

Greenhouse Production of Garlic Chives and Cilantro

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The consumption of fresh culinary herbs continues to increase in the United States. Fresh cilantro was the third most common herb used in southern California restaurants (Anon. 1991). Field grown fresh cilantro is commonly available at supermarkets but the quality may decrease from shipment from California. Chinese or garlic chives are a less common herb, but commonly used in Asia for cooking (Brewster 1994; Larkcom 1991). Greenhouse production of cilantro and garlic chives could tap the ever-expanding market for ethnic vegetables and herbs.

Trials were initiated to determine if cilantro and garlic chives could be grown in typical greenhouse bedding plant/vegetable transplant trays. Cell size and plant density were varied to determine the yield of the plants in a greenhouse situation.



Cilantro bunches harvested from production in polystyrene vegetable transplant trays.



Garlic chives grown in polystyrene vegetable transplant trays.

Methods

Cilantro (*Coriandrum sativum*) was grown as a short-term transplant. Seed germination required 5-7 days, seedlings were transplanted 10-12 days later and foliage was harvested 25-30 days later. Garlic chives (*Allium tuberosum*) were grown as a perennial; leaves were harvested every 4-8 weeks depending on the time of year.

Sub irrigation techniques, capillary mat or "float" system, were used for both plants in this study. Capillary mat sub irrigation utilized a constant water table system to maintain uniform water availability in the cells (Buxton 1994). The "float" system utilized polystyrene trays that are placed (floated) on the surface of water, 6 inches (15 cm) deep, held inside a wooden frame with a plastic liner.

Garlic chives and cilantro were transplanted and grown from Oct. 1993 to May 1994 in polystyrene and polypropylene trays (Table 1). Individual experimental units were 0.1 square meters. Garlic chives and cilantro were grown in greenhouses with ambient light levels and set points of 17°C night temperature and

23°C day temperature. Plants were fertilized with water-soluble fertilizer, Peter's 20-10-20, at levels of 50-70 ppm N. Fresh weights of the foliage and plant number were noted at the completion of the experiments.

Results

Garlic Chives - Garlic chive plants grew well on both types of sub irrigation systems. Because the "float" system was so easy to maintain, this irrigation system was used in all experiments. Initial trials demonstrated an effect of cell size on the harvested fresh weight of garlic chive foliage. Subsequent experiments demonstrated that the mean fresh weight (g/plant) was statistically similar in each trial (Table 2). Thus, a limiting plant density was not reached in these experiments because individual Chinese chive plants are quite small with 3-8 narrow leaves per plant.

Differences in the harvested fresh weight (on a square meter basis) were apparent in these experiments but this was due to changes in plant numbers and variable initial plant densities in the experiments (Table 2). There were no differences in harvested fresh weight of chive foliage with increased levels (80 ppm N compared to 40 ppm N) of fertilizer. Garlic chives grown for six and eight months had increased yields in fresh weight and plant numbers compared to those grown for two months (Table 2). Per plant fresh weight in the six-month-old plants was not larger than the two-month-old plants due to plant damage from thrips. Thrips can be a significant problem on garlic chives in the greenhouse. No pesticides are cleared for thrips on fresh herbs in the greenhouse so thrips screening and excellent sanitation must be used to manage these insects.



Cilantro leaves just before harvest from trays.



Trays of garlic chives with different cell sizes and different plant densities randomized in a single float bed treatment.

Cilantro - Cilantro was a successful short-term crop requiring only 50 to 60 days for production. This fast production time led to high greenhouse space utilization due to the rapid turnover. Cilantro did not perform well in the "float" system but did well on a constant water table capillary mat sub irrigation system.

The effects of cell size and plant density on yield of cilantro were variable. Initial trials demonstrated that lower plant densities might increase the harvested fresh weight of cilantro foliage even though the means were not statistically different (Table 3). Subsequent experiments demonstrated no statistical differences in the mean fresh weight on per plant basis in each trial (Table 4).

Differences in the harvested fresh weight on a square meter basis were statistically similar in these experiments due to the variability within the treatments (Table 4). There were no differences in harvested fresh weight of cilantro foliage with increased levels of fertilizer (100 ppm N compared to 50 ppm N). The yield of cilantro foliage was increased in the experiment completed in the spring. This was probably due to increased light levels in the greenhouse in the spring where these plants received 992 mol m⁻² PAR during the crop while plants in the fall received a total of 435 mol m⁻² PAR.

Summary

Garlic chives and cilantro were easy to grow and produced high yields in bedding plant/vegetable transplant trays. The potential returns for greenhouse production are based on numbers from these trials and typical wholesale prices for these products (Table 5). Unfortunately, the market for these herbs is highly variable and any grower should determine market opportunities before production is initiated.

Table 1. Specifications of polystyrene and polypropylene trays used in this study.

Cell width x depth (in)	Cell width x depth (cm)	Cell vol. (in ³)	Cell vol. (cm ³)	Cell no./ft ²	Cell no./m ²
Polystyrene trays					
0.94 x 2.25	2.4 x 5.7	1.04	17	97	1044
1.09 x 3.0	2.8 x 7.6	1.40	23	80	861
1.5 x 4.5	3.8 x 11.5	3.72	61	51	549
2.0 x 3.0	5.1 x 7.6	4.58	75	28.8	310
3.0 x 3.0	7.6 x 7.6	9.76	160	12.8	138
Polypropylene trays					
0.82 x 0.80	2.1 x 2	0.37	6	100	1076
0.82 x 1.60	2.1 x 4	0.67	11	100	1076

Table 2. The effect of plant density and cell volume on the yield of garlic chive leaves and plant number harvested in four separate experiments.

Cell vol. (cm ³)	Plants/cell	Initial plants/m ²	Fresh weight of harvested foliage		Plant no. increase (%)
			g/plant	g/m ²	
Transplanted Oct. 7, harvested Dec. 15, 1993					
61	2	1098	1.49	2255	125
75	3	930	1.47	1732	128
160	6	828	1.49	1741	145
Transplanted Oct. 7, harvested Dec. 15, 1993					
61	2.8	1550	1.45	3757	171
75	5	1550	1.30	2751	141
160	11.2	1550	1.20	2399	129
Transplanted Nov. 5, harvested Feb. and Apr. 5, 1994					
61	2	1098	1.49	3600	220
75	3	930	1.47	2792	205
160	6	828	1.49	2867	233
Transplanted Oct. 5, harvested Dec., 1993, Feb., Apr., and May 10, 1994					
61	1	549	2.88	5154	326

61	2	1098	2.84	8321	267
160	1	138	2.72	1356	361
160	2	272	3.12	3056	360

Table 3. The effect of plant density and cell volume on the yield of cilantro foliage harvested Nov. 11, 1993 from seed sown Oct. 5 and transplanted Oct. 25.

Plants per m ²	Plants per ft ²	Cell volume (cm ³)	Fresh weight of harvested foliage			
			g/plant	oz./plant	g/m ²	oz./ft ²
689	64	61	1.52	0.053	984.5	3.2
839	80	75	1.30	0.046	1090.0	3.5
968	90	23	1.40	0.049	1353.6	4.4
1076	100	17	1.36	0.048	1466.6	4.8
1377	128	61 ^z	1.35	0.047	1859.3	6.0

z – two plants/cell

Table 4. The effect of cell volume and plant density on the yield of cilantro foliage harvested in three experiments.

Plants per m ²	Plants per ft ²	Cell volume (cm ³)	Fresh weight of harvested foliage			
			g/plant	oz./plant	g/m ²	oz./ft ²
Seed sown Oct. 5, transplanted Oct. 15, harvested Nov. 15, 1993						
1550	144	61	2.04	0.07	3155	10.3
1550	144	75	2.05	0.07	2926	9.52
1550	144	160	1.98	0.07	3065	9.97
Seed sown Sept. 27, transplanted Oct. 15, harvested Nov. 11, 1993						
1550	144	6	1.66	0.06	2564	8.34
1550	144	11	1.61	0.06	2491	8.10
1550	144	75	1.51	0.05	2336	7.60
Seed sown Feb. 27, transplanted Mar. 15, harvested Apr. 12, 1994						
775	72	61	4.44	0.16	3440	11.2
775	72	75	5.64	0.20	4373	14.2
775	72	160	4.67	0.16	3617	11.8

References

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