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HANDLING RENEWAL CANES ON 'SONIA' ROSES

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Bottom breaks on 'Sonia' which were given a soft pinch to the 2nd 5 leaflet leaf from the terminal produced more cut roses of a higher quality than those where the treatment was removal of the terminal bud only or cutting a marketable flower at the 2nd 5 leaflet leaf from the bottom. 'Sonia' also produced the most roses under single layer, Tedlar® coated FRP over the 28 week period of this study when soft pinched.

The previous CGGA Bulletin 449 covered in detail the conditions to which 'Royalty' roses were subjected in four identically controlled greenhouses, and resulting response of 'Royalty' when grown under two cover types, with and without automatic shade screens. The 'Sonia', discussed in this report, were buffer plants used to separate 'Royalty' plots as the main treatments in each greenhouse.

'Royalty' were established in a standard, raised, greenhouse bench, filled with 8 inches of gravel in six plots per bench, with 6 plants of 'Sonia' between each plot and at either end of the north-south bench, resulting in a total of 7 'Sonia' plots all at one plant per square-foot density. This allowed six plots in each house to be selected at random for three treatments of bottom breaks with one replication per treatment per house.

To recapitulate the environmental conditions: The houses were heated at night to 62°F and to a minimum 72°F during the day with automatic adjustment of cooling based upon outside air temperature. Humidity was controlled at a vapor pressure deficit of 10 millibars during the day with the high pressure mist system off at night (about 65-75% RH). CO₂ was injected to maintain a minimum 35 Pascal (about 400 ppm) at radiation intensities up to 100 watts per sq.m., and incremented 0.2 Pascal per W-sq.m. above 100 when ventilation was off. The shade screens were closed when inside radiation exceeded 700 W/sq.m. and opened when outside radiation dropped below 600 W/sq.m. All roses were watered automatically with a trickle system when accumulated radiation in the respective greenhouse exceeded 2300 kilojoules per sq.m. The standard Colorado State University nutrient solution was injected at each irrigation.

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Two of the four houses were covered with a single layer, corrugated, 6 oz., Tedlar® coated FRP, and two with a double layer, air-inflated, Tedlar® plastic (polyvinyl fluoride). Each of the two cover types was fitted with a combination shade and thermal screen with the manufacturer's specification of 40% shade. The renewal canes, originating from the bottom 6 inches of the rose bushes, were subjected to: 1) a soft pinch of the bottom break, when the bud was visible, to the second 5 leaflet leaf from the top of the cane. 2) The terminal bud only was removed at the same stage as in 1). And 3), the cane was cut when the terminal flower was harvestable, with the cut at the second 5-leaflet leaf from the bottom of the cane. Treatments began the second week of May, 1986, when renewal canes began to emerge. Flowers were cut and graded every day with records accumulated on a weekly basis from June 13 to December 17, 1986.

Results and discussion

There were highly significant differences between renewal cane treatments on 'Sonia' roses (Table 1, Fig. 1), with the soft pinch producing 76.3 flowers per plant under FRP (no shade), as compared to 66.7 and 58.8 flowers per plant for the other two treatments under the same cover over the 28 week period of the study (12 plants per treatment). With one exception (double PVF with screen), the soft pinch produced the greatest number of flowers under all cover and screen treatments. Rose yield was less under double PVF (no screen), followed by FRP with screen, and lastly by double PVF with a screen (51.6 flowers per plant). 'Sonia', grown under double PVF with a shade screen, when renewal canes were given a soft pinch, produced 32% fewer total flowers than roses under FRP without a screen and also given a soft pinch. The same relationship held for

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Table 1: Total flower production and yield per plant of 'Sonia' roses where renewal canes were subjected to three treatments: Terminal portion of renewal cane removed to 2nd 5 leaflet leaf from top when terminal bud visible (PINCH), terminal bud only removed when visible (DISBUD), and renewal cane cut above the 2nd 5 leaflet leaf from the bottom when flower reached marketable condition (2ND 5 LEAF). Roses grown in 4 identically controlled greenhouses under two cover types, one house with each cover fitted with a combination shade and thermal screen. Records from 6 plots of 6 'Sonia' each in each house, planted at one per sq.ft. Records from June 6 to Dec. 17, 1986.

House treatment	Total flower yield			Total per house	Flower yield per plant			Average per house
	PINCH	DISBUD	2ND 5 LEAF		PINCH	DISBUD	2ND 5 LEAF	
Double, inflated PVF	780	674	817	2271	65.0	56.2	68.1	63.1
Single FRP	915	800	706	2421	76.3	66.7	58.8	67.3
FRP with screen	653	664	636	1953	54.1	55.3	53.0	54.7
Double PVF with screen	619	547	559	1725	51.6	45.6	46.6	51.3
TOTAL	2967	2685	2718		61.8	56.0	56.6	

bottom breaks treated by removal of the terminal bud only. On the other hand, roses cut to a 5 leaflet leaf (counting from the bottom) produced the most flowers under double PVF without a screen (16% more than single FRP, no shade). 'Sonia', where a cut flower was removed from the renewal cane, produced 46% fewer flowers under double PVF with a screen than roses given the same treatment but grown under double PVF without a screen. The statistical analysis showed significant differences in the interaction between treatment and greenhouse cover and shade.

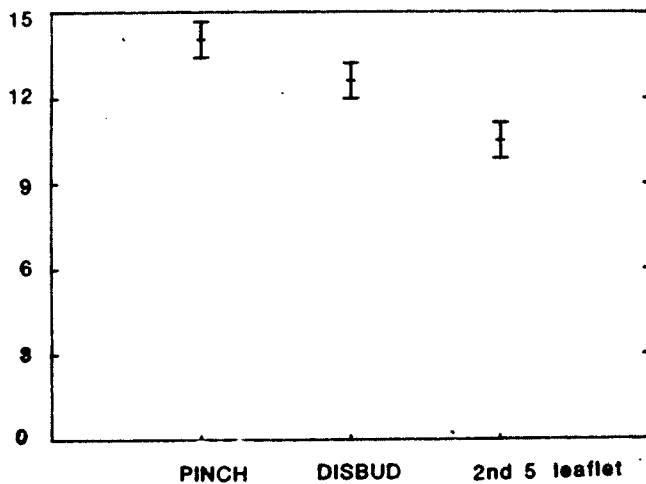


Fig. 1: Average weekly flower production per plot of 'Sonia' roses where renewal (bottom) breaks were subjected to three handling methods:

- PINCH — Terminal portion of renewal cane removed when bud visible to the 2nd 5 leaflet leaf from the top.
- DISBUD — Terminal bud only removed at the same stage as above.
- 2nd 5 leaflet — Harvestable flower removed at the second 5 leaflet leaf from the bottom.

Difference required for significance = 1.3 flowers. Data from period June 6 to Dec. 17, 1986 (28 weeks).

Plotting the accumulative weekly flower production (Fig. 2) from June 6 to December 17 showed continuing, increasing differences in rose production as the result of greenhouse cover, with single FRP (without screen) showing marked superiority. This contrasted to 'Royalty' behavior described in Bulletin 449 where roses under double PVF without a screen had an approximate 5% higher yield than those

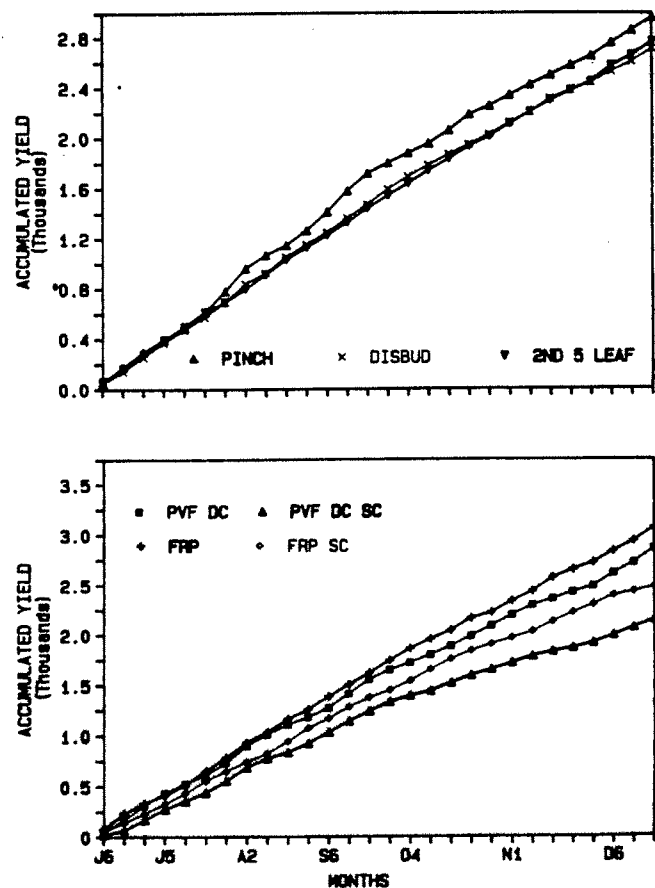


Fig. 2: Weekly accumulated flower production of 'Sonia' roses subjected to three bottom break handling methods (top) in four identically controlled greenhouses (bottom).

Top: PINCH — Top portion of bottom break removed to the second 5 leaflet leaf from the top.

DISBUD — Removal of main bud only when visible, same stage as above.

2ND 5 LEAF — Removal of harvestable flower at the 2nd 5 leaflet leaf from the bottom.

Bottom: PVF DC — Double, air-inflated polyvinyl fluoride cover.

FRP — Single layer, corrugated fiber-reinforced plastic.

PVF DC SC — Double PVF with a shade and thermal screen.

FRP SC — FRP with a shade and thermal screen.

under single FRP (no screen) over a 12 month period. However, renewal canes on 'Royalty' were usually cut to a 2nd 5 leaflet leaf from the bottom. Soft pinching renewal canes through the summer months (Fig. 2, top) showed a rapid gain in flower production around the end of July with this gain, compared to the other two handling treatments, maintained for the remainder of the experiment.

Toward the end of November, removing only the terminal bud resulted in thin flower stems of low quality and a considerable number of 9- and 12-inch stem lengths (Fig. 3). When soft pinched, roses produced most of their flower stems in the 21-, 24-, and 27-inch stem lengths, and no 9-inch cut flowers. Cutting a flower from bottom breaks gave results intermediate to the other two treatments.

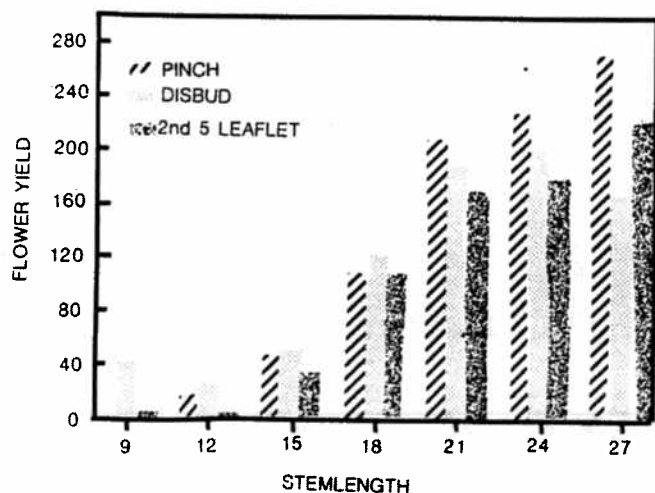


Fig. 3: Stem length distribution of 'Sonia' roses when bottom breaks were subjected to three treatments:

PINCH: Terminal portion of stem removed to 2nd 5 leaflet leaf from top when bud visible.

DISBUD: Terminal bud only removed when visible, and

2nd 5 Leaflet: Marketable flower removed at 2nd five leaflet leaf from the bottom.

Recording period from June 6 to December 17, 1986 (28 weeks).

Plotting the weekly mean production on the basis of handling treatment or greenhouse cover and shade, did not show the interactions suggested in Table 1 (Fig. 4) between greenhouse cover and treatment. The smoothed curves did show the fast response of 'Sonia' during the high energy summer period, with the typical decrease in the fall and early winter. However, soft pinching renewal canes, or removing only the terminal bud (DISBUD), clearly showed superiority over removing a flower with hard cutting of the bottom break. With 'Sonia', a double cover tended to delay cycles compared to an FRP cover, and the shade screens tended to delay and reduce maximum peaks, especially as winter approached. One exception was a very high peak during September to October by roses grown under double PVF with shade. Since these roses cut during September and October would have started growth in July and August, there may have well been an advantage to shading. However, regularity of cycling of roses under single FRP, with or without screens seemed to be much better than the other greenhouse treatments.

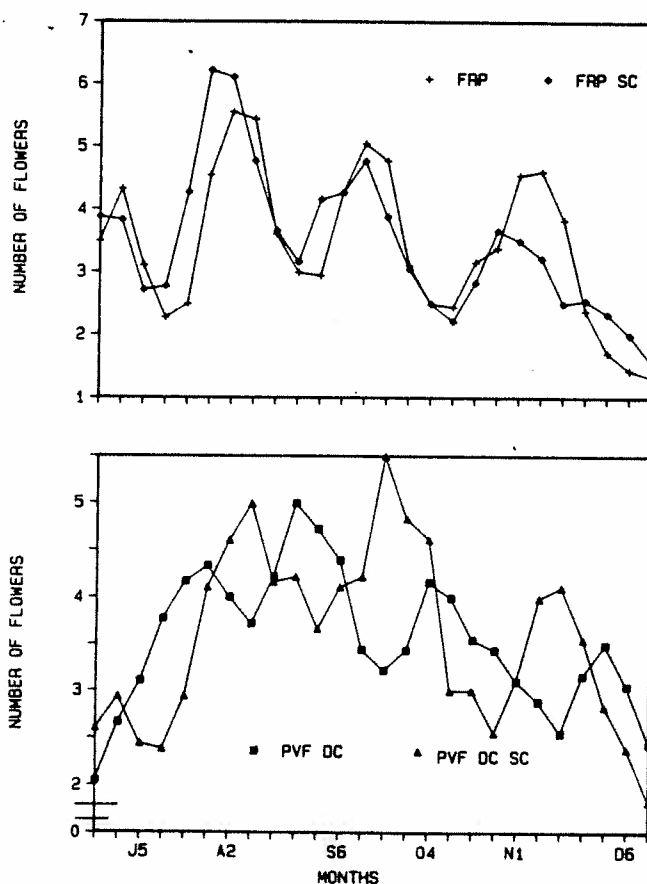


Fig. 4: Smoothed curves of average weekly yield per plot of 'Sonia' roses in four identically controlled greenhouses where renewal (bottom) breaks were subjected to three handling procedures under two covers with and without shade screens.

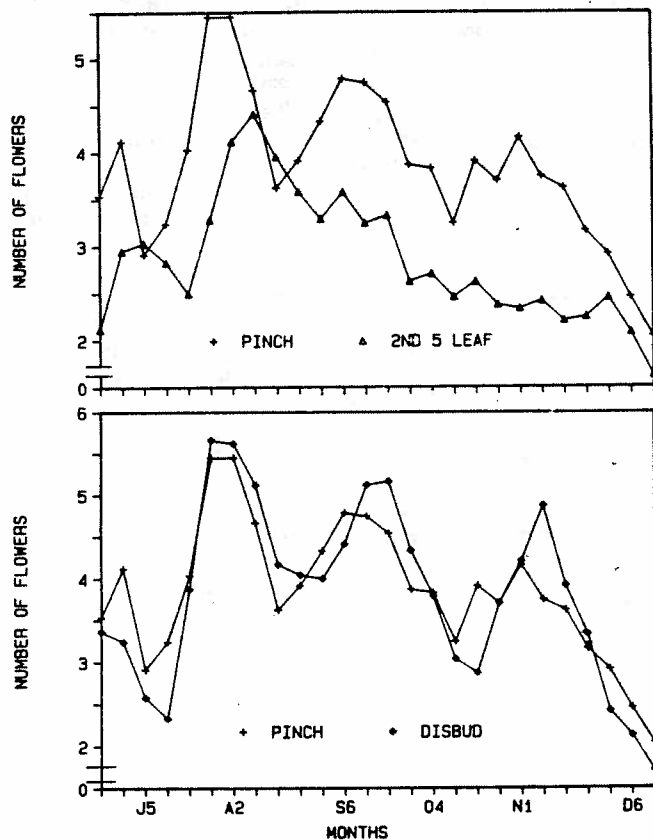
FRP — Single layer, corrugated fiber-reinforced plastic.

FRP SC — FRP with a shade and thermal screen.

PVF DC — Double, air inflated polyvinyl fluoride.

PVF DC SC — Double PVF with a shade and thermal screen.

Fig. 4 continued



PINCH — Top portion of renewal cane removed to second 5 leaflet leaf from top when central bud visible.

DISBUD — Removal of terminal bud only at same stage as above.

2ND 5 LEAF — Removal of harvestable flower at the 2nd 5 leaflet leaf from the bottom.

Records from June 6 to December 17, 1986 (28 weeks)

'Sonia' is known for its high productivity relative to a variety such as 'Royalty'. This was borne out by the fact that as many flowers were produced by 'Sonia' over a 28 week period as were produced by 'Royalty' over a 12 to 15 month period (Bulletin 449). But, as pointed out, 'Royalty' renewal canes were all cut to a 5-leaflet leaf when the flower was marketable. On the basis of this work, one may speculate that this had a considerable effect on 'Royalty' response to greenhouse covers and shade screens. Yield of both varieties were the highest we have obtained in experimentation at Colorado State University. This could be attributed to several factors such as that all treatments were arranged in a single bench with no shade restrictions by adjacent benches, the plants were grown with a maximum water supply in an inert medium with continuous fertilizer injection into a very high quality raw water, and the climate was controlled to take advantage of Colorado's climate by means of a sophisticated computer system. Previous yields obtained on roses grown in the ground were 52 flowers per plant on 'Forever Yours' and 50 per plant on 'Love Affair', over an 8 month period (Thompson, 1975, CFGA Bul. 297). In 1973, 'Forever Yours' produced 16.5 flowers per plant over a 12 week period beginning October 31, 1972. These were grown in the ground at high CO₂ concentrations in the Colorado State University "Light Houses" (CFGA Bulletin 279). Over a 19 week period, beginning January 28, 1973, high CO₂ and high ventilation temperatures resulted in 34.8 flowers per plant on 'Forever Yours' and 26.9 flowers on 'Love Affair'. The rose, despite being considered by botanists a woody shrub, is remarkably sensitive to its environment, especially when grown under optimum conditions.

Acknowledgements

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