



## COLORADO FLOWER GROWERS ASSOCIATION

# Comparison of CRAM and Conventional Carnation Cuttings: Possible Mutation Rates

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A test for possible differences in mutation rates between conventionally grown carnation cuttings and cuttings produced by the rapid-asexual-multiplication method showed differences in the first year's test and none in the second year's test. Conventional cuttings in 1974-75 produced more cut flowers with higher quality and fewer obvious off-types; whereas "CRAM" plants, 1975-76, had slightly higher quality cut flowers and fewer off-types. A real difference in mutation rates between the two cutting production methods was not proven.

Work at Cornell has suggested the possibility that cost of cutting production could be significantly reduced by proliferating many cuttings from a single carnation shoot-tip by culturing them in a suitable environment under aseptic conditions. If successful, the method — designated as "CRAM" for "carnation-rapid-asexual-multiplication" — would reduce the greenhouse area required for stock plants, and perhaps shorten the time involved for producing saleable cuttings from the primary, selected shoot tip.

In 1973, Baker and Davis began work to determine the best method for producing small cuttings by the CRAM method. However, a primary concern was that the process could increase the mutation rate. Because CRAM by-passes the usual check on shoot-tipped plants for trueness, a serious mutation in the original shoot-tip would cause serious problems. In 1974, and again in 1975, production of cut flowers from CRAM and conventionally-produced cuttings were tested.

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### Methods

On August 5, 1974, 24 selections of the cultivars CSU Red, CSU Pink and White Pikes Peak were planted at a 6 × 8-inch spacing, in gravel, at the CSU Bay Farm Greenhouse. Rows were alternated between CRAM-produced plants and conventionally-produced cuttings, for a total of 780 plants, 65 rows CRAM and 65 rows conventional. Irrigation was through Chapin, double-wall tubes with automatic fertilization. Plants were tagged if the flower cut appeared to be definitely off-type, and records were kept on cut and average grade.

The growing conditions in 1974-75 were not felt to be a good test due to bench location and the late planting. On July 7, 1975, 82 rows of conventional and CRAM-produced cuttings were planted in alternating rows for a total of 492 plants. The root medium was soil with double-wall drip irrigation and automatic fertilizer injection. The cultivars were White Pikes Peak, CSU Red and CSU Pink, with each row designated by number, and records kept on off-types cut. Obvious mutations were tagged individually.

### Results and discussion

Table 1 shows that there were considerable differences between CRAM and conventional cuttings, with much lower yield and quality, and a higher incidence of off-types and mutations for the CRAM cuttings. These were the first cuttings of this type produced at CSU. Apparently, better selection and growing conditions during the second year resulted in negligible differences between the two types

Table 1: Comparison between CRAM and conventionally produced cuttings in 1974-75.

	Yield (Flowers per row, 6 plants)	Mean grade	Off-types	Obvious Mutations
Conventional	21.3	3.59	41	0
CRAM	9.8	3.26	168	41

(Table 2). There were 5 obvious mutations in the conventionally produced plants in 1975-76, and none in the CRAM produced plants.

Of course, mutations need not be obvious, and it is often difficult to determine if an off-type carnation flower was produced as the result of environment or from mutation. The choice is often in the eye of the beholder. Carnations, regardless of the fact that they are asexually produced, vary markedly, and, within the limitations of the trial, we could

Table 2: Comparison of off-type carnation cut-flowers produced by conventionally produced cuttings and CRAM produced cuttings, 1975-76.

	Average number of cut flowers per row (6 plants)							
	Total yield	Mean grade	Slab sided	Weak stems	Hollow centers	Small flowers	Poor petalage	Bullheads
Conventional	1756	3.61	3.6	2.4	2.6	2.0	0.7	2.7
CRAM	1572	3.83	2.3	1.8	2.1	1.8	0.4	1.7
Significantly different?	NO	NO	YES	NO	NO	NO	NO	NO

### The Grower, 84(1), July 5, 1975. Grower Tech. Supplement No. 2 Food, not oil, is the vital issue

The argument that it would be less costly to import luxury items — tomatoes (ornamentals in the U.S.), potatoes, etc. — overlooks the energy needed to get the crop to our table. In many cases, almost as much oil is used to produce and transport the crop from the warmer country as is consumed to grow it under glass here.

Consider these figures: A Boeing 747 carries a payload of 50 tons and uses 8.5 gal. of fuel per mile. Distances from some countries to Britain are: Canaries 1,750 miles, Israel 2,500, USA east coast 3,600, Columbia 4,600 miles. On this basis, a 50 ton load would have an energy input from transport alone of 15,000 to 39,000 gallons. Air transport over 3,200 miles would use more energy than that needed to grow an acre of early long season tomatoes in this country.

Glass covering an acre in Britain can produce up to 120 tons of tomatoes, much more of cucumbers. Compared with field crop outputs of 2 tons of grain and vegetable yields, the better productivity is indisputable.

George Sheard (GCRI) has said that the strength of the domestic industry lies in its high level of technology and production facilities. If the market is to be adequately supplied with good quality produce over the entire 12

months, home production and imports are complementary so long as each seeks to supply that part of the market it is best equipped to do. Considering likely economic trends, the exporting countries are likely to become less, rather than more, competitive with home production.

not observe a real difference between mutation rates of conventionally produced and CRAM produced stock. The differences between the first and second trials were attributed to better growing conditions, better methods for producing the CRAM cuttings, and selection of CRAM plants prior to planting for the test, with obviously undesirable plantlets being discarded.

CRAM plantlets, as they come from the production flask are often less than an inch tall, lack the usual cuticle, and are brittle. A considerable stumbling block in successful utilization of the method is getting the plantlets from the flask to the size necessary if a grower is to handle them. Cultural details need to be worked out, and the need for one to two months of growth before selling to the producer will tend to reduce the advantages mentioned earlier. If a significant cost reduction can be achieved, the system may fit well to carnation single cropping. We are at the stage when concerted effort needs to be placed on rooting of CRAM plantlets if the method is to be successful.

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### Anon. 1976. Flower sales 20 years out of date. *The Grower*. 85(16):815. (British)

The choice which the flower industry faced 10 years ago remains the same. It is simply a question of whether to promote the buying of flowers or to continue supplying the existing market. The basic problem of selling flowers has never been tackled except in a fragmented way. The flower industry now is where the produce industry was 20 years ago; small, fragmented units unable or unwilling to produce large consistent quantities for organized mass sales.

Promotion of flowers to retailers and wholesalers should be done mainly by the producer just like shoes, shirts, cars or whatever. But in the absence of large flower groupings either for production or sale it seems impossible.

(The article reports other attempts to market flowers, but the main conclusion remains that promotion efforts for the floral industry is fragmented, and will never amount to much unless there is a radical change in attitudes.)

**Anon: 1975. Troubled carnation industry puts some of blame on winter imports. *The Grower*. 84(7):271. (British)**

Market returns are the worst in 5 to 8 years. It seems certain to result in some growers ending up with a loss this season of up to \$12,000 per acre. One prominent West Sussex producer stated: "It is the Columbian carnations which have ruined our business. It has killed us. The glut situation which has existed for the past 5 weeks shows little signs of easing. Blues were struggling to reach 3¢. Huge withdrawals of everything but top grade hasn't helped. Wholesalers report little life in the market. Part of the problem has been massive imports of carnations during the winter months from Columbia, Kenya, France, Israel and other places. This has made UK growers to go for the summer market.

**Editorial comment on above from *The Grower*. "Carnations on a knife-edge."**

On a holding which is really efficient, cost of growing a crop of carnations this season will be between \$60,000 to \$70,000. If the output is around 40,000 bunches of 20, we have to get about \$2.30 bunch to say we have a reasonable business. But, we must be satisfied most of the time with \$1.45 which brings us a gross of about \$83,000. At this figure, the margin is very tight. At 75¢ a bunch, which has been roughly the price this summer, we will be short \$23,000 of the costs. We would normally say that our peak of around \$2.58 a bunch would bring the average up to near the average we must have. This year, that sort of return lasted about 2 weeks, so that the average could run out about \$1.01 for some growers. One grower to whom we spoke said that UK carnations will become like UK grapes, curiosities in the market. We do not agree. Carnations have a low heat requirement, and owing to our climate, a summer potential for export and therefore a big future. But, in the short-term, the Columbian menace is real and could result in the death of carnation growing here. Increasing our efficiency and effective marketing are not enough. We must have some support.

1 British pound = \$2.30 U.S.

**Anon: 1975. Time is running out! *The Vegetable Grower*. 23(8):25-26.**

There is no more time for agriculture to sit back and hope that a reasonable, workable solution to pesticide registration will be found. The countdown ends on October 21, 1976, and growers may find themselves without pesticides for some 15,000 uses. By October 21, every pesticide must be federally registered, meeting all data requirements spelled out in the Federal Environmental Pesticide Control Act.

Most of the 15,000 uses in question have never appeared on a federal pesticide label. In New York, for example,

recommendations of the State Experiment Station have been tantamount to official state registration. It is estimated that in New York alone about 3000 uses are not on federal or state labels. Even those uses currently registered may not be continued. FEPCA requires that all labels approved before registration regulations were promulgated must be reregistered.

Today, under Section 3 regulations, two-year chronic toxicity tests are required, with cost estimated at \$100,000 as contrasted to earlier, two, 90-day feeding tests for efficacy and short-term toxic effects. With all the rest, it adds up to an \$8 to \$10 million cost to discover and bring a new pesticide on the market. It is the lack of efficacy and residue data that will prevent the addition of minor crop uses to labels approved for major crops even though proven efficacious and safe over a period of years under state labels. It is illegal to use a pesticide for any use not on the label.

Despite the fact that only 14 or 15 months remain to solve the minor uses dilemma, there is little sense of urgency at USDA or EPA. USDA has assigned one man to the problem. One EPA'er shrugged his shoulders and said, "It's not our problem."

**CPA Debate rolls on. *The Vegetable Grower*. 23(8):26.**

Certification of private applicators of pesticides is a requirement under FEPCA. The deadline is October 22, 1976. A major stumbling block is the lack of an EPA list of pesticides classified as to restricted or general use. As of early July, 22 states had submitted plans for certification to EPA. Georgia and Iowa have already published in the *Federal Register*. New York's plans have not been approved by EPA, although some 12,000 private applicators have already been certified. The \$10 million appropriated is supposed to defray the cost of training an estimated 80,000 to 120,000 applicators and 2 million private applicators. The amount is insufficient. One state official lamented; "Who is going to pay?" It costs money to print a certificate, clerical workers, filing systems, followup procedures, enforcement.

EPA's attitude has been let the farmer pay by charging a fee. Comments have been that government cannot expect to force a grower-user who has consistently used a restricted use pesticide for many years to undergo the red tape of certification and get slapped with a fee to pay for the program. Due to the controversy, EPA has not been as hidebound. It will now be possible to be certified as a private applicator without taking a written or oral test if other criteria are met. Attendance at an authorized training session will qualify.

EPA argues that certification "will increase production and reduce costs," but didn't offer any proof of that statement before the House Ag Committee. Despite all shouting during the hearings, don't look for any changes. Certification is here to stay, and the certification card will become a part of most pesticide transactions. Dealers are going to be required to check that card as they "police" sales of restricted use pesticides.

**Anon: 1975 British living standards make more flower sales 'improbable.' *The Grower* 84(8):323. (British)**

The survey, carried out for the Dutch Marketing Board in 1974, found that the public cannot afford to buy flowers and plants. "Under present economic conditions in Great Britain, a rise of standard of living is hardly to be expected," says the report. "Consequently an increase in demand for flowers and plants is improbable."

This conclusion is based on the fact that the percentage of households buying flowers or plants is highest (41%) in the period before Mothers' Day when the market is flooded

with very cheap bulb flowers on sale in many outlets. Then the retail price per bunch is not higher than 44¢ at a time when the price level in Holland is twice or three times as high.

The report concludes that flowers are too expensive for the general public and a luxury they cannot afford. The same is true for pot plants. The choice of cut flower available to the British consumer is very limited. On a quantity basis, narcissus and tulip account for nearly 60% of purchases, narcissus alone 50%. On a value basis, their market value comes down to 30%. Mums account for 25% of sales, followed by carnations (8%) and roses (5%). The report comes to the surprising conclusion that apart from the mixed bouquet, these few types exhaust the flower assortment generally available.

Family consumption of flowers and plants in Britain: 1974.

4 wks ending	Percentage of households buying			Average consumer prices	
	Cut flowers only	Pot plants only	Cut flowers and pot plants	Flowers per 10 bunch	Pot plants
January 26	14	6	3	\$ .59	\$1.07
February 23	23	3	3	.35	.74
March 23 (Mothers Day)	29	5	7	.29	.79
April 20 (Easter)	27	4	4	.29	.81
May 18	17	4	3	.42	.81
June 15 (Whitsun)	11	5	2	.66	.77
July 13	9	4	1	.70	.79
August (Holiday)	8	4	1	.77	.72
September (Holiday)	10	4	1	.83	.75
October 5	10	4	1	.87	.77
November 2	9	3	1	1.05	.87
November 30	8	4	1	1.29	1.07
December (Christmas)	9	9	3	1.20	1.31

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