

No Easy Way out of Chrysanthemum Stunt

During the summer and fall of 1948 when chrysanthemum stunt was at its peak, the following experiments were outlined. These projects were carried on by Harry C. Kohl, Jr., Anton M. Kofranek, Dr. Kenneth Post, and Fred Horton and his staff. These came about as a result of conferences with many growers to determine the effects of environment on the problem. In these tests more than 8000 plants were used.

Since these experiments were started, Baker, Clark, and Kimball (1949) have reported the presence of Deuterophoma in many stunted plants. The effectiveness of this in producing stunted plants was uncertain. Brierley and Smith (1949) have reported the virus nature of the disease, the ease of spread and the slow moving nature of it in the plant. Olson (1949) has reported a sound method of obtaining stunt-free foundation stock. This method has been demonstrated in a large practical way by Yoder Brothers.

Occasional stunt-free plants from stunted stock and consistent stunted plants from normal appearing stock is now explainable because we did not have an accurate method of determining why the plants were dwarfed as compared with the normals, because of the ease of spread of the virus, and because of the complicating factor of the cause of the dwarfing not readily determinable.

It is evident from these experiments that cold treatment did not kill stunted stock nor did it prevent normal appearing stock plants from producing stunted plants. Propagating by leaf-bud cuttings of normal plants did serve as a means of obtaining a large number of plants, but these produced as much stunt as those from stolon shoots. Isolation of stock from other mums did not give less stunt than when plants were grown in an area known to be infected. This indicates that some means of getting stunt into the plants was present in the isolated area. Since all types of dwarfing are called stunt, the same cause may not necessarily be responsible in all cases.

Cold Treatment of Mum Stock Does Not Reduce Stunt

It was postulated that perhaps cold treatment of the stock plants would either kill those stock plants infected or reduce the amount of stunt in the cuttings produced from these plants.

We had a group of varieties with more than 50 per cent stunt in each and we selected 12 stock plants apparently stunted and 12 apparently normal of several varieties. These were removed from the bench at the time they were in bloom September 9, 1948, and cut back and planted in a cold frame. The stunted plants were in alternate rows with the normal.

An electric cable, with thermostat, controlled the air temperature at a minimum of 40°. Sashes were placed over the plants when the temperature was below 50°F. The plants all looked healthy in spring and vigorous cuttings resulted from both normal and stunted stock. No stock plants died from either stunted or normal stock.

Cuttings were made March 28, June 1, and August 5, 1949. Cuttings were pinched 10 days after planting and given a short photoperiod starting 20 days after pinching. Cuttings from each individual stock plant were numbered so the progeny could be referred back to the original stock. The plants were examined at flowering time and if dwarfed, compared with other plants of the variety, they were considered stunted. No further testing was done to more accurately determine if the plant was stunted because of the virus or other cause.

Incidence of Stunt from Normal and Stunted Stock Plants

Variety	Stock	Planting Date		
		3/28/49	7/1/49	8/5/49
Mrs. Kidder	Normal-N	28	8	26
	-S	28	17	45
	Stunt -N	0	0	6
	-S	31	12	70
Marie De Petris	Normal-N	0	0	1
	-S	14	3	22
	Stunt -N	0	0	2
	-S	31	8	43
Long Island Beauty	Normal-N	29	12	40
	-S	29	7	79
	Stunt -N	0	0	9
	-S	44	12	106
Sea Gull	Normal-N	2	1	17
	-S	80	15	104
	Stunt -N	6	0	8
	-S	88	12	99
Arcadia	Normal-N	65	0	16
	-S	1	12	100
	Stunt -N	0	1	9
	-S	67	12	18
Golden Herald	Normal-N	25	9	13
	-S	44	14	57
	Stunt -N	0	0	3
	-S	43	12	65
Barcarole	Normal-N	56	12	3
	-S	0	0	47
	Stunt -N	62	12	1
	-S	6	0	48
Pixie	Normal-N	10	3	22
	-S	36	9	39
	Stunt -N	0	0	5
	-S	28	12	2

The table gives a summary of the results from all the plants. It shows that (1) occasionally an apparently normal plant arises from stunted stock (2) apparently normal stock plants produced high percentages of stunted progeny (3) the percentage of stunted progeny increased with successive propagations (4) growing stock plants could did not prevent them from producing stunted cuttings and (5) individual stock plants in the group of twelve gave the high percentage of stunt.

Leaf-buds Don't Avoid Stunt

Ten apparently stunt-free plants and five stunted plants were chosen by size and vigor from a planting of Long Island Beauty which was 90 per cent stunted. Leaf-bud cuttings were made from the old canes.

Plants grown from cuttings taken from the plants resulting from the leaf-bud cuttings were then compared as to incidence of stunt with plants grown from cuttings taken after the old root stock had grown new shoots. There were known stunted plants present.

Results and observations are as follows:

1. Leaf-bud cuttings from the stunted plants rooted poorly or not at all (58 per cent rooted).
2. Leaf-bud cuttings from the stunt-free plants rooted well (99 per cent rooted).
3. In all cases the offspring of the stunted plants were stunted whether from stolons or from the leaf-bud cuttings.
4. Stolon shoots of normal stock plants gave the following results --

Cuttings taken January 31, 1949

	<u>Plant</u>	<u>Per Cent</u>
Normal.....	56	90.3
Stunted.....	6	9.7

Cuttings taken April 9, 1949

	<u>Plant</u>	<u>Per Cent</u>
Normal.....	68	88.3
Stunted.....	9	11.7

5. Cuttings of plants produced from leaf-bud cuttings of the flowering stem gave the following --

Cuttings taken January 31, 1949

	<u>Plant</u>	<u>Per Cent</u>
Normal.....	149	90.9
Stunted.....	15	9.1

Cuttings taken April 9, 1949

	<u>Plant</u>	<u>Per Cent</u>
Normal.....	155	88.1
Stunted.....	21	11.9

6. Almost all the stunted plants among the normal plants were the progeny of one plant - number 10.

7. Although an attempt was made through consecutive numbering and analysis to find whether the stunt infection was before or after the leaf-bud cuttings were taken, there was insufficient data; and it was too indefinite to draw any conclusion.

These experiments illustrate no advantage in using leaf-bud cuttings for a foundation stock compared with similar stunt-free stock plants selected.

Isolation No Assurance of Stunt-Free Plants

Many growers believed that stunt was induced in Chrysanthemums by propagating continuously from stock plants without giving them a rest period after flowering. In the fall of 1948, an experiment was initiated to determine if these claims had some merit.

Varieties, Sea Gull and Detroit News, are known to be troubled seriously with stunt. Stunt-free plants of these varieties were obtained from Harry Allyn, Big Flats, New York, and Al Campbell, Wayne, Pennsylvania. The stock plants were divided into three lots; (1) one lot was given a long photoperiod at 60°F in a stunt infested area, (2) another lot given similar conditions in an area thought to have no stunt, and (3) the third lot was kept in a 40°F house (normal photoperiod) in the "stunt-free area." Cuttings were taken weekly from lots 1 and 2 but only those cuttings taken on dates shown in accompanying table were rooted and allowed to flower. No cuttings were taken from lot 3 until the spring of 1949, when the plants started to grow. Cuttings from lot 3 were rooted on dates shown in table and then grown to the flowering stage.

Lot 1 was grown in a greenhouse during the entire experiment. Lots 2 and 3 were grown in the greenhouse for the first and third flowering but were grown in a cloth house for the second flowering. The stock plants of lots 2 and 3 were grown in the field during the summer months and cuttings were taken from these plants on August 26 for the final flowering.

The data were recorded when the plants were in full bloom. If a plant did not show definite signs of stunt and did not look quite normal, it was classed as "doubtful."

The table shows that there was no stunt present (lot 2) in the "stunt-free" area the first flowering period, but the plants somehow were infected and showed signs of stunt in the later propagations. The plants were grown in a cloth house during the second flowering period and the insect control was not perfect. During the handling of the stock plants during the winter of 1948-49, they may have been inoculated with the stunt virus. These data show that the plants kept

at low temperatures (lot 3) during the winter months were infected almost as severely as those grown at 60°F which had cuttings taken from them (lot 2) during the winter.

The number of stunted and "doubtful" plants increased during the final flowering period. The stock plants no doubt were infected with stunt soon after the experiment started and the severity increased during the spring and summer. The cuttings, therefore, taken in August were from severely infested stock and produced a high percentage of stunted plants.

Amount of Stunt in Successive Propagations

"Stunt Infested" Area

Lot No.	Cuttings Taken	Data Recorded	DETROIT NEWS			SEA GULL		
			N	S	D	N	S	D
1	Dec. 14	May 5	31	0	4	57	0	2
1	May 11	Sep. 21	81	4	11	90	0	5
1	Aug. 1	Dec. 4	56	30	8	96	0	3

"Stunt-Free" Area

Lot No.	Cuttings Taken	Data Recorded	DETROIT NEWS			SEA GULL		
			N	S	D	N	S	D
2	Dec. 18	May 12	77	0	0	50	0	0
2	May 4	Sep. 21	72	4	11	90	2	4
3	May 4	Sep. 21	83	6	4	91	1	4
3	Aug. 26	Dec. 21	64	31	2	52	33	10
2	Aug. 26	Dec. 21	66	19	7	43	32	21

N - normal
S - stunt
D - "doubtful"

References:

BAKER, KENNETH F., LILY H. CLARK, and MARSTON H. KIMBALL. (Univ. of California, Los Angeles.) Association of Deuterophoma spp. with a chrysanthemum stunt disease in California. Plant Dis. Reporter 33(1): 2-8. 1949.

BRIERLEY, P. and F. F. SMITH. (U. S. Dept. of Agriculture, Beltsville, Md.) Evidence points to virus as cause of chrysanthemum stunt. Florists' Rev. 103(2676): 36-37. 1949.

Trans-

mission of chrysanthemum stunt by grafting, by leaf rubbing, and by aphids.
Florists' Exch. 112(15): 18. 1949.

OLSON, CONRAD J. (Yoder Bros., Inc., Barberton, Ohio.) Intensive program conducted to whip chrysanthemum stunt. Florists' Rev. 105(2711): 33-34. 1949.