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Malformation Studies on Better Times Rose

by William H. Hubbard/1.

Large numbers of roses produced as cut flowers are reduced in value due to malformation of the flowers. Malformed or "crippled" roses have petals that are shortened and unevenly developed, resulting in a bud that is not shaped symmetrically. Petal edges turn inward in contrast to the gentle outward curvature of normal rose petals. The point of the bud is flattened in severe cases, and a blunt, rounded shape results instead of the sharp, conical form of a perfect rose.

Crippling tendencies vary markedly between varieties. Better Times--the major greenhouse variety--is most seriously affected, and it was because of this variety that the study was instigated. Much of the time the crop is relatively free from crippling, yet twenty percent of the cut may be malformed under certain conditions.

Four hundred Better Times rose plants grown in 10-inch pots were used for this study. Pots were employed to facilitate the movement of plants into temperature chambers, in addition to providing a confined soil mass for the individual plant. Supplementing the potted plants, 840 plants established in concrete V-bottom benches were available from which additional data was obtained. All environmental conditions, except those under investigation, were maintained near standard commercial procedures.

For high temperature treatments, a set of four steam-heated glass chambers were constructed within the greenhouse. Night temperatures of 65, 70, 80, and 90° F could be maintained, and each chamber was capable of holding 8 plants. Two refrigerated chambers were available for colder-than-normal temperatures, each holding 16 plants. These cold chambers were lighted with incandescent and flourescent lamps, which developed a maximum of 500 foot candles of intensity.

Grading of roses into normal or crippled flowers is a subjective matter. Therefore, to remove much of the bias from grading, individual plants were given code numbers by which all flowers were recorded. At the time of grading, the grader had no knowledge of treatments applied to the plants. Since crippling occurs in variable degrees, individual flowers were recorded by a categorical index. The numbers of 1, 2, 3 and 4 were used to signify degrees of malformation, with 1 being normally shaped and 4 the most severe degree of crippling.

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High temperature.-- Plants were grown at four temperatures from 60 to 90° F for various durations of time from 1 hour to several days. Generally, higher-than-normal temperature produced a significant increase in crippling in roses. Any temperature over 70° produced more malformation than the normal growing temperatures of 60 to 65°. Highest malformation was obtained after treatment with 90°F. The durations of high temperature applied to plants in this study had no significant effect on bud development. One hour of high temperature crippled as many flowers as 12 hours of a similar temperature. Also, no significant variance was obtained between crippling from 1 and 7 days of continuous high temperature.

Stage of bud affected.--Different stages of bud were treated with the high temperatures to determine the stage at which buds were malformed. Malformation tendencies occurred significantly more on buds subjected to high temperatures at 3 to 10 days prior to flowering in comparison to buds of a more mature stage. However, no difference was noted between buds treated 3 to 10 days, and those 6 to 13 days prior to flowering. The critical stage from high temperature was between 4 and 9 days prior to flowering, with peak crippling on the sixth day.

Time of the Year.--To ascertain the variability in crippling with the time of the year, similar treatments were conducted at intervals throughout the seasons. A system of check plants were grown continuously to determine the amount of crippling under natural conditions, and to offer a basis for comparison of treatments. Considerable variability was noted between crippling from treatments at different periods of the year. A graph of malformation on check plants throughout the fall, winter and spring indicated high crippling at Fort Collins during January, February, March and April. Under the natural conditions occuring this particular year, the fall season produced relatively few abnormally shaped flowers.

Soil Moisture effects.--Three moisture levels from 0 to 20 inches of mercury tension were investigated to examine the effect of the watering factor on malformation. In conjunction with the soil moisture levels , various temperature treatments were applied to plants to ascertain the interaction effect of these two conditions. Within these soil moisture levels, no significant differences were obtained in the production of cripples. In addition, various combinations of the three moisture levels and the four temperatures resulted in no significant variance.

Vigor.--To check the validity of the proposition that vigor is correlated with crippling, two studies were conducted. Stem length of normally shaped flowers was compared with the length of stem of crippled roses. In comparing over 11,000 flowers cut over a 6-month period, normally shaped flowers had stems averaging 1.09 inches less than crippled roses. This difference was highly significant statistically. The rapidity of development of crippled vs. normal roses was investigated, and a near-perfect correlation of 0.9680 was obtained between rapidity of development and malformation.

Heredity as a factor.-- Throughout the entire study, individual plants were recorded separately. This was employed primarily to determine the extent of variability existing between individual plants in the production of abnormal flowers. A separate study was made whereby 255 plants were grown under natural conditions for a 10-week period. These plants were studied individually for the purpose of comparing cripple production of a large number of plants growing under similar conditions. The malformation tendencies of this randomly selected group of 255 plants approximates a normal bell-shaped curve. Over the 10-week period of cut, 12.5 percent of the plants produced all normal-shaped flowers, while 25 percent of the plants produced no cripples that were severe enough to lower their value commercially. Some of the plants produced all cripples during this period and others produced varying numbers of malformed flowers. A statistical analysis showed the differences between plants to be highly significant.

DISCUSSION OF RESULTS

The complete range of crippling tendencies from all perfect flowers to all malformed is exhibited by the population under study. The trend of variability is demonstrated by a bell-shaped curve. While slight malformation appears to be nearly universal, records show that almost the entire production of severe crippling was from a relatively few plants.

It seems probable that certain slight changes, which occur continually in vegetative propagation, may result in a trend for the flowers to be crippled. The resultant propagation of these changed forms will within a short time produce a heterogeneous population in respect to crippled flower production. If the preponderance of changes are of a degenerative nature, it is easy to understand why non-selective propagation will lead to deterioration of the variety.

While the hereditary constitution of a rose plant appears to be the influencing factor in crippled flower production, it is indicated that certain environmental conditions will contribute significantly to the trouble.

Any hourly duration or more of temperature over 70° F tends to increase cripple production over the normal growing temperature of 60 to 65° F. Since only short periods of high temperature were required to cause the abnormality, it appears that the trouble does not take an extended time to develop. Perhaps it is the sudden increase in temperature and the resultant increase in growth rate that is responsible for the damage.

Variation in malformation due to time of year appears to be mainly the result of immediate weather conditions as indicated by sharp fluctuations in crippled flower production between biweekly intervals. Long term season-of-the-year effects are not too pronounced; however, more crippling appears during the spring months.

Various soil moisture levels between 0 and 20 inches mercury tension produced no significant variance in the amount and degree of malformation.

Vigor is definitely correlated with the trend of crippling. Highest malformation tendencies occur on those canes developing at the most rapid rate, as well as on those producing the longest stems.

Buds at the most critical stage for malformation are at a stage approximately 6 days prior to flowering. They are beginning to show color at this time, and the sepals are separating from the petals. Their size is from three-eighths to three-fourths inches in diameter. The rate of development, at least of the petals, is probably near the maximum at this time.

Malformation is concentrated mainly on vigorous canes, where growth rate is the most rapid. A rise in temperature increases the growth rate; it also increases the amount of crippling. The abnormality becomes greatest during periods of rapid growth and development in the spring. Finally, the stage of bud at which malformation occurs is near the maximum developmental rate. In conclusion; if the plant is inherently susceptible to malformation, it appears evident that any factor which enhances the rate of growth may contribute to this condition.

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More on the Control of Slugs.--

Prof. R. N. Jefferson of UCLA has recently reported results with trials of metaldehyde dusts and sprays of various strengths. He made extensive tests against several species of greenhouse and garden slugs and snails. The following excerpts are from his report in the Florists' Review of Nov. 20, 1952.

In regard to plant tolerance, metaldehyde as a spray or dust has been applied to a wide variety of plants without apparent injury. Among the plants treated were seven species of ferns, five species of orchids, cyclamen, dieffenbachia, fittonia, maranta, pepperomia, etc.

Metaldehyde dusts apparently deteriorate rapidly. A 20 percent dust prepared in August 1951, was completely ineffective in the spring of 1952, even though used under favorable conditions. One lot of 10 percent dust was packaged in unlined sacks and in a week or two had deteriorated to such an extent that it was ineffective. It is, therefore, important that the dust be fresh, packaged in airtight containers and used up as rapidly as possible after opening.

Although good control was had with 10 percent dusts in most trials, Prof. Jefferson recommends a 15 percent dust for consistently good results in the greenhouse. For slugs, he recommends one or two pounds of 15 percent metaldehyde dust to 1,000 square feet of area. Thorough coverage of the foliage, soil, pots, and bench surface is essential for effective control. Where the plants are thick and close together, more than two pounds may be necessary. For best results, the dust should be applied at night, and at least three applications at seven to 10-day intervals should be made.

Metaldehyde sprays prepared from 42 and 50 percent wettable powder were also effective but the dust would usually be cheaper to apply. The European brown snail was not controlled by dusts.

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New Insecticides

by

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With the advent of DDT, greenhouse managers and horticulturists have been deluged with articles, advertising and personal contacts on the "newer insecticides". Many of these new chemicals have already been demonstrated through the experience of many growers to have value. However, the manufacturers have brought out such a large number of these new compounds under brand names that it is difficult for anyone to know exactly what each will do. The word of the manufacturer has to be taken as to what plants it may be used on; what formulation should be used; and what pest or pests it will control.

Since 1950 a plan has been under way in the state of Colorado in an attempt to coordinate the responsibility and interests of agricultural production, chemical industries, State Department of Agriculture, the Colorado Experiment Station, and the Extension Service at Colorado A & M for the purpose of providing up-to-date recommendations for the control of insects, plant disease, weeds and rodents. The second annual meeting of the Colorado Agricultural Chemicals Clearing Committee was held December 4-5 with the Colorado Agricultural Chemicals Association. The 1953 changes in recommendations were presented to the group for discussion.

Ovatran as a miticide was recommended for the first time. This compound has shown excellent control properties on two-spotted mites. Its killing action is primarily on the eggs. Under orchard conditions it has proven to be one of the best chemicals for mite control. However, it is suggested that it should be used with Parathion or TEPP to kill the adults and immature forms of the mites.

Parathion and TEPP are both in general use, not only as miticides but for aphids and leaf hoppers. The hazards in the use of these compounds should be recognized.

Dieldrin for the control of thrips has received considerable attention in the discussions of the clearing committee this fall. As a control for onion thrips its value has been recognized. The possible use of this material for thrip control under greenhouse conditions on greenhouse plants needs to be tested. It has been used successfully for thrips on gladioli. The use of a spray of 0.2 pounds of actual dieldrin wettable powder per acre, or a one percent dust, 30 pounds per acre has given very satisfactory control.

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More on the use of Dieldrin in the Greenhouse.-- In a recent letter received from Dr. W. E. Blauvelt of Cornell University, he offers the following notes on his trials with Dieldrin under greenhouse conditions:

"I have used the 25 percent Dieldrin wettable powder at 1 pound to 100 gallons of water as a rather light overhead spray without injury and believe we could go to a higher dosage if desired. In a number of cases we have had good thrips control for a period of two weeks from one application. Dieldrin is effective against quite a few other pests but not a very wide range of florist pests. It gives fair aphid control. Dieldrin is considerably more effective than lindane for thrips on roses, carnations and chrysanthemums, and it has a longer residual action."

Your editor,

W. D. Holley