



IN COOPERATION WITH COLORADO A & M COLLEGE

Secretary, Ray App, 4434 Lowell Blvd.,
Denver, Colorado

Bulletin 51

January 1954

Colorado's Fourteenth Short Course

February 3, 4, and 5, 1954

Among our guest speakers this year will be:

Dr. Gustav A. L. Mehlquist of the University of Connecticut who needs no further introduction.

Dr. Robert N. Hampton of the Marketing Department of Cornell University. Bob and Dr. Max Brunk made marketing studies on roses this past year. I am sure he will have a lot of interesting results and observations for us.

Carl Ball of Geo. J. Ball, Inc., West Chicago, Ill., will bring his fine movies on European Horticulture and Mum's the Word.

A complete program will be published in the February bulletin.

Pathogenicity of Eight Strains of Carnation Mosaic Virus

W. D. Thomas, Jr.

Methods

Since the first report of carnation mosaic several investigators have been attempting to determine the characteristics and identity of the virus. All of these investigations have been carried out with the assumption that the virus samples used were pure and unmixed. Some evidence has been obtained, however, to indicate that the samples might have been mixtures of more than one virus or more than one strain of a single virus.

While testing the ultraviolet light technique for diagnosis of mosaic in carnation, various types of symptoms were observed in individual test plants of several Sweet William varieties inoculated with an extract from a single infected carnation plant. Further types of symptoms were observed during recent investigations of the properties of the virus. In order to determine whether or not there were several strains of this virus, the following study of differential pathogenic reactions of several virus samples was conducted.

Accessions of mosaic were collected from different carnation varieties produced in several greenhouses in the Denver area. Crude juice extracts from 36,000 plants, representing 12 carnation varieties, were used to inoculate a mixture of varieties of sweet william. From these inoculations eight selections of plants were made in which obviously different symptoms had developed. The virus samples in these selections were originally obtained from Scarlet King, Donna Lee, Pink Patrician, Miller's Yellow, Elitch, Northland, White Patrician, and William Sim carnation varieties, and were numbered from 1 to 8, respectively (Table 1). The samples were extracted and purified by filtration and titration prior to further inoculations.

Five varieties of sweet william, Scarlet Beauty, Giant White, Holborn Glory, Newport Pink, and Purple Beauty,

with uniform flowering and growth performance, were used to provide the differential test plants throughout the investigations.

Five plants of each sweet william variety were inoculated with the purified extracts of each of the eight virus samples. All except the top five fully-developed leaves and the growing tips were cut from the plants with scissors. This area provided a marked zone on each plant to indicate the site of inoculation. Inoculations were by abrasion with 320 mesh carborundum. Following inoculation the plants were atomized sufficiently to wash off the excessive carborundum. Observations were made after the plants had grown for 30 days in a greenhouse in which the temperatures were maintained at $60^{\circ} \pm 5^{\circ}\text{F}$.

Results

Symptoms were arbitrarily classified into 5 classes shown in Figure 1: (1) no apparent symptoms, (2) local necrosis with a purple border and sometimes with a mild mottle, (3) local necrosis a blanched spot free of color margin and sometimes with a very slight mottle, (4) severe mottle and vein clearing with a tendency toward a ring-spot pattern and with severe rugosity in some varieties, and (5) mild mottle. Type 4 had the most deleterious effect on the host plants.

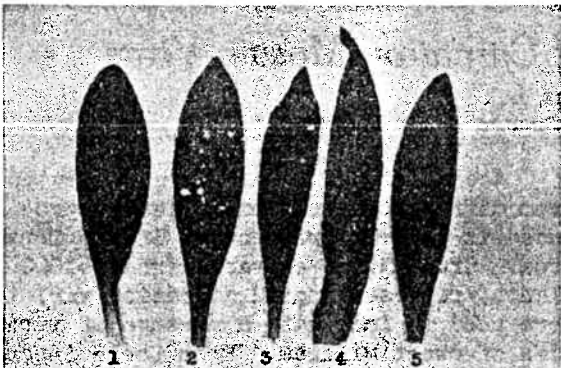


Fig. 1.--Types of symptoms caused by eight strains of carnation mosaic virus on Sweet William (*Dianthus barbatus*).

Propagate Carnations with Large Cuttings

W. D. Holley

Carnation plants that are propagated from large cuttings out produce plants from small cuttings, although the average quality of the flowers from either size is similar.

Plants from large cuttings are ready to pinch faster and come into production about two weeks sooner.

The data in Table 1 indicate that all eight virus samples differed in their pathogenic reactions on the varieties of sweet williams used. Virus strains 1 and 2, and strains 3 and 4 were very similar, strain 2 differing from strain 1 only in its reaction on Holborn Glory, and strain 4 differing from strain 3 in symptoms on Scarlet Beauty and Purple Beauty. Uninoculated control plants in this test remained free from mosaic symptoms.

Because of the similarity between some of the strains, this test was repeated twice in insect-proof cages to eliminate the chance of insect transmission. In each case the results were the same as those indicated in Table 1. Large-scale tests using 100 plants of each sweet william variety for each virus strain, also provided results identical to those indicated in Table 1. On the basis of these tests it seems probable that at least eight strains of the carnation mosaic virus may exist. Investigations are currently in progress to determine the physical and chemical differences between these strains.

Table 1.--Types of symptoms expressed by five different varieties of *Dianthus barbatus* inoculated with eight strains of carnation mosaic virus.

Strain	Source	Scarlet Beauty	Giant White	Holborn Glory	Newport Pink	Purple Beauty
1	Scarlet King	5	5	3	5	5
2	Donna Lee	5	5	5	5	5
3	Pink Patrician	4	2	5	5	4
4	Miller's Yellow	5	2	5	5	2
5	Elitch	4	5	4	1	3
6	Northland	4	4	4	5	4
7	White Patrician	4	5	3	1	2
8	Wm. Sim	4	2	4	5	2
Check		1	1	1	1	1

Cuttings were taken from mother blocks of Frosted Patrician and Miller's Yellow carnations on April 29, 1952. They were graded into small, medium and large by weighing on a dietary scale. The weight categories were:

Small - 4-5 grams
 Medium - 6-9 grams
 Large - 10 grams and up

All cuttings of Frosted Patrician were well rooted in 20 days with no observable differences between sizes. The cuttings of Miller's Yellow were poorly rooted at this time with some foliar breakdown apparent. The small cuttings of this variety appeared to be poorest for rooting and most seriously affected by leaf breakdown.

The rooted cuttings were direct - benched in sterilized soil on May 19 in a randomized block arrangement. Fourteen plants were set in each plot. Two varieties and three sizes of cuttings gave six plots per block. The blocks were repeated three times for a total of 18 plots.

As the plants became established and cleared side breaks, they were pinched just above the top vegetative break. The average time from benching until breaks were sufficiently cleared for pinching was:

Frosted Patrician

Large - 29.9 days
Medium - 34.2 days
Small - 41.7 days

Miller's Yellow

Large - 40.8 days
Medium - 46.7 days
Small - 50.9 days

The production from September 8, 1952 to May 15, 1953 was graded by using a combination of weight and length. An average quality (Q.I.) was calculated for each size of cutting by multiplying splits x 2, shorts x 3, standards x 4 and fancies x 5. The total of this divided by the number of flowers from the treatment gives a weighted figure for comparison.

Quality and production from the three sizes of cutting in each variety are shown in the table. The figures for each cutting size are the product of 42 plants. Differences in quality are so small that they are not significant. However, the increased production from large cuttings is statistically significant.

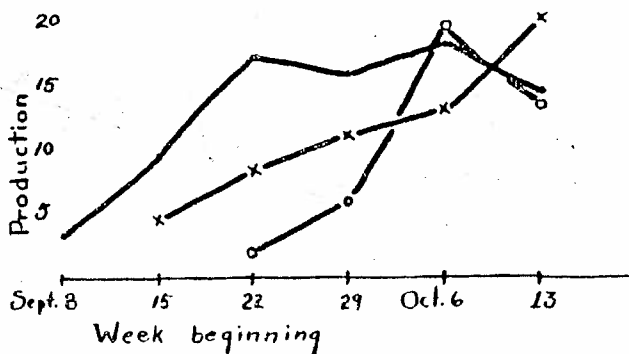
Effect of size of cutting on quality and production of carnations

	Split	Short	Stand.	Fancy	Q.I.	Total Prod.
<u>Frosted Pat</u>						
Small	11	59	174	83	4.01	327
Medium	15	81	165	83	3.92	344
Large	19	85	160	105	3.95	369
<u>Miller's Yellow</u>						
Small	2	10	153	101	4.33	266
Medium	1	16	171	110	4.31	298
Large	1	16	174	112	4.31	303

Frosted Patrician behaved slightly different from Miller's Yellow in that there was a distinct trend in production from small cuttings to large. The medium-sized cuttings of Miller's Yellow produced as well as the large. As is often true with Miller's Yellow, some of the largest cuttings have a tendency toward reproductiveness. This in turn, reduces the production from these cuttings. The behavior of Frosted Patrician is believed typical of most varieties, however.

As a matter of explanation for the increased production from large cuttings, let us look at a graph of the production from Frosted Patrician the first six weeks. After this time production of all sizes of cuttings followed rather closely.

Small ○—○ Med. x—x Large —



The first six week's production from three sizes of Frosted Patrician cuttings.

The increased production brought about by large cuttings is due to faster growth and quicker flowering. It was forecast in the pinching operation for large cuttings were ready to pinch 10 to 12 days quicker than small cuttings. The difference in production on Frosted Pat was one flower per plant or three per square foot of bench area. Large cuttings from well fed plants are certain to pay off.

Several considerations are in order from these data. First, it will pay to take large cuttings. If cuttings are small, leave them on mother stock longer if at all possible.

Second, less time is required to flower a crop from large cuttings.

Third, about two weeks more time in the nursery bed should be allowed for small cuttings.

Fourth, cuttings of different sizes should be graded before being stuck in the propagating medium. Graded cuttings will give uniform blocks of plants in the nursery bed or permanent bench.

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Your editor,

W D Holley

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