Colorado Flower Growers Association, Inc.

IN COOPERATION WITH COLORADO STATE UNIVERSITY

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Some Major Factors Affecting Quality and Grade of Carnations

by W. D. Holley

We must realize that quality and grade are not the same thing. Often the two terms overlap in meaning; they are never synonomous. Quality is rather difficult to describe or define. About the only way we can define it is to list those characteristics which contribute to it. To the majority of our customers a quality carnation looks good, lasts a long time and must have adequate size, form, weight and stem strength.

Grade, on the other hand, disregards keeping quality, appearance to a great extent, and often form and stem strength. Grade may be determined almost entirely by size, weight and stem length.

Let's think for a few moments about quality as I have defined it here. A quality carnation must look good after being shipped to the customer, must keep well and must have adequate size, form and stem strength. What makes a carnation keep? What makes a stem strong? What makes a carnation ship well with a minimum of bruising, breakage and sleepiness? The answers to these questions lead to the production of quality carnations.

The sugar content and the dry matter content when the flowers are cut provide the best objective measurements of quality. If we look at the main factors which influence these two fractions, we come up with 1) light, 2) plant load, 3) temperature, 4) water, 5) speed of growth, and 6) carbon dioxide content of the air. Nutrients seem to have very limited effects on either dry matter or sugar content unless they are either limiting or excessive.

Light

Light is the energy by which the sugars and dry matter are assimilated. Probably the more light the better for quality providing the temperature of the growing plants and developing flowers does not become excessive. Flowers cut from the south side of benches in winter normally have around 2 to 2½% more dry matter than those cut from the north side. This is not all because of light, however, as we will see later. Again, if temperature can be kept down, sugar increases in proportion to light.

That the percentage of dry matter varies with light is brought out clearly in the temperature research by Joe Hanan and Jim Manring. One of their continuing experiments consists of starting rooted cuttings every 3 weeks in four different temperature conditions. The plants are

grown 12 weeks, pulled, and their dry matter accumulation calculated. Temperature has played a secondary role to light in the year around dry matter production (CFGA Bul. 106).

When an average percentage of dry matter is calculated for plants harvested at the same age throughout the year, the variation follows incident light, Fig. 1. This percentage of dry matter is lowest from December to April and highest from June to September. The percentages in Fig. 1 are for 12-week-old plants and usually would increase with plant age.

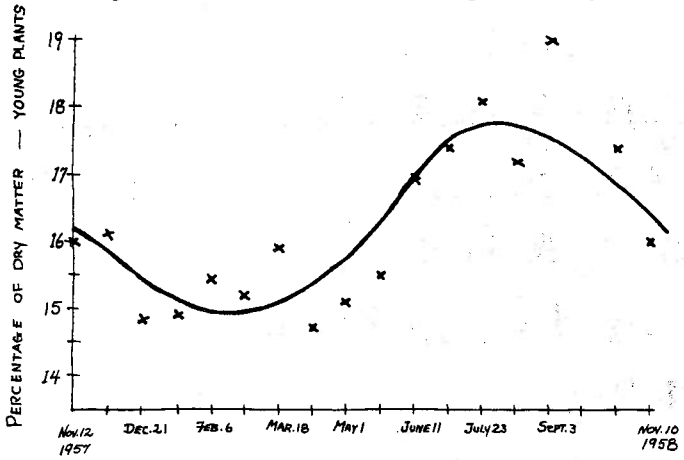


Fig. 1. Dry matter percentages of 12-week-old carnation plants washed and dried throughout one calendar year.

Competition

Plant load is rather closely related to light in that a heavy load of developing flowers decreases dry matter and sugar content more seriously when light is limited. One seedling we had was a classic illustration of this competition factor. It was a beautiful salmon similar to Venus with a tendency to grow tall and produce three to five extremely large breaks high on the flower stem. If these were not removed, a short or standard length flower was the best we could cut. The flower was an extremely poor keeper. We found that by removing all or most of the breaks when small, the flower kept as well as any other. Competition by these fast developing breaks was actually diverting sugar and dry matter from the developing flower.

I believe that this suggests one practice we can and should use to improve both quality and grade (stem length). We should remove some of the vegetative breaks from developing flower stems as early as they can be taken off. The owner or manager can make the decision, depending upon the time of flowering, whether to disbud standard or fancy length stems.

Temperature

Temperature should be kept as near optimum as possible the year around, preferably with moving air during the sunny part of the day. These temperatures will vary with light as per our recent bulletins. Day temperatures too low decrease dry matter percentage and cause brittleness, poor color and poor flower form. Temperatures too high cause flat, poorly formed flowers with protruding pistils and thin stems. Wide variations in temperature from day to day (over 5 degrees) cause slabsided and bullheaded flowers. Extreme variations from day to day cause splitting. Balancing day temperature with seasonal variations of light is in my estimation one of our best means of maintaining quality carnations.

Water

Water is the opposite of dry matter but we all know it is also essential to quality flowers. If the plant can get water too easily, it will make more stretch, have softer stems, and a lower percentage of dry matter. This is the other reason why flowers cut from the north side of benches in winter have 2 to $2\frac{1}{2}\%$ less dry matter than those cut from the south side. With sprinkler irrigation the tendency is to water according to the needs of the dry side.

Speed of growth

One of our major changes in carnation growing over the past 10 years is that of growing carnations faster in almost every stage. Let's look at a dry matter chart on flowers produced on various cropping systems (Fig. 2). With other factors being equal, unpinched plants produce a flower with the lowest percentage of dry matter. The first to flower have the least dry matter, and the last of a given planting have up to 6 weeks or 2 months longer to settle down in growth.

Plants flowered in January at about mid-crop stage from a single pinch average about the same dry matter as the last flowers produced in a group of unpinched plants. First crop carnations grown with a pinch and a half have about one per cent

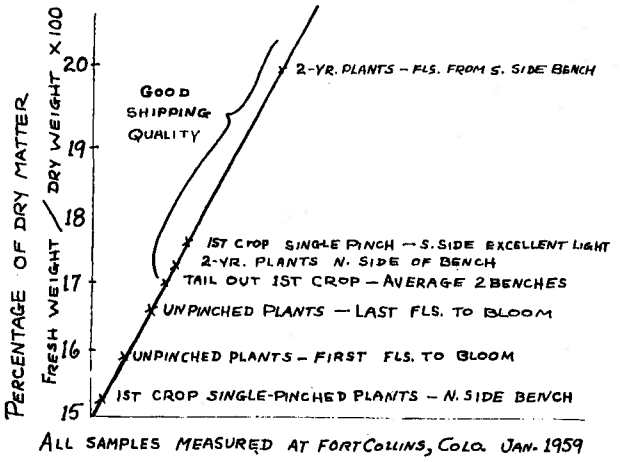


Fig. 2. The percentage of dry matter is influenced by the cropping system.

more dry matter than those from a single pinch. As the crop cuts off, the dry matter content of the flowers decreases slightly. Second crop carnations contain higher dry matter than the first crop. The second, and probably later, years the flowers have from 17 to 21% dry matter depending upon the interaction of all factors responsible. The best dry matter content for quality and shippability is probably between 18 and 21%. In general, as growth slows to a steady pace, dry matter is around the optimum percentage.

We know that benching rooted cuttings directly where they are to flower is the fastest way to grow them. However, the first flowers from these plants are likely to contain less than the desirable percentage of dry matter, especially if they are grown from a single pinch. Growing the young plants in a nursery bed or peat pots checks the growth just enough to increase this important fraction. The use of a pinch and a half also increases the dry matter percentage in the first crop. In general, the faster any crop is grown, the more water it is likely to contain.

Carbon dioxide

The percentage of carbon dioxide in the air is known to influence sugar content and dry matter percentage. At this time we can only estimate the periods when CO_2 is likely to be most limiting. On cold, bright days when there is no air flow through the houses, the carbon dioxide content may go as low as half or one-third normal. This may influence sugar content and keeping quality more than dry weight percentage. Research on this phase of plant growth is just getting under way at Colorado State University.

The Checking in Plant Growth Caused by Holding in Peat Pots or a Nursery Bed

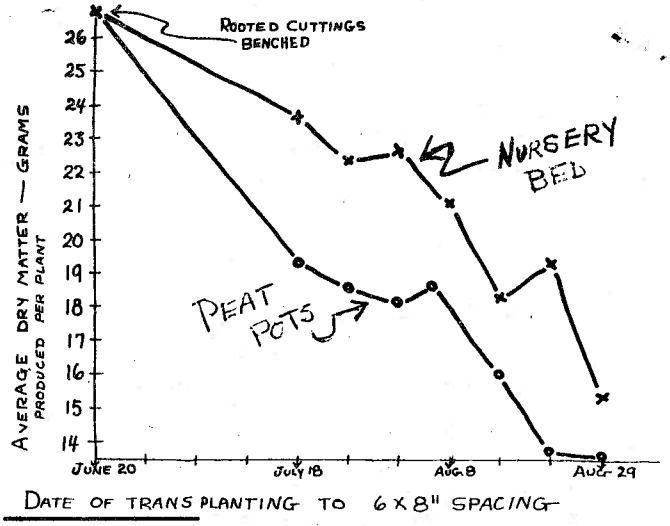
By Kenneth L. Goldsberry

Under winter conditions, carnation transplants held in peat pots or a nursery bed for 4 weeks decreased growth of carnations by 20 per cent when compared to the growth obtained from the same cuttings benched directly from the propagating bench. Each additional week the cuttings were held before transplanting decreased growth further, with cuttings held for 11 weeks causing a decrease of 40 percent in growth as measured by oven dried weight (CFGA Bul. 101). Plants were 18 weeks old when dried and weighed. The delay caused by peat pots and nursery bed growing was essentially the same during this period of the year.

Since growth is about half as fast during winter, a second experiment was started June 20, 1958. Sixty-three rooted cuttings were planted at 6 by 8" spacing at the same time that cuttings were planted in 3" peat pots setting pot to pot on a wooden bench and in a nursery bed at 3 by 4" spacing. Four weeks later, on July 18, 21 transplants in peat pots and 21 nursery bed plants were set at 6 by 8" spacing in this same bench. The planting was repeated each week through August 29.

On September 26, all plants were pulled from the bench, their roots washed free of soil, the plants weighed, oven

dried, and weighed again. The accompanying chart shows the check in growth caused by these handling procedures when compared to the growth made by cuttings benched directly. One month in a nursery bed decreased growth (final dry matter) by 11 per cent, while the same period in peat pots reduced the final yield by 27 per cent. The decrease by 3 additional weeks in either location was an additional 10 per cent for nursery bed and only 3 per cent for peat pots. The delay caused by 10 weeks in the nursery bed was 42 per cent and 10 weeks in peat pots decreased growth by 49 per cent.



The delay caused by transplanting from nursery bed or peat pots actually increased the percentage of dry matter in the plants at the end of the experiment - from 16.2% for dry matter for direct benched cuttings to 17.3% for either method of transplanting.

The only advantages which can be justly claimed for peat pots over nursery bed growing of transplants are: 1) ease of handling at planting time, 2) slightly more plants can be grown in the same area, and 3) selection against poor plants and disease is facilitated.

Ed. note: While the delay shown by these results is highly significant, it should be understood that the decrease in growth caused by transplanting is a maximum on young plants weighed at this stage. This delay can be expected to carry over to the crop harvested at any time, but the differences between the methods of handling (direct benching vs. transplanting) would decrease steadily as the crop is grown for a longer period.

your editor, W. D. Holley

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