COMMERCIAL ASPECT OF NEW CROP DEVELOPMENT

James C. Mikkelsen
Mikkelsens Inc.
Ashtabula, Ohio U.S.A.

Abstract

The role of the commercial ornamental plant breeder is to hybridize existing or newly acquired germplasm using the most improved scientific breeding technologies to develop or improve varieties or cultivars to meet the demands of disease and insect resistance, stresses of environments, and present uniqueness or novelty to allow the producer to make a profit.

1. Introduction

Commercial plant breeders of seed produced or asexually propagated ornamental plant materials have the same common needs, namely:

1.1. The help and influence of professional teaching and research at university and research centers for the next generations of plant breeders.

1.2. Scientific genetic research.

1.3. Germplasm from existing depositories, other breeders, or from new sources via exploration and discovery. Generally new acquisitions via exploration need hybridizing to maximize their economic value.

1.4. Abilities to apply new technologies from scientific research such as irradiation breeding, tissue culturing, and gene splicing.

1.5. Personal intuition and fortitude to pursue economic development of new varieties or cultivars.

1.6. Moral and financial support for the promotion of new crops.

1.7. Plant variety protection that allows for the payback of investments and a profit for the plant breeders efforts.

Discussion

Generally in the U.S.A. the academic researcher in ornamental plant breeding is not in a position to compete with the commercial plant breeder because of institutional policies, lack of marketing expertise, and in many cases the fortitude or conviction that the new development may be successful.

Although academia must be respected for their contributions to genetics and plant breeding technologies it would be advisable to mention some short comings. In some instances research plant breeders have hybridized new varieties for dissemination under a cloak of secrecy without sufficient knowledge of what is being developed simultaneously by commercial plant breeders. Often some researchers (like many growers) have prejudices to a new plant development and tend to play favoritism to older established varieties. This short coming does seem to be changing with younger more aggressive horticulture departments.

The size of the U.S.A. and diversity of its environments and the Land Grant Colleges philosophy of publications tends to reduce the opportunities for practical research that growers want and need. Thus industry itself, with some exceptions, has turned to searching out new plant materials developed in other lands from exploration and/or hybridizing. And yet at the same time foreign breeders have acquired native U.S.A. plant materials and developed them into worth while products, such as Liatras via Holland and Eustoma via Japan.

There have been and are today many professional and amateur plant breeders without formal training in genetics or plant hybridizing that contribute greatly to the horticulture industry. Generally their interest is so profound that they have developed exceptional reading skills, seek personal communications with contemporary plant breeders and academia. They often are rewarded by self satisfaction rather than financial renumeration. However, there is no doubt they contribute to the well being of society.

As an example, the author has a B.S. in geology. Allied courses in biology, botany, and paleontology contributed to an interest in plant breeding, originally as a hobby. Dr. Gustav Mehlquist, prof. emeritus of the University of Connecticut was the first of many professors to personally encourage, direct, and advise reading materials for the author to pursue a course of commercial plant breeding. Dr. Kenneth Sink of Michigan State University, Dr. Richard Craig of Penn State University, Dr. Robert Stewart formerly of the U.S.D.A., Prof. John Culbert prof. emeritus of the University of Illinois, and Dr. J. Doornbos of Wageningen, Holland have continuously advised and encouraged me. Dr. Milton Constantin of the University of Tennessee and Dr. Kees Broertjes of ITAL, Wageningen, Holland have been outstanding in sharing and advising irradiation technologies. It would be amiss not to include in general the many contemporary commercial plant breeders such as: Claude Hope, William Duffet, Peter Hesse, Hans Jaquen Rohde, Leonard Shoesmith, Barrie Machin, and many others too numerous to mention, that have contributed a wealth of their experiences. Dr. M Cathey gave special encouragement for the use of germplasm collected by the U.S.D.A. especially for poinsettias and New Guinea Impatiens.

The acquisition of new germplasm is extremely important to the plant breeder, particularly for rapid development of specific characteristics. A great deal of original germplasm already exists in botanical gardens and plant conservatories. The problem is searching it out. As an example, the most complete single collection of kalanchoes is probably at the University of Holland at Wageningen, organized by Mr. J.J. Karper. Nearly all of it was acquired from European botanical gardens.

Undoubtedly well trained botanists and plantsmen will still find many original plant species in areas yet unexplored. Modern transportation is rapidly opening up this possibility. An overall greater interest in new plants by the consumer is adding further pressures for plant exploration.

Objectives and contributions

It was requested that this paper emphasize the historical and present developments at Mikkelsens Inc.

1. Chrysanthemums

In the early 1950's we hybridized chrysanthemums. In 1956-7 an exchange of U.S.A. mum cultivars was made with an English firm for European mum cultivars. The English cultivar Princess Ann, hybridized by Shoesmith, was successfully disseminated in the U.S.A. by Mikkelsens Inc. in the 1960's. The technology of applying Alar to very short breaks and allowing the shortest possible time from pinching to short day treatment had to be developed in order to produce the most desirable pot plant. This technology developed by Mikkelsens Inc. made it possible for the Princess Ann mum and its mutations to be the number one pot mum class in the U.S.A., Canada, and northern Europe. Millions upon millions of Princess Ann pot mums were produced in the mid 60's thru 70's, with lesser amounts being produced in 1980's. Paradoxically the Mikkelsen cultivar, Bonnie Jean, sent to England in the exchange program, was rejected by U.S. propagators and growers. Bonnie Jean was a white daisy mum, mutated to yellow, and became number one cut mums in Europe. Several years later they migrated back to the U.S.A. and enjoyed some popularity for several years. Bonnie Jean was also one of the parents of the Horum series hybridized by the Dutch firm of Hoek.

2. Geraniums

Almost concurrently with mum breeding was the pursuit of new hybrid zonal geraniums. Although this project at Mikkelsens never became of economic importance, the cultivar Eleanor has been used extensively in further geranium breeding by other breeders.

3. Poinsettias

During the mid to late 50's an intensive program was developed for the hybridizing of poinsettias. The cultivar Paul Mikkelsen (#6066) was disseminated in 1963. This cultivar was scientifically important to Dr. Robert Stewart who proposed that the then existing pink poinsettia had a dilution of red pigments and thus were genetically red. The Paul Mikkelsen poinsettia progressively mutated to pink, then pink/white bi-color, and finally to white; confirming Dr. Stewarts previous findings. The Paul Mikkelsen poinsettia also mutated to the self-branching type found at Rochfords in England.

In the early 70's a U.S.D.A. exploration team found a genetic pink poinsettia in Mexico. The "Mexican pink" poinsettia was ultimately released to plant breeders. A gene pool of genetic pink poinsettias has been established at Mikkelsens Inc. along with genetic reds and whites.

The latest poinsettia development from Mikkelsens is the dissemination of genetic dwarfs. This area will see a great deal of development in the next few years with the increase demand and use of "mini" pot plants for home use.

4. Begonias

In 1970 the right to disseminate the Rieger types of hiemalis begonias (Fotsch) was negotiated with the estate of R. Rieger, Nurtingen, West Germany. It should be noted that the research of Doornbos and Karper, Wagening, Holland identified that the Rieger's Schwabenland Red begonia was the result of crossing "Sonneschoen" tuberous begonia (4N) with the species begonia socatrana (2N) = sterile 3N hiemalis begonias. With the expertise of Dr. Milton Constantine at Oak Ridge, Mikkelsens Inc. recovered many mutations of the original Rieger cultivars exposed to Cobalt 60 and Fast Neutron irradiation. Because h. begonias are sterile triploids and white and yellow are recessive, mutation breeding has played an important role in recovering valuable mutants.

Since 1972-3 Mikkelsens Inc. embarked on a breeding program of tuberous begonias and socatrana strains to develop mildew resistance in hiemalis begonias. After 12 years, and to no avail, this objective has been minimized. The fungicide Baylaton applied monthly to begonias keeps mildew under control. Present breeding goals are for faster flowering, self branching, uniform flowering of double flowers, excellent keeping qualities, and being capable of rapid propagation from leaf cuttings for multiple shoots.

At the present time a high percentage of academia insists on improperly calling hiemalis begonias "Riegers". Riegers are hiemalis begonias hybridized by the Rieger firm. However hiemalis begonias hybridized by Daehnfeldt, Mikkelsen, Larsen, Doornbos/Karper and others are incorrectly and unappropriately called Riegers. This injustice should be corrected in academic circles. Hiemalis begonias are often classified as elatior, meaning winter flowering. Presently most hiemalis begonias will flower more or less any season of the year, therefore should not be classified as elatior.

5. Kalanchoes

In 1972-3 an agreement was signed between the firm of Wyss Samen und Pflanzen of Solothurn, Switzerland and Mikkelsens Inc. to disseminate the Grob kalanchoes from St. Galien, Switzerland into the U.S.A. A broad gene pool of kalanchoes was organized at Mikkelsens Inc. and a breeding program initiated. Also included in this program were kalanchoes from Norbert Bull, Gonnebek, West Germany; as Mikkelsens were also licensed to disseminate his cultivars in the U.S.A. The research of kalanchoes by Prof. DeWerth of Texas AM and subsequent breeding by Irwins in Canyon, Texas, resulted in cultivars basically suited for the southwest U.S.A. The Grob and Bull cultivars and the research of Schwaab in Germany, gave rise to cultivars more suitable for Northern Europe and Northern U.S.A.

Mikkelsens Inc. breeding objectives for kalanchoes have been for shorter critical daylengths for flower initiation, brighter colors, self branching, earlier uniform flowering, shorter flower initiation and development time, better keeping qualities, smaller foliage, mildew resistance, elimination of night closing, and more tolerant to high light and temperature for summer flowering.

Some success has been obtained by Karper in Holland in breeding kalanchoes suitable for cut flowers. To date results in this area of hybridizing at Mikkelsens Inc. have been encouraging.

Light color shades of kalanchoes at present are not popular, so the need for a white commercial kalanchoe is not yet important, although breeding is progressing in this area.

The important breeders of kalanchoes are presently: Norbert Bull and Wiesmoor in West Germany; Fides in Holland; Wyss Samen und Pflanzen in Switzerland; Ball Pan Am, Irwins, and Mikkelsens Inc. in U.S.A.

6. New Guinea Impatiens

The present development of New Guinea Impatiens is one of the most exciting stories of present day plant breeding. Joint exploration by Longwood Gardens and the U.S.D.A. in New Guinea in 1970 uncovered a wealth of species and hybrid germplasm of previously uncommercialized impatiens. In the approximate 28 selections that survived the transportation stress, sufficient genetic variability was available in the species and apparent hybrids to produce nearly all the characteristics present in the commercial hybrids available today. A yellow New Guinea Impatiens is not known to exist in commercial gene pools.

Starting in 1972-3 Mikkelsens Inc. embarked on an intensive New Guinea Impatiens breeding program that produced three sets of continuous crossings per year, to ultimately select cultivars for dissemination through asexual propagation. Many breeders, propagators, and plant brokers discouraged our attempt to hybridize for asexual propagation. However, by the time the best hybrids were patented in 1976, propagators and growers generally had come to respect the patent and licensing system for plant protection.

Several other hybridizers chose to follow the route of seed produced hybrids but failed because of sterility problems.

Cultivars developed at Longwood Gardens (Circus Series), U.S.D.A. Beltsville, and Iowa State Un. at Ames (Cyclone Series) were initially siezed upon by breeders, propagators, and growers for the novelties offered. Mikkelsens Inc. at first incorporated these cultivars into their gene pool only for speeding up the development of certain characteristics; ie branching or earlier flowering. Many of the early hybrids had the common faults of late flowering, long internodal lengths, poor flower production, high susceptability to mites, botrytis and presence of bacterial problems such as erwinia.

From the beginning our goals were to overcome the above, and added were the following: better self branching, not only for plant appearance but for production of cuttings; better leaf and flower color compatibility, and especially variegated foliage; new color tones including whites and yellows; adaptability to high light (Sunshine Series); and resistance to thrips and Japanese beetle.

Still to be resolved are hybrids more tolerant to water stress, low light stress for house plant usage, better shipping qualities (more tolerant to ethylene), bi-color flowers with variegated foliage, double flowers. All of these and more are in stages of development at the present time at Mikkelsens Inc. Strong bi-colored flowers and flowers with distinct eyes will be introduced in 1987. Selections for house plants are being tested and screened in a growth chamber simulating home conditions. Double flowering types should be ready for dissemination in 1988.

After the first four years of pressured hybridizing, breeding of New Guinea Impatiens is now on an annual basis, pollinating being carried out in the fall after summer testing. Concentrated hybridizing is still done for specific characteristics such as presently pursuing selection for house plants.

In 1976 Mikkelsens Inc. introduced the Bicentenial series and in 1978 the Sunshine Series, which series is still being expanded. Approximately 85-90% of all New Guinea Impatiens commercialized world wide today belongs to the Sunshine Series.

Besides the aforementioned early sources of New Guinea Impatiens cultivars, the California/Florida Plant Co. introduced the Indian series, and the Pan American Plant Co. introduced the Vista series. Several European firms have now embarked on a breeding program of New Guinea Impatiens with emphasis on house plant characteristics.

7. Streptocarpus

Mikkelsens Inc. learned years ago that one can not rest on the results of present successes; but that rather each success is a building stone to the next endeavor. With that in mind, our breeding program has strong emphasis on hybridizing streptocarpus for 10 cm pots with better keeping qualities, smaller symmetrical foliage, year around flowering, shorter multibranched flower stems, and other characteristics.

8. Achimines

Also being undertaken is the challenge of breeding and developing year around flowering of Achimines. The initial cultivars and distribution rights have been obtained from K. Michelssen of Burgdorf, West Germany. With all the past experiences of growing, propagating, and hybridizing other crops, we feel confident that there can be developed the total technology for producing the beautiful Achimines for flowering year around.

9. Aeschynanthus

Another gesnereace of possible economic importance is Aeschynanthus. Too few cultivars, indeterminant flowering, and other short comings must be overcome before large numbers can be profitably produced.

10. Cyclamen

The one seed crop currently being pursued is minature cyclamen. Of interest is the total abandonment that cyclamen seed must be produced in the winter. Even pollen production has not been a problem in Ohio under the adverse conditions of the "Great Lakes Snow Belt". Although frozen pollen has been successfully used, selection of outstanding pollen and seed producing strains has eliminated the need to freeze storing of pollen for normal seed production.

SAF/USDA New Crops Program

Happily it can be reported that various segments of the ornamental horticulture industry are developing a cooperative attitude to new crop developments. Plant breeders, tissue culture labs, propagators, growers, and seed firms are collectively contributing $50,000 per year with an additional matching amount from U.S.D.A. Agriculture Research Service programs for new ornamental horticultural crops. This total funding is expected to be increased for 1987. Basic research is being conducted at the Ornamentals Laboratory, Beltsville, Md. under the direction of Dr. Roger Lawson. Presently 14 research cooperators are involved in the SAF/USDA New Crops Program and the major financial contributors to the fund are conducting field tests and evaluations for possible dissemination of new cultivars.

A program for total industry financial participation is a goal of the near future. One firm has made a small increase in its royalty rates that is then contributed to the SAF/USDA New Crops Research Fund. In this way all growers using the product contribute. Of course ultimately it is the consumer that contributes.