange and fade to salmon. Leaves are large and unusually dark green. Growth is upright with moderate to sparse branching. It demands shade and is very susceptible to nematodes. It must be grafted to be grown in general soil conditions successfully but grafting has not been very successful. It is a very nice specimen when grown in well prepared soil and kept free of nematodes.

2. *Ixora 'HENRY MORAT'—*A cross of *I. acuminata* x *I. coccinea* made in Miami, Florida, in 1943. Flowers are light pink, fragrant and produces prolific blooms over a long period of time. Foliage is dark bluish-green and relatively large. Growth habit is compact with upright branches. Produces satisfactory growth on its own roots. Parviflora grafting has not been satisfactory.

3. *Ixora 'HERRERA'S PINK'—*An import from Trinidad in 1952 and introduced in 1960 to the horticultural trade. Flowers are dark rose similar to *I. rosea*. Leaves are medium size and light green. Growth habit is upright. Shade is very desirable as full sun results in badly faded flowers and foliage. It has been grown successfully on its own roots but grafting on parviflora does not appear to be compatible.

4. *Ixora 'HYDRANGEAEFORMIS'—*Sometimes known as *I. 'TRINIDAD PINK' has been grown in South Florida for a number of years. Imported in about 1952 from Trinidad. Flowers are pink similar to *I. rosea*. Leaves are medium size and light green. Growth habit is upright. Shade is very desirable as full sun results in badly faded flowers and foliage. It has been grown successfully on its own roots but grafting on parviflora does not appear to be compatible.

5. *Ixora 'KELLY GENT'—*A selective cross of *I. acuminata* x I. SINGAPORE NO. 1 gave flower color of deep pink with seasonal blooming habit. This was named *I. 'PINKSING' I. 'PINKSING' x I. 'McGEE'S YELLOW' resulted in I. 'KELLY GENT'. This cross was made by Swedroe in about 1964. An unusual new color of orange at opening and turning salmon with age. It blooms constantly. Foliage chlorosis is bad on own roots but parviflora grafts are performing well.

6. *Ixora 'PINKSING'—*A hybrid developed by Swedroe in about 1960 by crossing *I. acuminata* x I. SINGAPORE NO. 1. Flower color is rich pink with blooms from spring to summer and having a slight fragrance. The first grafts on parviflora has performed well and appears well adapted for espalier.

7. *Ixora profusa—*Unknown parentage. An old English hybrid of garden origin dating to 1883. Introduced by Swedroe from Calcutta in 1964. Flowers are rosy-salmon, in dense, very large clusters. Growth habit is upright with sparse branches. It is the most susceptible to nematodes of any *Ixora* but has been very highly successful on parviflora.

8. *Ixora rosea—*Introduced by Edwin A. Menninger from seed brought into Florida from Madris, India. Flowers are vivid, deep rose in bloom throughout the growing season. Leaves are small and dark green. Growth habit is compact and branches freely. It grows better in partial shade but can be grown in full sun or shade. It is very susceptible to nematodes and chlorosis on its own roots. Grafted plants on parviflora roots produced slow developing prostrate growth which do not appear to be compatible in some situations. I. 'HYDRANGEAEFORMIS' has proven more satisfactory over a period of 12 years. The rate of growth is fairly rapid and when properly planted performs very satisfactorily on I. 'HYDRANGEAEFORMIS'. This rootstock does sucker badly but is presently in great demand.

9. *Ixora westii—*Developed in 1882 of garden origin. Introduced to Fort Lauderdale by Swedroe in 1964 from Calcutta. Flowers are pale rose, becoming bright rose. It is still under observation by Swedroe to determine its habits for South Florida. It appears to have some desirable characteristics.

E. RED

1. *Ixora chinensis—*It was discovered in South China in about 1822. It has been in Florida for many years. Flowers are orange red and of free blooming habit. Growth habit is dwarf compact with cold hardiness in excess of most *Ixoras*. It was a much used *Ixora* by early English hybridizers. A very variable plant with white, pink, yellow and orange forms. It is very susceptible to nematodes in South Florida but when
grafted on parviflora the plants grow vigorously. They grow best in shady locations.

2. *Ixora williamsii*—Known also as *I. TRINIDAD RED*. It was introduced to South Florida in about 1956 from the Panama Canal Zone by Mrs. Dora McGee of Miami. The flowers are the deepest of the reds, free flowering with very large blooms. Leaves are very large and dark green. It does best in southern exposures and benefits from severe trimming in late winter before new growth commences in the spring. Larger flowers and more vigorous growth are produced when grafted on parviflora.

3. *Ixora 'SUPERKING'* — A variety of *I. macrothyrsar* introduced to the South Florida trade in about 1950 by Swedroe but has been available in Florida since about 1932. It has brilliant red flowers, probably the most spectacular of the popular Ixoras. Flowers are very large and abundantly produced all year in South Florida. New leaves are usually pale green but turn dark green as they mature. Leaves are very large, becoming as much as ten inches long. It grows well on its own roots with moderate care on most soils. Grafting with parviflora has not been successful since they seem to be incompatible. It is well adapted to general landscape use and produces a very large bushy plant.

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**PHILODENDRON IMPROVEMENT THROUGH HYBRIDIZATION**

R. H. McCOLLEY and H. N. MILLER

**Abstract**

Philodendron hybridization has been conducted with the objectives of producing plants that have increased beauty through new forms, leaf shapes and coloration and to produce plants which show resistance to some of the more common diseases and have improved keeping qualities in transit and in the home. Data on philodendron flowering, collecting and storing of pollen, time of pollination for successful fertilization and compatibility have been obtained. Hundreds of crosses have been made, and millions of seedlings screened. Some desirable selections have been made from inter-specific F₁ hybrids and a lesser number of multi-hybrid crosses.

**Introduction**

The use of foliage plants for indoor decoration and enjoyment goes back as far as history. However, the modern foliage plant industry began in earnest at the close of World War II. Prior to that time foliage was primarily ferns and sanseverias. As late as 1950 only two major nurseries in Florida were in volume production of large leaf Philodendron. Yet in the same year the question asked by every northern buyer was: “What do you have that is new and different?” This demand led to the introduction of many soft, worthless species and to the introduction of diseases not yet identified. It seems nature provided only two types of foliage plants, those that are tough but of little beauty and those that are beautiful but soft and susceptible to ills from climate and diseases.

It was about the beginning of the 20th century that improvement of agricultural crops began through hybridization. Today, hardly a single crop has not been radically changed through the process of cross-pollination. These changes, in a way, were forced changes. With heavily increased production needed to prepare for the population explosion following the two world wars, it was necessary to produce strains which were resistant to diseases, gave increased yields and had better keeping qualities.

Hybridization to improve foliage plants, however, is in its infancy. It seems strange indeed that man has been satisfied with plants that were available even at the turn of the century. It was not until the early 1950's that any serious hybridization of philodendron was started. An Italian hybrid, *P. corsinianum* was made in Florence in 1887 (1). Manda in 1936 produced the