Breeding Research on Geraniums from seed. Left — tall bedding plant type; Right — Dwarf Inbred; Middle — Their semidwarf F₁ Hybrid which is adaptable to Pot Plant Culture. These plants represent research results by Robert Henault, a graduate student in Genetics and Breeding working with Dr. Richard Craig.
News from SAF

EXPERIMENTAL MARKET NEWS SERVICE LAUNCHED

The industry's producers, shippers, wholesalers and retailers can now obtain information on prices and market conditions at the San Francisco wholesale market — and on prices and shipments of five major crops in California's Central Coastal Section, announces James Vosters, Chairman, Research & Development Committee, Society of American Florists. Daily experimental reporting by the U.S. Department of Agriculture of market information on roses, carnations, gladioli, standard chrysanthemums, and poms in these areas began early in December.

“Market news reports provide both buyers and sellers with information needed to make more effective marketing decisions,” points out Mr. Vosters. SAF urges all industrymen who wish to receive the cut flower reports regularly to write to: A. M. McDowell, Federal-State Fruit and Vegetable Market News Service, 727 Appraisers Bldg., San Francisco, Calif. 94111.

USDA will be reimbursed by Florists' Transworld Delivery Assn. for the cost of the pilot market news service. A survey of the feasibility of market news service on cut flowers, financed by FTD, was made by USDA's Consumer and Marketing Service earlier this year. The pilot market news project was initiated to determine the value of such a service to producers, shippers, wholesale receivers, and retailers of cut flowers.

Federal-State Market News Service, administered by USDA's C&MS in cooperation with state agencies, has reported prices, shipments, and market conditions for most major agricultural products for over fifty years. Market news reports are disseminated nationwide on a 20,000-mile, leased-wire system. The Federal-State Market News office in San Francisco which reports the fruit and vegetable market will handle the experimental service on cut flowers.

SAF WORKMEN'S COMPENSATION PROGRAM PAYS 32.85% DIVIDEND

A dividend of 32.85% was declared for participants in the Society of American Florists Workmen's Compensation Program, administered for SAF by Florists' Insurance Service, Inc., announces SAF President Wallace R. Pierson, Jr. Approximately 375 participants received this sizable return which has a total dividend return value of approximately $90,000.

Society members pay the same rates for Workmen's Compensation Insurance under the SAF plan as they would pay through any insurance program. However, low compensation loss experience of SAF members and low administrative costs make possible the impressive dividends which have been paid annually under the SAF plan. “As a result,” states Mr. Pierson, “many participants find that the SAF Workmen's Compensation Program is more than paying for their Society membership and is reducing their costs of operation.”

The Society’s Workmen’s Compensation Program is a service for SAF members only. It was inaugurated in May, 1965, and has grown rapidly as members realized the great benefits which are derived from it. Some of the program’s major advantages are:

1. Florist industry insurance specialists provide economical administration and direct service.
2. Savings classification plan for SAF members with preferred risks controlling their own Workmen's Compensation costs.
3. All premiums returned to participating members in excess of administrative expenses, excess of loss protection and loss service, state insurance taxes, licensing costs, and losses.
4. Although profit not guaranteed, similar plans for other industries have been returning a substantial percent of the original premium.

The program complies in every respect with the Workmen's Compensation laws of each state. This includes coverage, rates, and claim settlement. Claims are handled directly by Florists' Insurance Service by phone, mail, or adjuster, depending upon the type and character of the claim.

Information on how the plan can help florists operate their businesses more economically can be obtained from the Society of American Florists, Sherman-Park Hotel, Washington, D.C. 20008.

SUPPORT FLORICULTURE RESEARCH AT PENN STATE
Contribute to DILLON RESEARCH FUND

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Past, Present and Future of Seedling Geraniums

Richard Craig, Assistant Professor of Plant Breeding
The Pennsylvania State University

The Past

It indeed seems odd to be here at this meeting talking about the past, the present and the future. I have always felt, at least up to this time, that geraniums from seed was a topic better placed in current events than in history. Research on seedling geraniums was started at Penn State in January, 1958. I remember begging my first nine cultivars from the Penn State greenhouses. After looking through several catalogs and finding just one seed produced type hastily ordered it.

In 1958, we at Penn State felt that someday flower growers would grow geraniums from seed. After 100 years of cuttings — that thought seemed senseless to many people. But we produced seed on the cultivars and grew out the seed that we had purchased. Of the original nine cultivars two are still mainstays in our breeding program. These are 'Madame Buchner' and 'Madame Landry'. Two such unlikely women have rarely excited a man's imagination. The geranium seed that we purchased — designated 'Florist Mixture' — produced so many problems that even ten years — and I am sure 20 will not be long enough to solve them.

We grew out about 200 seedlings in the original sowing. A germination percentage of 40% in 3-4 weeks was considered good at that time. Previous literature indicated that one should sow the seed and continue transplanting for up to 6 months in order to be successful. Our early research on scarification, that is chipping a small hole in the seedcoat to permit the entrance of water showed that 90-100% germination in two weeks was possible. This discovery probably added the greatest impetus to our program. After growing out the original 200 seedlings several factors became more clear.

1. The mixture produced a great array of flower colors — from red to almost white.
2. The seedlings flowered over a period of 120 to 180 days from a February sowing.
3. The plants were generally tall and plant habit was very poor. Some plants flowered when 20-24" tall.

Seedlings produced from the cultivars gave generally the same results with the exception of 'Madame Buchner' seedlings which were all white flowered, and had compact plant habit. In addition, certain plants flowered in a significantly shorter period of time.

Having the above plants to work with, we made selections of the best plants from the seedlings. In the following years we found that it was possible to select for seed produced lines that were uniform for flower color, that flowered in a shorter period of time and that flowered when the plants were not quite so tall. The first commercial variety to come true from seed was released by Penn State in 1964. We called it 'Nittany Lion Red'. This cultivar was developed to be a bedding plant and was never recommended for growing in pots. 'Nittany Lion Red' had many faults when compared to cutting produced cultivars but it was truly superior to what we had in 1958. It was readily observed that 'Nittany Lion Red' was too tall, too late flowering and produced single flowers. Many growers had great difficulty in producing good plants even though other growers had been successful.

During this same time many cultural problems had to be solved. What temperature is adequate for seedling geraniums, how much fertilizer is necessary, does photoperiod enhance flowering, etc. Some of these have been solved but many other problems still remain. In my mind, I ask the question — should we solve these problems by adapting our cultural conditions to suit the present cultivars or should we solve it by adapting cultivars to the best possible cultural conditions? I am convinced that the latter is the best solution — the adaptation of cultivars through breeding to optimum cultural conditions. This solution, I think, will prove to be best over the years. An example of this would be the following — Do we take a cultivar like 'Nittany Lion Red' and treat it with a growth retardant to produce adequate height or do...
we attempt to breed a 'Nittany Lion Red' type that grows only as tall as we would like it. The first solution is stop-gap — while the second is permanent.

In the early 1960's great impetus was given to geraniums from seed by the entrance of several commercial seed companies into geranium breeding. These were the Joseph Harris Seed Co., the Pan American Seed Company and Ferry-Morse. Later Yoder Brothers also started a geranium breeding program.

The Present

The present and the past are never entirely mutually exclusive. For instance, 'Nittany Lion Red' is still being offered in seed catalogs even though I feel that it is definitely inferior to the F₁ hybrid cultivars offered commercially. The only trait that has not yet been surpassed in 'Nittany Lion Red' is its flower-color — but even this is temporary. In 1966, the Joseph Harris Seed Company wrote the second chapter in the story of geraniums from seed, by releasing their 'Moreton Hybrids'. These hybrids included five cultivars which produced uniform plants from seeds. This year of 1968 begins the third chapter of the story — with the release of Pan American's 'Carefree' F₁ hybrids. Since all of these cultivars are now commercially available I would like to present my opinion on them. All of the new cultivars are far superior to 'Nittany Lion Red' but like 'Nittany Lion Red' they are meant to be used chiefly as bedding plants. Certain cultivars have been and can be grown as pot plants as you will hear later but this is not generally the case. In general the 'Moreton' F₁'s and the 'Carefree' F₁'s are uniform for their respective flower colors and flowering dates. However, neither series of cultivars is well matched. By this I mean that 'Carefree Scarlet' or 'Moreton Orange Scarlet' both produce uniform plants from seed but when compared to 'Carefree White' or 'Moreton White-Blush' there is a wide diversity of other characters. Do not expect all of the 'Moreton' F₁'s or 'Carefree' F₁'s to behave in a similar manner. This has not been the case in my trials. Last summer we compared the 14 cultivars both as pot plants and bedding plants.

In the greenhouse evaluation seeds were sown on April 19, seedlings were transplanted to 2½ inch peatpots on May 3 and they were potted into 4 inch clay pots on June 14, 1967. The mean number of days to flower and the mean height of the plants at flower are presented in table 1. The flowering time range was 93 to 111 days with the earliest cultivars being 'Carefree Picotee', 'Carefree White', Carefree Light Salmon and 'Moreton White-Blush'. These cultivars were also the shortest and may be used on a trial basis for flowering in pots.

In the garden trials the seeds were sown and the seedlings were transplanted as stated above for the greenhouse evaluation. They were planted into the field on June 22, 1967. The earliest cultivars were the same as those in the greenhouse evaluation with the addition of 'Moreton Cerise Salmon'.

<table>
<thead>
<tr>
<th>Cultivar</th>
<th>Mean Days to Flower</th>
<th>Mean Height (in.)</th>
<th>No. Plants flowered</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carefree Scarlet</td>
<td>110</td>
<td>11.9</td>
<td>18</td>
</tr>
<tr>
<td>Coral</td>
<td>107</td>
<td>11.9</td>
<td>11</td>
</tr>
<tr>
<td>Picotee</td>
<td>91</td>
<td>6.2</td>
<td>18</td>
</tr>
<tr>
<td>Bright Pink</td>
<td>107</td>
<td>12.4</td>
<td>15</td>
</tr>
<tr>
<td>Light Salmon</td>
<td>99</td>
<td>7.4</td>
<td>15</td>
</tr>
<tr>
<td>Deep Salmon</td>
<td>107</td>
<td>9.6</td>
<td>14</td>
</tr>
<tr>
<td>White</td>
<td>97</td>
<td>8.4</td>
<td>16</td>
</tr>
<tr>
<td>Moreton Scarlet</td>
<td>111</td>
<td>12.8</td>
<td>15</td>
</tr>
<tr>
<td>Scarlet Picotee</td>
<td>111</td>
<td>11.9</td>
<td>14</td>
</tr>
<tr>
<td>Deep Salmon</td>
<td>109</td>
<td>9.9</td>
<td>14</td>
</tr>
<tr>
<td>White</td>
<td>104</td>
<td>9.6</td>
<td>18</td>
</tr>
<tr>
<td>Red</td>
<td>111</td>
<td>13.5</td>
<td>14</td>
</tr>
<tr>
<td>-Salmon Red</td>
<td>109</td>
<td>11.3</td>
<td>17</td>
</tr>
<tr>
<td>Cerise Salmon</td>
<td>107</td>
<td>12.0</td>
<td>17</td>
</tr>
</tbody>
</table>

1 Out of 18 original plants.

After evaluating these cultivars I can make several observations:

1. The lighter flower colors seem to flower earlier and at a shorter height. This is unfortunate since these colors will have limited sales appeal. If the darker colors would be equal to these, the prospects for the immediate future would be better.
2. Germination of scarified seed is excellent — 90-100% in 2 weeks.
3. The most ideal plant to date is 'Carefree Light Salmon'. This is the type of the future.

General cultural recommendations call for 'fast crop' growing of these cultivars — they should be grown according to the recommendations furnished by the company. Use as pot plants should be on a trial basis.

To summarize the present; we have come a long way with seed produced geraniums but we have not come all the way. The next ten years will produce a 100-fold the results of the last ten years. Now to the future!

The Future

Perhaps the question that should first be answered is — What characterizes the ideal geranium cultivar from seed? I would like to look into the crystal ball and predict what it might be in the future:

1. Germination of 95-100% without scarification would reduce the cost of seed because at the present time scarification is a costly process.
2. Plants which flower in pots at a height of no more than six-eight inches and when planted in the garden reach the ultimate height of 12-15 inches.

(Continued on page 7)
3. Plants with medium sized foliage — so that more can be grown per bench — thus greater efficiency and profit per square foot of space.

4. Plants which flower uniformly in about 80 to 90 days from a late winter sowing. These plants should have at least one fully opened flower, one partially opened flower and several buds at time of sale. Thus, a February 15th sowing would be saleable after May 10th.

5. Large flower size with the inflorescence borne several inches above the foliage.

6. Dark green foliage which is resistant to adverse conditions.

7. Compact, self branching growth habit.

8. Semidouble florets — similar to cultivars produced from cuttings.

These objectives are all possible — and may even be too conservative. In our research greenhouses we have achieved, in a small way, all of the above objectives. True, all of the characters have not been incorporated into a single F₁ hybrid cultivar but within certain test F₁ hybrids and inbred lines we have observed all of these traits.

1. We now have a large number of inbred lines which will give 90-100% germination without scarification. They are genetically high germination lines.

2. Recent tests have indicated that crosses between dwarf inbreds and tall inbreds produce semi-dwarf F₁ hybrids which flower at about six-eight inches of height. These have foliage which is intermediate between tall and dwarf. This allows for relatively close spacing on the bench. They are also self branching and produce excellent pot plants.

3. Among our inbred lines are types which flower in 75 days. The earliest seeding that we have ever seen flowers in 62 days from seed. Thus this objective seems possible.

4. It is not uncommon to have lines which flower at every node after the initial inflorescence is produced.

5. Flower size and plant size do not seem to be genetically related. This summer we should have the ultimate proof of this statement. We have at least 50 F₁ hybrid combinations between dwarf inbreds and tall inbreds with extremely large flowers — 6” in diameter.

6. Fortunately the dwarf inbred transfers its foliage color and resistance of foliage to adverse conditions to the F₁’s in which they are incorporated.

7. We have in the past shown the possibility of producing F₁ hybrid tall, semi-double flowered types. This past summer we have achieved the incorporation of the uniform semidouble flower type into the semi-dwarf F₁ hybrids.

8. In addition — the range of colors has been greatly extended within our inbred lines. We now have clear bright orange and cherry red flower colors. Within our breeding materials exist almost any color that is imaginable from purple to white.

Over the next ten years you will see great progress in geraniums from seed. Pot plant types are entirely feasible. Each new year will bring additional improved cultivars. Plant breeding is a slow and meticulous art. A new cultivar usually takes seven years to develop. Today, as in 1958, I am optimistic about geraniums from seed.

With today's emphasis on 'fast crop' geraniums from cuttings several problems seem evident; namely cost and supply. Both of these problems will be solved in the future by geraniums from seed. It is inconceivable that a seed will ever cost 1/4 the price of a cultured cutting. It is more likely that the cost in the future will be even less. As far as supply is concerned there is no doubt that the supply of high quality seed can be practically inexhaustable. Improved growing techniques for seedlings will also reduce the total cost of production and will increase profit margins.

At the present time I can foresee nothing that will impair the progress of seed geraniums. Indeed the great amount of breeding that is being conducted by university and commercial plant breeders assures me that progress in this crop is virtually unlimited. Only through breeding can we tailor the geranium to fit the needs of the grower.

To close I would suggest that we be patient and that each of you should trial seedling geraniums. Only by this method will you become familiar with their growing techniques. In the future you will then be ready to accept the improved varieties that are certainly to be developed.

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2833 Pennsylvania Street Allentown, Penna.
GERANIUMS AS A FAST CROP

John W. Mastalerz
Penn State University

If your production program takes more than 8-10 weeks to grow a 4-inch geranium from a rooted cutting — a careful examination of your procedures is suggested —

There Are Six Essential Features of a Fast Crop Program for Geraniums —

1. Obtain cuttings from culture-indexed stock — For a fast crop, pathogen-free plants are absolutely necessary. The presence of disease organisms makes an 8-week geranium impossible. Growing conditions for a fast crop cannot be adjusted to help infected cuttings in their battle for survival.

2. Fast Crop Geraniums must have a loose-well-drained soil mixture — that can be watered and fertilized frequently. The same care and effort should be put into the preparation of a soil mixture for geraniums as we put into the preparation of a soil mixture for poinsettias, Easter lilies, pot mums, or any other potted plant from which we expect a profit. Geraniums can be grown in almost any kind of soil mixtures, but you can't grow a profitable fast crop of geraniums in a soil mixture that doesn't permit fast growth?

The practice of using old bench soil from a mum crop may not be wise unless the soil is loose, well drained, low in fertility and free from pathogens. The recommended soil mixture is —

- 2 parts by volume silt loam or 1 part of soil if heavy clay
- 1 part peat moss
- 1 part horticultural grade perlite
- Add 8 oz. of ground limestone (dolomitic)
- and 8 oz. of 20% superphosphate per bushel of mixture

Steam sterilize soil mixture to eliminate pathogens.

3. Warm temperatures are necessary for fast crop geraniums — This means a minimum of 60-62°F at night and 70-75°F during day. Growers have a tendency to forget that geraniums are a semi-tropical plant and they thrive on relatively high temperatures.

Most of the growth of a regular crop of geraniums takes place in late April and early May when greenhouse temperatures warm up to 55°F. Temperatures at night are fine if you are trying to grow a crop at a slow pace — however, to achieve the size required for a 4 inch plant in minimum time-temperatures above 60°F are required.

If you propagate plants in December, January or February, low temperatures are necessary to hold the plant back; otherwise they get too large by the middle of May.

For a fast crop however, we are not trying to hold the crop back. We are doing everything we can to make that geranium grow rapidly, and warm temperatures are an essential feature of our program.

4. Frequent irrigation and fertilization — Fast growth will require high moisture and fertility levels. Applying water one or two times a day is not unreasonable in a fast crop program. Fertilizer should be included in the irrigation water (8 oz. of a 20-20-20 or 25-0-25 per 100 gallons is suggested); fertilization separate from irrigation is less satisfactory but acceptable fertilizers should be applied each week at the rate of 3 lbs. of a 25-0-25 or 20-20-20 per 100 gallons.

The same principles which make it essential to use warm temperatures apply to watering and fertilization. Plants must grow rapidly for a fast crop; they should not be held back by restricting water or fertilizer. If you plan to grow the crop for 16 or 18 weeks (January or February propagation), it is necessary to hold back on water and fertilizer, otherwise plants get too large if they are watered and fertilized as we suggest for a fast crop.

5. Full light intensity — Do everything you can to provide adequate light energy for the crop. Clean the glass, space the plants properly, grow them in glass houses which permit the largest amount of light to enter, avoid flats on shelves above the geraniums.

For strong, sturdy plants of high quality, light is essential; without adequate light, growth may be weak and spindly, and flowering will be delayed. Do everything you can to promote photosynthesis; don't crowd the plants.

6. CO₂ Fertilization is not required — CO₂ will increase growth rates and plant size. However, under most conditions, maintaining 1200-1500 ppm of CO₂ in the greenhouse during April and May is difficult and uneconomical because of the need for ventilation at that time of the year. You may wish to try CO₂ — it should...