Colorado State Flower Growers Association

In Cooperation with Colorado A & M College

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The Percentage of Roses Flowering from a Late Fall Pinch

by William Hubbard[1]

The results of pinching roses at various times of the year are being studied to determine, if possible, the answer to the questions: How much does it cost to grow a pinched rose for a holiday market? Are there means at our disposal of reducing this cost? Enough data to answer these questions has not been collected, but the results obtained from a late fall pinch will be given as a start. Since the pinch was made on November 22, the results would be almost comparable to those of a Christmas pinch.

Pinches were made on the varieties Better Times and Pink Delight. Ninety-seven soft pinches were made at random on 680 Better Times plants, and 92 were made on 420 plants of Pink Delight. All possible types of growth in the proper stage of development were pinched to give an assortment of results. Each pinch was tagged and pertinent data concerning the pinch were recorded. The recorded characteristics of each pinch included, the diameter of the shoot pinched (recorded at maturity to give comparable results), position of the pinch on the plant, position of the plant in the bench, the type of shoot pinched (terminal or side break), number of days from pinch to break of new shoot, days from pinch to cut of resulting flower, and stem length and diameter of the resulting flower.

Seventy-two of the 97 pinches on Better Times broke to produce 79 flowers. Seven of the pinches made two breaks resulting in two flowers per pinch. For all practical purposes, 81.4% of the pinch produced flowers. However, during the peak 10-day cutting period only 50.5% of the total pinches flowered. This percentage might have been raised to 60% or more by increasing temperatures prior to cutting.

Pink Delight plants produced 51 flowers from

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the total 92 pinches or 55.4%. For the maximum ten-day period, 32.6% or approximately a third of the total pinched shoots were cut.

Flowers cut from the Better Times pinch averaged 56.8 days from pinch to cut (peak - 49 through 58 days), while Pink Delight took 62.4 days to flower (peak - 54 through 63 days). Under comparable conditions it would be necessary to pinch Pink Delight and related varieties a few days earlier than Better Times in order to flower the two at the same time. The temperatures during the time these flowers were developing were slightly cool and the day-length about as short as is possible.

Table I. Correlation of the Size of Cane Pinched and Flowering

	Better Times			Pink Delight		
Diameter[1] of cane pinched	Number pinched	Number[2] flowering	Percent flowering	Number pinched	Number[2] flowering	Percent flowering
3.0-3.9	8	0	0	15	0	0
4.0-4.9	16	4	25.0	22	1	4.6
5.0-5.9	35	31	88.6	17	13	76.5
6.0-6.9	25	26	104.0	18	16	88.9
7.0-7.9	12	17	141.7	15	15	100.0
8.0-8.9	1	1	100.0	4	5	125.0
9.0-over	0	-	-	1	1	100.0

This table shows a strong positive correlation between the size of cane pinched and flowering. On Better Times the average mature diameter of a pinched shoot which produced a flower was 5.8/32 or .185 inches. In comparison, non-flowering shoots averaged 4.1/32 or .127 inches in diameter. Pink Delight flowering shoots at maturity were 6.4/32 or .199 inches through, while the size of pinched shoots which did not eventually flower averaged 4.0/32 or .126 inches in diameter.

By pinching only shoots which will be larger than 5/32 of an inch in diameter at maturity, it would be possible to raise the flowering percentage of a late fall pinch by 20% on Better Times. Flowering of a Delight pinch could be increased by nearly 35% by pinching only shoots larger than this size, rather than all sizes of growths. In both varieties, few shoots of less than 5/32 of an inch in diameter will flower from a pinch at this time of year. Either the cane will not break, or blind wood develops. Even when the smaller canes do break and flower after a pinch, the resulting flower is more often than not too late to hit the intended market. The larger, more vigorous shoots, often produce two breaks per pinch, thus increasing the flowering percentage.

Table II. Correlation of Size of Cane Pinched with Time from Pinch to Flowering

	Better Times		Pink Delight	
Diameter of cane pinched*	Flower Cut	Average number of days to flowering	Flower Cut	Average number of days to flowering
3.0-3.9	0	---	0	---
4.0-4.9	4	60.7	1	63.0
5.0-5.9	31	58.5	13	67.1
6.0-6.9	26	55.8	16	63.3
7.0-7.9	17	54.5	15	59.6
8.0-8.9	1	50.0	5	54.6
9.0-over	0	---	1	52.0

1/Diameter measured in 32nds of an inch. 2/Some pinches produced two flowers.
*Diameter in 32nds of an inch.

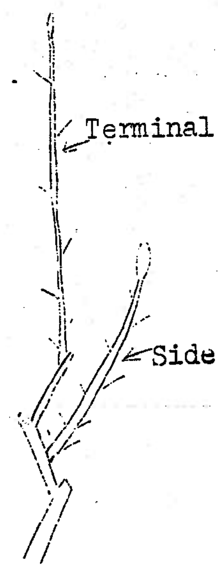
Possibly due to the greater carbohydrate production by larger, more vigorous growths, they return flowers from a pinch in a shorter length of time. For Christmas, by pinching medium sized growths on Better Times three or four days earlier than larger shoots, it would be possible to raise the ten-day cut by 3 or 4 percent. By pinching medium and large sized shoots of Pink Delight a week or more apart, it would be possible to increase the ten-day crop from a late fall pinch by approximately 5 percent. Whether this increase in cut would pay for the added labor in making the extra pinch is doubtful, however.

Table III. Correlation of Size of Cane Pinched with Stem Length of Resulting Flower

Diameter of cane Pinched*	Better Times: Flowers Cut	Better Times: Ave. Graded Length Inches	Better Times: Av. Length to second 5-leaf eye Inches	Pink Delight: Flowers Cut	Pink Delight: Ave. Graded Length Inches	Pink Delight: Av. Length to second 5-leaf eye Inches
3.0-3.9	0	---	---	0	---	---
4.0-4.9	4	13.5	11.2	1	15.0	15.0
5.0-5.9	31	15.2	12.9	13	17.1	16.1
6.0-6.9	26	16.8	14.2	16	20.1	19.1
7.0-7.9	17	17.8	15.2	15	22.4	21.0
8.0-8.9	1	24.0	18.0	5	21.6	19.8
9.0-over	0	---	---	1	24.0	24.0

Larger canes, when pinched, give roses with longer stems. The average graded stem length of Better Times resulting from the pinch was 16.33 inches and Delight flowers averaged 20.12 inches. Most flowers in both varieties were cut below the pinch, which accounts for the relatively long stems. The average stem length to the normal second 5-leaf eye cut was 13.78 inches for Better Times, and 19.00 inches for Pink Delight.

The pinches made were divided into three classes relative to their position on the plant. Pinches noted as lower were on the lower two feet of the plant. Middle pinches were between two and four feet, and top pinches occupied the position above four feet. The results of correlating the position of the pinch with flowering and stem length of resulting flower are shown in Table IV.



In Table VI, the terms "terminal" and "side" refer to the type of cane that was pinched. "Terminal" is the type of shoot which breaks from the terminal end of a cane, in contrast to a "side" break, which has recently appeared somewhere below the terminal end.

Table IV. Correlation of Position of Pinch on Plant with Time of Flowering and Flower Stem Length

Variety	Position of Pinch	No. of Pinches	No. of Flowers	Percent Flowering	Days to Flowering	Graded Stem Length, Inches
Better Times	Top	65	60	92.3	54.9	16.0
	Middle	30	19	63.3	62.5	17.2
	Lower	2	0	---	---	---
Pink Delight	Top	77	44	57.1	61.9	20.1
	Middle	14	7	50.0	65.4	19.7
	Lower	1	0	---	---	---

*Diameter in 32nds of an inch.

Table V. Correlation of Position of Plant in Bench with Time of Flowering and Flower Stem Length

Variety	Position of Plant	No. of Pinches	No. of Flowers	Per Cent Flowering	Days to Flowering	Graded Stem Length, Inches
Better	Outside	69	60	86.9	57.0	16.7
Times	Inside	28	19	67.8	56.2	15.2
Pink	Outside	64	40	62.5	61.9	20.0
Delight	Inside	28	11	39.2	64.1	20.4

Table VI. Correlation of Type of Pinched Cane with Time of Flowering and Flower Stem Length

Variety	Type of Pinched Cane	No. of Pinches	No. of Flowers	Per Cent Flowering	Days to Flowering	Graded Stem Length Inches
Better Times	Terminal	81	71	87.6	56.7	16.4
	Side	16	8	50.0	57.3	15.7
Pink Delight	Terminal	70	40	57.1	61.1	20.1
	Side	22	11	50.0	66.8	20.2

It is possible to draw some conclusions although these results are still fragmentary. A larger percentage of Christmas pinches fail to produce roses because the light intensity is lessening materially and the day-length is at its shortest during the time the pinches are developing.

The data presented here indicates that this percentage of roses may be increased. To accomplish this:

1. Pinch shoots 5/32 of an inch in diameter or larger.
2. Pinch terminal growths rather than those in a side position.
3. Pinch outside rather than inside plants when possible.
4. Pinch only around the outer periphery of the bench since shoots pinched in the middle or lower portion of the plants produce less at this time of year.

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SOILS AS I KNOW THEM

by Walter R. Heald[1]

When the use of soil is commercialized, some money and labor are involved. The soil buyer's main consideration is how will the soil produce and how long. If flower growers decide that the soil is falling down on the job, they can change without too much labor and cost. But it would be impossible for a farmer to change his soil. Therefore, a good farmer uses fertilizers, crop rotations and conservation practices to improve or maintain the usefulness of his soil. Practices used on a farm are usually impractical in a greenhouse. It follows then, that a florist should buy or obtain the best soil possible and use as many soil conserving practices as possible.

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Soil Formation

A possible clue as to the productivity of a soil might be gained by knowledge of where and how the soil developed. For instance, some soils develop from material laid down by wind, water, or glaciers. Some of these transported materials are low in the chemical compounds that furnish plant nutrients. A large variety of rock materials may result in similar appearing soils with the difference being the time and degree of weathering, or conversely, similar rock materials may result in dissimilar soils because the conditions under which they were formed were different. No matter how or what the material is composed of when soil formation starts, profound chemical and physical changes take place, especially when microscopic plants and animals are introduced. Chemically, many substances are broken down, while others are synthesized or built up. Physically, rock materials are broken into smaller and smaller pieces. In some cases, chemical and physical changes have advanced to such a degree that few of the plant nutrients remain.

When a soil is purchased as is a green house practice, it is hoped that the soil will function as a fertile soil producing good crops, not as would a pile of rock. Farmers have learned by experience that the best soils usually are either on bottom land areas or on upland areas where the soil has considerable depth showing that soil formation has taken place over a long period of time. A florist should use caution in buying a soil just because it looks desirable or is cheap. Such a soil might cost much more in decreased yields and maintenance handling problems.

Composition of Soil

Suppose a florist buys a soil or buys an area from which the soil is to be used. What has he bought? If the soil is in good condition, it is about half pore spaces and half solid material. Since all space is the same, the solid part must make the difference. The solid part of any soil is made up of varying amounts of sand, silt, clay, chemical salts, organic matter, and living organisms.

Sand, silt, and clay refer to particles of different size. Sand is visible to the naked eye, silt is microscopic, and clay is sub-microscopic. The percent of each of the above particle sizes determines what is called the textural grade. For instance, a soil with large amounts of clay is called a clay modified by the amount of sand or silt present, i.e., sandy clay, clay loam, etc. These three particle sizes make up between 45-48% by volume of most Colorado soils. The chemical salts, such as lime, gypsum, or fertilizer which are added make up a very small but important percent, usually between 2-4%.

Function of Soil Separates

Each of the particle sizes, or soil separates as they are called, contribute something to a soil. Sand and silt serve mainly as skeleton material around which clay and organic matter can be grouped. Also, as will be mentioned later, the size of each pore is a function of the size of the particles making the pores. Clay, on the other hand, has a large role to play. Clays are colloids or very small particles which can adsorb or hold liquids, gas, or solids to their surface much the same as a magnet holds a nail. This means then that when water is applied to a dry soil, a large amount will be held by the clay colloids, and that which is not held percolates through the soil and as is usually said, the soil is drained. This does not mean that sand and silt do not adsorb water. They do, but the amount is small. Because most particles in soil are touching other particles, water is held in the spaces between the particles or in the pores. Since large particles hold relatively little water, the pores between large particles must hold little water. Conversely, small pores will be full or almost full of adsorbed water. Also, just because a soil has a high percent of pore space does not mean it is desirable. The pores may be all of the small size.

Adsorption of Nutrients by Clays

Another very important characteristic of clay colloids is that the surfaces are negatively charged. Positively charged particles coming into their zone of influence are attracted. In soil, the positively charged particles are ions such as those of calcium, magnesium, potassium, or ammonium (these are just a few of many). Since they are of a very small size as compared with the clays, we say the clays adsorb the positive ions or cations as they are called. This is important because when a fertilizer such as ammonium nitrate or potassium chloride is added to a soil, most of the ammonium and potassium would be lost in the drainage water, if clays did not prevent or at least decrease this loss by adsorbing and holding a large amount of these nutrients. (This loss actually happens in a good many instances).

Base Exchange

The process can go one step further. Suppose the clays had calcium, potassium, and ammonium which are plant nutrients adsorbed to their surface. A plant is unable to take them from the colloid directly, but can make a trade. When a root is living it is giving off large amounts of carbon dioxide. Carbon dioxide and water produce carbonic acid which in turn can produce hydrogen ions. These hydrogen ions can replace any cation which the plant needs. Any cation can replace any other cation. This process is called cation exchange. Only a small part of replaceable ions are ever used by plants. Clay colloids can be considered not only as a storehouse for many of the plant nutrients, but a storehouse from which plants can withdraw supplies. In a greenhouse, with the soil at a high level of fertility, plants can get their nutrients from those dissolved in the soil water not held by colloids.

Soil Organic Matter

The organic part of soil (approximately 2%), which consists of all types of dead plant and animal materials, is important primarily for two reasons as far as plants are concerned. One is that when straw, manure, peat, etc., are added to a soil, all the microorganisms such as bacteria, fungi, and actinomyces become more active. They will decay or break-down all this material to humus and plant nutrients, if given time. It is by this decay that nutrients can complete the cycle from a living plant to dead material to a living plant. Humus is an <u>organic colloid</u> which has all the properties of clay but to a much greater extent. Reason number two is that organic matter and humus help to keep the soil from becoming compact by promoting or maintaining the structure of a soil.

Soil Structure

Structure is important. As mentioned before, the size of the pores between particles is determined by the size of the particles. A soil containing large amounts of clay has a high percent of small pores which means if the soil is kept fairly wet, there will be very little room for air and the soil will drain very slowly. On the other hand, a sandy soil will be just the opposite; very little water will be held in the soil for plant use and the soil will have to be watered often. Nature has attempted to overcome some of this variation by forming <u>aggregates or clumps of the soil separates.</u> When aggregates are formed, some pores become larger and some become smaller because some particles are squeezed closer together and others pushed apart. Obviously, these aggregates have to be stable when wet or they would be of little value. Organic matter, especially humus, helps to stabilize the aggregates. Some chemicals such as sodium nitrate cause dispersion. Soil structure is important because, (1) it tends to equalize the amount of pores which hold water and the pores which are almost completely full of air, (2) it allows for a more or less rapid movement of excess water out of the soil. Soil aeration is important because the microorganisms and plant roots require oxygen. Therefore, if a soil is kept too wet, many plants suffer from a lack of oxygen around the roots. Many greenhouse soils tend to be poorly aerated because the soils are kept very moist or are compact.

Soil Horizons

So far, soil as a whole has been considered a single unit, but actually it varies considerably with depth. The most fertile soil is found on the surface, usually the first six inches. This layer is usually dark colored, but not black, containing most of the organic matter and the most desirable structure. This is the part of soil a florist should buy and a farmer should prevent being washed or blown away.

Underneath this surface soil is the subsoil. It might be thought of as being the zone of soil which has not developed as far toward being a productive soil. It is lighter in color, lower in organic matter, and many of the essential plant nutrients are present in low concentrations. The structure, if present, might be unstable.

Sterilizing Greenhouse Soil

Most greenhouse soils are steamed for partial sterilization. This reduces the number of all organisms for a time, but in a short time, many species will exceed the numbers present before steaming. It has been noticed that after steaming, soils may become difficult to wet, at least for a short time. This is possibly due to the formation of organic compounds which seal many of the pores. When the microorganisms become great enough in number, these organic compounds are decayed, opening the pores. It has also been found that some soils which have been continually kept moist, decrease in their ability to take water. This condition has been attributed to the increased growth of some organisms such as algae which plug-up some of the pores.

In many cases, plantings in a soil several days after steaming, do very poorly, but if the soil is allowed to stand idle for an interval of time, the plants grow normally. No one knows for sure why this is true. Most of the theories advanced to explain this initial retardation of seed germination and plant growth on steamed soils assume that the injury is due to a toxin produced that is soluble and not too stable chemically, and that its disappearance is related to oxidation or microbial activities or both.

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The preceding paper was presented by the author at Colorado's 11th Annual Short Course.

Your editor,

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