

Effect of Pot Size on Growth and Flowering of Cucumbers in the Greenhouse

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Cucumbers grow rapidly compared to most crop species, so that it is possible to get 3 to 5 generations per year in a breeding program using greenhouse facilities. Four generations per year is possible if the plants flower within 6 weeks of planting so that pollinations can be made in time to allow up to 6 weeks for the seeds to mature and up to 1 week to harvest and replant the greenhouse. It is often difficult to stay on a 13-week generation time due to the extra labor requirements at planting, pollination and harvest times.

Researchers with other crops have been successful in getting more generations per year by crowding the plants. Goulden (2) proposed the idea of using growth chambers to speed the growth of small grains by crowding. Grafius (3) applied the method by planting barley and oats in greenhouses using sand culture. Water was applied as needed, but fertilizer was given only 2 to 3 times. The plants remained small and produced only 0 to 4 (rarely 0) seeds per inflorescence. Many plants could be advanced in a small space in less time under this system. The system was modified by Brim (1) for his single-seed descent breeding method. Robbins and Pharr (4) grew cucumber plants in pots ranging from 0.4 to 5.9 l in volume to restrict root growth. Water and nutrients were provided to prevent stress, and shoots were given unlimited growth space in the greenhouse. However, the shoots were proportionally smaller on plants with restricted root size (root/shoot ratio remained constant).

Peterson (personal communication) found that seeds could be harvested 4 weeks after pollination, cleaned with high pressure water, dried for 1 day, soaked in acetone for 1 day, incubated at 32°C in petri plates containing moist vermiculite, and transplanted to pots 1 day later. That method saves 2 weeks on post-pollination seed development time, and 1 week on fermentation, drying and packeting time. Thus, with gynocious plants, it is possible to go from seed to seed in 10 weeks for 5 generations per year.

In working with genotypes that grow fairly large, and are not as rapid to flower and set seed, it would be desirable to reduce further the generation time. It is possible that if cucumber plants were crowded into a small space they would grow smaller, flower faster, and set seeds sooner than normal. The objective of this study was to determine whether growing plants in small pots could reduce the generation time of cucumbers in the greenhouse.

Methods. The experiment was a randomized complete block with 2 cultivars, a gynocious inbred pickle (Gy 14A) and a monoecious inbred slicer (Poinsett 76). Plants were grown in one of 4 pot sizes (10, 13, 15, or 20 cm diameter), and fruits were either held on the plants without watering 2, 4, or 6 weeks after pollination (summer, 1983), or harvested 2, 4, or 6 weeks after pollination (spring, 1984).

Data were collected at fruit harvest time. The vine length, fruit weight, number of seeds per fruit, weight per seed, and percentage of germination at 22°C were measured. Also, the number of days from planting to first pistillate flower was recorded.

Results. Plants grown in large pots had longer vines and heavier fruits than those grown in small pots (Tables 1 and 2). The larger fruits had more seeds, but the weight per seed did not change. Days to flower and percentage of germination of the harvested seeds did not change with pot size, except that no seeds were produced from fruits harvested 2 weeks after pollination. Although 'Poinsett 76' flowered as soon as Gy 14A, the flowers were staminate for the first 5 to 10 days (data not shown). Thus, for monoecious lines, self-pollinations cannot be made until 41 to 49 days after planting (Tables 1 and 2). The extra 1 to 2 weeks time for pollination of monoecious lines would make it possible to get 4 generations a year, but not 5 (as is possible for gynoecious lines).

Thus, it is possible to change the size of the plant and the number of seeds per fruit by using larger pot sizes. However, plants grown in small pots do not flower or reach mature seed stage sooner than those grown in large pots. Although there were occasional problems of small seeds and poor germination of seeds from plants grown in 10 cm diameter pots, it was possible to get sufficient seed numbers from plants grown in 13 to 20 cm diameter pots. Two weeks after pollination, watering could be stopped and seeds would still develop properly (Table 1). However, fruits harvested 2 weeks after pollination did not have viable seeds (Table 2). It required 4 weeks for seeds to develop sufficiently for good germination.

Plants grown in 13 cm pots with fruits harvested 4 weeks after pollination provided 90 to 296 seeds per fruit that were plump and germinated well. That appeared to be the minimum satisfactory system of the treatment combinations tested.

Literature Cited

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Table 1. Effect of pot size and weeks to end of irrigation on plant and fruit growth for summer, 1983 greenhouse crop^z.

Cultivar	Weeks of water ^y	Pot dia. (cm)	Vine length (cm)	Fruit weight (g)	Seed no.	Weight per seed (mg)	% germination	Days to 1st flower
Gy 14 A	2	10	102	25	74	22	100	37
		13	136	23	52	27	100	38
		15	180	35	61	21	100	38
		20	308	103	213	28	100	37
	4	10	132	37	82	16	98	38
		13	135	28	90	21	98	40
		15	206	65	60	27	100	38
		20	290	50	67	26	100	41
	6	10	75	20	45	26	95	37
		13	126	40	61	25	98	37
		15	236	68	197	18	100	38
		20	390	95	219	28	100	38
Poinsett 76	2	10	176	16	39	25	100	49
		13	192	40	125	23	100	49
		15	264	53	179	25	100	43
		20	306	75	172	27	100	49
	4	10	108	28	99	16	95	49
		13	157	48	142	21	100	49
		15	323	65	102	27	100	47
		20	300	120	118	27	100	49
	6	10	204	45	87	23	100	48
		13	220	40	149	25	100	43
		15	347	117	202	28	100	43
		20	451	118	210	24	100	49
LSD (5%)			86	31	109	10	4	3
CV (%)			19	27	55	20	2	5

^zData are means of 2 replications.

^yIrrigation of pots stopped 2,4, or 6 weeks after pollination.

Table 2. Effect of pot size and weeks to harvest on plant and fruit growth for summer, 1984 greenhouse crop^z.

<u>Cultivar</u>	<u>Weeks to harvest</u>	<u>Pot dia. (cm)</u>	<u>Vine length (cm)</u>	<u>Fruit weight (g)</u>	<u>Seed no.</u>	<u>Weight per seed (mg)</u>	<u>% germination</u>	<u>Days to 1st flower</u>
Gy 14 A	2	10	74	201	0	0	0	37
		13	102	411	0	0	0	29
		15	107	347	0	0	0	35
		20	108	333	0	0	0	33
	4	10	87	350	160	26	100	36
		13	92	496	228	26	100	36
		15	110	567	251	28	100	35
		20	126	522	231	32	100	36
	6	10	91	354	189	22	88	35
		13	100	507	225	26	100	35
		15	107	595	221	29	93	34
		20	141	624	218	29	100	36
Poinsett 76	2	10	158	170	87	12	50	46
		13	144	291	0	0	0	45
		15	172	418	0	0	0	43
		20	218	435	0	0	0	45
	4	10	122	366	234	14	45	46
		13	164	534	296	25	100	45
		15	182	532	197	25	90	44
		20	195	665	230	28	100	45
	6	10	176	439	277	18	85	45
		13	176	631	260	27	100	42
		15	193	727	235	29	100	41
		20	154	641	311	26	98	45
LSD (5%)			36	150	143	5	43	4
CV (%)			13	16	45	10	34	6

^zData are means of 2 replications.