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Greenhouse Production of Garlic Chives and Cilantro

Robert G. Anderson and Wenwei Jia

Fresh herbs continue to increase in consumption in the U.S. 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 is decreased by shipment from California. Chinese or garlic chives are a less common herb, but commonly used in the Orient 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.

METHODOLOGY

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.

Subirrigation techniques, capillary mat or "float" system, were used for both plants in this study. Capillary mat subirrigation utilized a constant water table system to maintain uniform water availablility in the cells (Buxton 1994). The "float" system utilized polystyrene trays that are placed (floated) on the surface of water, 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 meter. 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, 20-4-16, 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 subirrigation 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 santitation must be used to manage these insects.

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 subirrigation system.

The effects of cell size and plant density on yield of cilantro were variable. Initial trials demonstrated that lower plant densities may 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 a total of 992 mol m^{-2} PAR during the crop while plants in the fall received 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.

REFERENCES

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

Cell width x depth (cm)	Cell vol. (cm^3)	Cell no. /m^2
Polystyrene trays		
2.4 x 5.7	17	1044
2.8 x 7.6	23	861
3.8 x 11.5	61	549
5.1 x 7.6	75	310
7.6 x 7.6	160	138
Polypropylene trays		
2.1 x 2 cm	6	1076
2.1 x 4 cm	11	1076

Table 2. The effect of plant density and cell volume on the yield of garlic chive plants.

			Foliage fresh wt		
Initial plants/m^2	Cell vol. (cm^3)	No. plants/ cell	g/plant	g/m^2	Plant no. increase (%)
Transplanted Oct. 7, harvested Dec. 15, 1993					
828	160	6	1.49	1741	145
930	75	3	1.47	1732	128
1098	61	2	1.49	2255	125
Transplanted Oct. 7, harvested Dec. 15, 1993					
1550	61		1.45	3757	171
1550	75		1.30	2751	141
1550	160		1.20	2399	129
Transplanted Nov. 5, harvested Feb. and Apr. 5, 1994					

828	160	6	1.49	2867	233
930	75	3	1.47	2792	205
1098	61	2	1.49	3600	220
Transplanted Oct. 5, harvested Dec., 1993, Feb., Apr., and May 10, 1994					
138	160	1	2.72	1356	361
272	160	2	3.12	3056	360
549	61	1	2.88	5154	326
1098	61	2	2.84	8321	267

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.

		Fresh weight	
Plant no. /m^2	Cell vol. (cm^3)	g/plant	g/m^2
689	61	1.52	984.5
839	75	1.30	1090.0
968	23	1.40	1353.6
1076	17	1.36	1466.6
1377	61[z]	1.35	1859.3

[z]2 plants/cell

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

		Foliage fresh wt.	
Cell vol. (cm^3)	Plants/m^2	g/plant	g/m^2
Seed sown Oct. 5, transplanted Oct. 15, harvested Nov. 15, 1993			
61	1550	2.04	3155
75	1550	2.05	2926
160	1550	1.98	3065
Seed sown Sept. 27, transplanted Oct. 15, harvested Nov. 11, 1993			
6	1550	1.66	2564
11	1550	1.61	2491
75	1550	1.51	2336
Seed sown Feb. 27, transplanted Mar. 15, harvested Apr. 12, 1994			
61	775	4.44	3440
75	775	5.64	4373
160	775	4.67	3617

Table 5. Potential returns for garlic chives and cilantro.

Assumptions for winter greenhouse crop of garlic chive foliage

1. Perennial crop, harvest every 8 weeks from Oct. 1 to June 1.
2. Each crop requires 8 weeks and plants are grown at 1550 plants m^{-2}
3. Utilize 50 m^2 of bench space for each crop.
4. Receive $.70 per 2 oz (30g) package.

Gross returns calculations

2.5 kg foliage m^{-2} x 200 m^{-2} x 4 crops = 2,000 kg x 5% shrink = 1,900 kg

1,900 kg/30 g per 2 oz. package = 63,333 packages

63,333 packages x $0.70 = $44,333.00

$44,333/200 m^2 bench space = $222 m^{-2} gross returns for winter crop

Assumptions for winter greenhouse crop of cilantro foliage

1. Thirteen crops, sow seed every 2 weeks from Oct. 1 to Apr. 1. Use greenhouse from Oct. 1 to June 1.
2. Each crop requires 8 weeks and plants are grown at 775 plants m^{-2}
3. Utilize 50 m2 of bench space for each crop.
4. Receive $.70 per 2 oz (30g) package.

Gross returns calculations

3 kg foliage m^{-2} x 50^{-2} m x 13 crops = 1,950 kg x 5% shrink = 1,852,500 g

1,852.5 kg/30 g per 2 oz. package = 61,750 packages

61,750 packages x $0.70 = $43,225.00

$43,225/200 m^2 bench space = $216 m^{-2} gross returns for winter crop

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