COLORADO FLOWER GROWERS ASSOCIATION, INC.

IN COOPERATION WITH COLORADO STATE UNIVERSITY
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Northern Europe via South Africa

Joe J. Hanan

Traveling to Northern Europe via the Canary Islands and South Africa is the hard way, but interesting. It is further to Johannesburg from Rome than from Rome to New York, but the lack of a big time change makes it less difficult to adjust.

Gran Canaria, the largest of the Canary Islands controlled by Spain, is rapidly developing into an important resort area. Situated in the trade wind belt, the climate is usually mild although there can be large temperature fluctuations in the mountains. The islands are arid and volcanic, the interior is very rugged, and wood is extremely scarce—most of the trees being cut prior to World War II. The majority of greenhouse structures are concrete covered with polyethylene, with most of the ventilation on the sides. Roofs are nearly flat. The water scarcity causes some difficulty, and since good soil is hard to obtain, the government is showing considerable interest in the abundant volcanic ash for hydroponics.

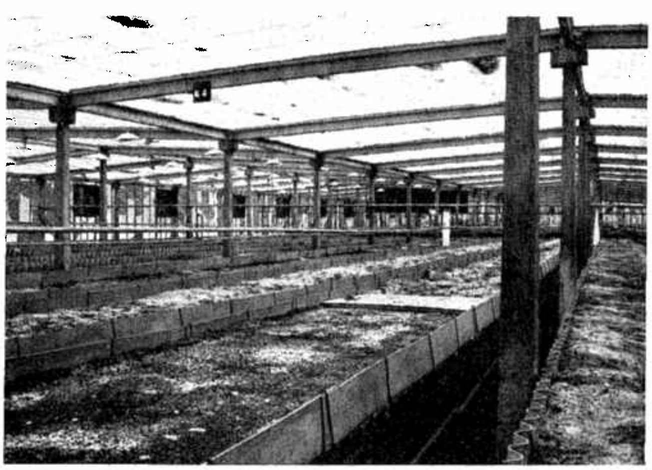

Fig. 1: Typical concrete greenhouse construction with polyethylene cover, Framptons' Nurseries, Canary Islands.

Citrus, bananas, vegetables, and some cut flowers are grown on the island. Strawberries shipped to Britain are very profitable. Most of the flowers go to Germany. Framptons' Nurseries produce mum and carnation cuttings, with the mother stock shipped to the Islands from Britain. While I was there, they were constructing a very large reservoir for water storage. They produce their own electricity. I did not visit their rose range but managed to tour another rose grower. Since the market is good only during the winter, very little is done to the bushes during the summer (no spraying and very little watering), bringing the plants back into production for December.

One of the most unusual horticultural operations in the world is located on Lanzarote (one of the Canary Islands). Here grapes are grown in black volcanic ash under conditions so dry that cactus has difficulty. With a suitable mixture of fine and course volcanic ash fractions, the large temperature fluctuations cause water condensation in the ash. This is sufficient for the grapes to survive and to produce a profitable crop.

South Africa

Ten days is too short a time to appreciate the opportunities in South Africa. Johannesburg is approximately 23° south, at an elevation near 6000 feet. Although mean temperatures are higher than in Colorado, the humidity is low, and temperature fluctuations can be large. The growth potential in this region is tremendous. Coupled with a wide range of plant species as yet unexploited for cut flower production, South Africa represents a wonderful opportunity for mass flower production. Unfortunately, most effort has been given to mining and engineering, and although the University is well equipped, there are few students and relatively little attention is given to agriculture. Well-trained grower personnel are difficult to obtain, and the markets are still undeveloped.

I visited Rolf Flowers, a firm with approximately 25 acres at Johannesburg, as well as other productian areas outside the city about 300 miles northwest of Johannesburg in the Letsitele Valley. They are rapidly covering most of their ground in Johannesburg with glass greenhouses. The houses are locally designed and cheap, since steel costs about $100 per ton and glass around 10¢ per square foot. Rolf's location in the Letsitele Valley was one of the most interesting in terms of the effect of local topography on climate. Situated on the up-valley side of a small "koppie," there has never been any record of frost or hail, although there have been severe hailstorms and frost within a quarter mile of their farm. Apparently, the small hill acts to divide storms passing down the valley and increases minimum temperatures. The summers are much too warm for carnation production outdoors, but conditions are ideal for winter growing.

Europe

Winter, of course, is not the time to truly enjoy Europe. Once I left Southern France, I saw the sun but once or twice until I arrived in Israel. One cannot appreciate the difficulty in growing cut flowers in this part of the world until he experiences the lack of light. Symptoms were seen on carnations that we, in Colorado, would ordinarily attribute to anything but light. Carnations are cut, but if day temperatures go much higher than 40°F, weak stems are sure to result. The low temperatures predispose standard carnations to slabsides and splitting. Nevertheless, the larger operations I visited apparently manage to do a creditable job. Supplemental light, as contrasted to day-length control, was being used by Framptons in England and von Staaverens in Holland. The lamps were high-intensity mercury types and apparently permitted them to double the total daily radiation received by the crops during December. One had to keep in mind, however, that natural light might often be less than 20 gm-cal/cm^2/day as contrasted to a dark day in Colorado with a total radiation of 50 to 60 gm-cal. The greater part of Europe is farther north than North Dakota.

Fig. 2: Typical carnation growth in mid-winter, Northern Europe, picture taken on December 21.

I was impressed with Framptons' use of day-length control on carnations in conjunction with growth retardant sprays to strengthen stems. This appeared to be a regular operation in their carnation culture. All greenhouses used hot water heat, sometimes running the water in plastic pipes laid directly on the bench surface. Greenhouse structures were varied, but some spanned nearly 100 feet or more without intermediate posts. In general, the greenhouse industry appeared to be progressive, although I was told in Germany that the average family size operation may cover only 5000 sq. ft. This would limit opportunities for improved technology.

Greenhouse production in Europe is much more important to the economy as compared to the United States. The research stations are correspondingly better equipped with what seemed to be a greater number of staff in comparison to our own state research stations. Some of the large greenhouse operations had their own research and development departments—such as DCK, Framptons, and Barberet in France. Of particular interest was the Peat Research Institute supported by Satoturveoy, in Finland. Finland has large peat deposits, and the Institute conducts research on the use of peat moss in greenhouse production.

Fig. 3: Pot mum production, Framptons' Nurseries, England. Mr. Brian Matthews at the side of the picture. Note the large movable beds.

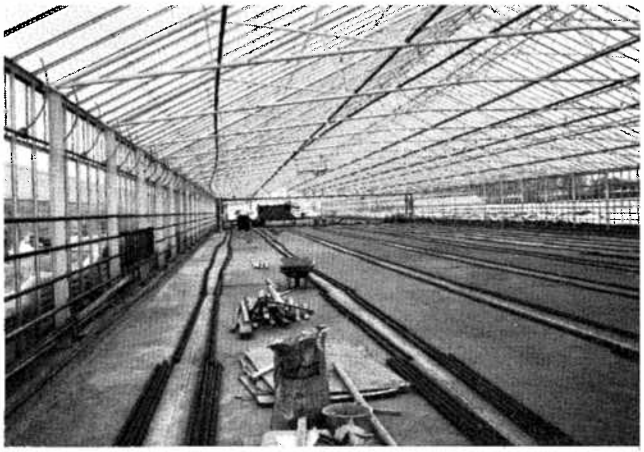

Fig. 4: New cucumber house, Ab Fortuna, Malmoe, Sweden. Pipes are for hot water heating, and will be laid along the side of each row, the cucumbers grown in peat moss, directly on the concrete floor.

Fig. 5: Fluorescent lights mounted on a movable trolley and suspended from the roof, for lighting Chrysanthemums. Shading is automatic with black plastic, Kurz Greenhouses, Stuttgart, Germany.

Fast Crop Chrysanthemums

W. D. Holley

About 10 years ago the research and development arm of Yoder Bros., Barberton, Ohio, researched fast chrysanthemum culture for production of short-stemmed disbud and spray chrysanthemums. William Skou of Yoder Bros. prepared directions for growing and timing schedules and presented this information at numerous conferences of flower growers. The goal in this fast culture was to produce short-stemmed, high quality flowers for mass marketing.

Mass marketing of cut flowers did not develop at that time for numerous reasons, one of which was lack of an adequate supply of quality flowers. Recent developments in mass marketing indicate there will be a need for short-stemmed chrysanthemums in ever-increasing numbers. To check Skou's cultural directions and to obtain facts and figures on the production potential of this crop in Colorado, fall and winter plantings of some 20 cultivars were made at CSU in 1968. The rooted cuttings were supplied by Yoder Bros. and Skou helped select the cultivars.

The cultural directions published previously by Yoder Bros. were followed:

1. Spacing was 6" by 8" on both crops.
2. Natural short days were supplied from planting to harvest.
3. An inert medium (Idealite) was used instead of soil.
4. Watering with a complete nutrient solution was twice per day in early fall and once per day from November to March.
5. Night temperature was 6OF in fall, but during the colder weather in midwinter temperatures often dropped to 55 degrees due to an inadequate system. Day temperatures were 15 degrees above night.
6. Plants were pinched high and soft 18 days after planting. No branches were removed following pinching.
7. One set of support wires was used.
8. Some cultivars were disbudded and some were grown as sprays.
9. All stems were broken off at the origin from the base stem.

Rooted cuttings of 22 cultivars were planted September 16 and flowers harvested from November 20 to December 10. A second planting of 23 cultivars was made December 20 to December 27. Each cultivar occupied an unreplicated plot of 15.5 square feet. During January and February night temperatures dropped below the 60F desired night temperature due to inadequate radiation surface. The cultivars Carnival, Cheerful, Dark Yellow Iceberg, Duchees, Firebrand, Jackstraw, Maple Leaves, Stingray and Yellow Leaves were delayed by low temperature so are not included in Table 2. The Decembr planting was harvested from March 3 to March 24, except those cultivars that were delayed. Those delayed were harvested as late as mid-April. Lenth of each stem was recorded when picked.

Table 1. Yield and stem length of chrysanthemums planted September 16.

Cultivar	Number stems	Stems/ft²	Range of length-inches	Mean length-inches	Days to cutoff
Yellow Indianapolis	232	15.0	6-9	7.6	81
Snow Crystal	536	34.5	5-13	8.0	79
Nimbus	293	18.9	6-10	9.0	71
Duchess	255	16.4	8-11	9.6	85
Woking Scarlet	276	17.8	8-12	10.2	78
Telstar	222	14.3	10-13	11.1	84
Jackstraw	380	24.5	9-13	11.1	85
Luyona	345	22.3	9-14	11.6	79
Starburst	410	26.4	9-14	11.8	85
Iceberg	264	17.0	9-13	11.9	85
Firebrand	316	20.4	9-14	12.0	81
Golden Starburst	356	23.0	9-16	12.2	85
Flamenco	293	18.9	9-13	12.2	80
Dark Yellow Iceberg	305	19.7	10-14	13.0	85
McKinley	322	20.8	12-16	14.1	85
Surfside	268	17.3	12-15	14.3	85
Bluebird	316	20.4	12-17	14.5	71
Maple Leaves	409	26.4	12-18	15.3	79
Yellow Knight	308	19.9	12-18	15.7	85
Yellow Leaves	355	22.9	12-18	15.7	79
Shane	194	12.5	15-19	16.6	85
Stingray	172	11.1	15-22	18.4	84

Results

Table 1 contains the yield, stem length and bench time required for the 22 cultivars of the fall planting. They are arrayed from shortest (7.6″) to the tallest (18.4″). Since all branches were allowed to develop, branching characteristics under these conditions are indicated by the variation in yield between cultivars of from 11 to 34 stems per square foot at this spacing and time. There were almost no leaves on the flower stems of Yellow Indianapolis, Luyona, and Flamenco. Bluebird was one of the fastest in the fall crop and among the slowest in the winter crop. There is a good chance that it was delayed by cold since it was rather tall in the winter crop.

Table 2 presents similar data for the December planting on 14 cultivars. Data is not shown for the 9 cultivars that were delayed by cold. Seven to 9 more days were required to complete this winter crop compared to the fall crop. Yield was less for most cultivars and stems were slightly longer (Table 3). Most cultivars produced from 13 to 17 stems per square foot compared to fall production of 15 to 20.

Table 2. Yield and stemlength of chrysanthemums planted December 20-27.

Cultivar	No. stems	Stems/ft²	Range of length-inches	Mean length-inches	Days to cutoff
Themesong	131	8.5	8-10	9.2	89
Woking Scarlet	230	14.8	8-12	10.4	87
Nimbus	203	13.1	9-13	10.8	78
Silver Bow	214	13.8	8-12	11.0	87
Overture	278	17.9	9-12	11.1	89
Explorer	296	19.1	9-13	11.1	89
No. 2 Pennant	172	11.1	10-13	11.9	89
Telstar	228	14.7	10-14	12.1	89
Goldpiece	223	14.4	10-15	12.6	94
Yellow Knight	251	16.2	10-16	12.7	87
McKinley	269	17.4	10-16	13.6	87
Surfside	192	12.4	12-16	14.7	94
Shane	236	15.2	14-18	16.0	89
Bluebird	198	12.8	17-22	20.5	94

Discussion

The type of flower, length of stem and whether disbudded or grown as sprays depends upon the market and use. Large daisies, anemones and spiders do not display well when tightly packaged. Packages should be designed for chrysanthemums in mass markets outlets that would display them to their fullest potential. In this way the buying public can have the advantage of the fine array of variety that is inherent in chrysanthemums.

Ten-week chrysanthemums can be produced without long days in from 75 to 90 days of bench time. There is a wide variation in the performance of cultivatars so the grower should start with better cultivars such as the Icebergs, Telster, Starburst, McKinley and Surfside. He should add other varieties, a few at a time, keeping in mind the type of package and productivity of the cultivar.

Projecting from these figures on two crops, it should be possible to grow 4⅓ to 4½ crops per year. By selecting cultivars, 18 stems per crop per square foot of bench can be produced. At 8 cents per stem returned to the producer after selling costs, this could mean a gross return of over $6.00/ft² per year. The market must be assured before these are planted because regular wholsale marketing channels do not presently want short-stemmed, high quality chrysanthemum flowers.

Table 3. Comparison between fall and winter results with selected chrysanthemum cultivars.

Cultivar	Fall crop			Winter crop		
	Stems/ft²	Mean length-inches	Days to cutoff	Stems/ft²	Mean length-inches	Days to cutoff
Nimbus	18.9	9.0	71	13.1	10.8	78
Woking Scarlet	17.8	10.2	78	14.8	10.4	87
Telstar	14.3	11.1	84	14.7	12.1	89
Yellow Knight	19.9	15.7	85	16.2	12.7	87
McKinley	20.8	14.1	85	17.4	13.6	87
Surfside	17.3	14.3	85	12.4	14.7	94
Shane	12.5	16.6	85	15.2	16.0	89
Bluebird	20.4	14.5	71	12.8	20.5	94

Recent and Good

The following are abstracts from papers presented at the 67th Annual Meeting of the American Society for Horticultural Science, Miami, Florida, November 2-4, 1970.

Snapdragon

Transpiration under greenhouse conditions. Rutland, R. B., Univ. of Georgia, Athens, Ga.

Transpiration of snapdragons in the greenhouse, as determined by continuous weighing, increased directly with radiant energy (0.2 to 1.0 cal/cm^2/min). Daily transpiration was proportional to daily radiation in the range 150-375 cal/cm^2/day. In the growth chamber, transpiration increased as temperature increased from 20° to 35°C, as vapor pressure deficit increased from 10 to 30 mb, and as soil temperature increased from 10 to 25°C. Soil temperature apparently has the most profound effect on maintaining turgidity and open stomates. Transpiration was not reduced by decreasing incident radiation by 50%. It was progressively decreased at CO_2 concentrations of 500, 700, and 900ppm. Plant factors of importance are leaf age (rate of young leaves was 140% of old leaves) and stomatal density (rate of cultivar with 170 stomates/mm^2 was 130% of one with 135).

Response of Snapdragon to postharvest storage handling conditions and floral preservatives. Raulston, J. C. and J. J. Marousky, Gulf Coast Experiment Station, Bradenton, Fla.

Seven experiments were conducted to investigate handling techniques for cold storage of snapdragons and use of an 8-hydroxyquinoline citrate (8-HQC) plus sucrose (S) holding solution following storage. A 150 or 300 ppm 8-HQC plus 1.5% S solution was most effective in developing spike florets and delaying senescence. In all experiments, holding spikes in 8-HQC + S following storage was superior to holding in distilled water.

There was no difference in subsequent vase life when spikes were wrapped in paper and held in 40°F storage for three-four days with cut ends (1) dry, (2) in water, or (3) in 8-HQC+ S. When storage was extended to seventen days, holding cut stems in water was superior to dry storage. Three days dry 40°F storage caused flowers wrapped in paper to lose more weight than spikes wrapped in polyethylene film; however, both had equal development and vase life following storage.

Roses

Some characteristics of water flow through isolated rose stem segments. Durkin, Dominic, Rutgers University, New Brunswick, N. J.

Cut rose flowers undergo an increasing resistance to water flow beginning at harvest. To study this phenomenon experimentally, 20 mm stem sections were removed from flowering shoots and placed under a water head pressure of 100 cm. Resistance to flow was calculated as the inverse of water conduction per hour.

The following results were obtained in experiments repeated at least four times:

1. Resistance to flow (R) increases from time of harvest at a rate which is described by the equation, $\log R = a + bx$.
2. The rate of blockage (b) is similar at pressures of 15, 51, and 97 cm of water.
3. The rate of blockage (b) is similar at segment lengths of 30, 60, 90, and 120 mm.
4. The rate of blockage increases tenfold when water extracts (15 min) of rose stem slices are substituted for distilled water.

Implications of these and other results were discussed at the meeting by Durkin.

Poinsettia

An analysis of low temperature induction of floral initiation in poinsetta. Hackett, W. P. and A. M. Kofranek, Univ. of California, Davis.

It was found that the floral initiation response of "Paul Mikkelsen" poinsettia to low temperatures under noninductive photoperiods was saturated after exposure to constant temperatures of 60°F for ten days. This response to temperature was perceived by the shoots but not the roots. The promotive effect of a constant temperature of 60°F under noninductive photoperiods was completely negated by a weekly application of a 40 mg/liter GA_3 solution. In contrast, plants grown at constant 70°F and treated with Cycocel initiated floral primordia at a much lower node than untreated plants. At 70°F, light intensity and quality interacted with Cycocel to promote floral initiation. These findings were discussed in relation to a possible mechanism by which low temperatures stimulate floral initiation in poinsettia.

Foliage plants

The influence of elevated soil temperatures upon development of cuttings and seeds of tropical indoor foliage plants. Poole, R. T. and W. E. Waters, Univ. of Fla., Apopka.

The influence of soil medium temperatures on production of several species of tropical foliage plants from both seeds and vegetative cuttings was investigated. Media temperatures, maintained with electric heating cables in transite benches, were: 75°F, 85°F, and ambient bench temperature. Samples were removed periodically to determine progress in root and shoot development.

In general, the elevated medium temperatures, with few exceptions, greatly accelerated development—thereby reducing time required for propagation up to 50% in some instances. Generally, plants held at 75°F responded as well as those held at 85°F.

Your editor,

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