

PERFORMANCE OF *ANGELONIA* CULTIVARS AS A SUMMER GREENHOUSE CUT FLOWER

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Introduction

Angelonia is a relatively new plant used primarily for mixed patio containers for spring and summer garden center sales. *Angelonia angustifolia* or summer orchid has indeterminate spikes of purple, purple and white, pink, and white orchid-like flowers that are about 1 inch (2-3 cm) in diameter. The plants can be too tall for use as a spring pot or bedding plant so growth regulators have been used to control their height (Bartel and Starman, 2000, Miller, *et al.* 2000). I have had angelonia plants in our research greenhouses for four years and their cut flower potential was clear. Preliminary trials demonstrated that cut stems had good post-harvest life. These trials were initiated to determine the potential yield and cut stem quality of *Angelonia*.

Materials and Methods

Angelonia cultivars were grown as a greenhouse cut flower in the summers of 1999 and 2000. Plants were grown in 4 inch (10 cm) pots at a density of 9 plants ft⁻² (pot to pot, 97 plants m⁻²) with daily ebb-flood irrigation with a fertilizer solution with an EC of 0.6-1.2 mS cm⁻¹ from Peters 20-10-20 fertilizer. Cut stems were harvested twice per week. Greenhouse average daily temperatures ranged from 76 to 85 F (24C - 29C) each year, evaporative cooling was not used.

In 1999, three replicates of 30 plants of the non-patented purple/white cultivar were planted week 21 (late May). In 2000, three replicates of 30 plants of the non-patented cultivars (purple/white, white, purple, pink) and the patented, virus-indexed AngelMist™ cultivars (purple, white, pink, lavender, deep plum) from Ball FloraPlant were planted week 16 (mid April) in a randomized complete block experiment.

Results

In 1999, the non-patented purple and white cultivar produced 58.5 plants ft⁻² (632 stems m⁻²) from week 27 to 48 (Table 2). Cut stems were harvested from 36 to 98 cm long and over 60% of the cut stems were over 50 cm long (Table 1). It was clear that angelonia could be a summer greenhouse cut flower. These relatively long cut stems and high yields led to the more complete variety trials in 2000. The plants grew much better under the high light and high temperature conditions of June and July, so the starting date was moved into April for the 2000 trials.

In 2000, cut stems were harvested from week 21 to week 41. Harvest was concentrated during weeks 22-23, weeks 27-28 and weeks 36-38 (Figure 1). The non-patented purple/white cultivar had significantly longer mean stem length compared to the other cultivars (Table 1). AngelMist™ purple had the highest yield, 119 stems ft⁻² (1285 stems m⁻²), AngelMist™ deep plum had the lowest yield, 58 stems ft⁻² (629 stems m⁻²) (Table 2).

Angelonia has relatively high cut flower yields, an average yield of 78 stems ft⁻² (841 stems m⁻²) for approximately 20 weeks of greenhouse production compared to 52 week yields of 20-50 stems ft⁻² (250-600 stems m⁻²) for greenhouse roses (Pellet, *et al.* 1998). The cut stem production leads to relatively high returns for summer greenhouse cut flower production. At prices of only \$.10/stem, gross returns would be \$84.10 m⁻² (\$7.80 ft⁻²).

General recommendations from these trials:

Varieties - Select the non-patented purple/white and white for initial trials. They are relatively easy to propagate from tip cuttings or node cuttings, under mist and bottom heat. These cultivars are infected with cucumber mosaic virus, so be sure that will not be a problem to other crops in your greenhouse. The main reason to choose non-patented varieties in the beginning is cost. It would be quite expensive to purchase AngelMist™ plugs to fill a greenhouse, although it seems the high yields would pay for the cost of these cuttings. If you choose AngelMist™ varieties, use Purple Stripe, Purple and White. Stem lengths of the pinks and non-patented purple seemed too short. AngelMist™ Lavender is also a good variety, it cycles the fastest from harvest to flower. In these trials, the AngelMist™ cultivars had higher yields than non-patented cultivars, presumably because these varieties were clean (cucumber mosaic virus had been removed from the plants).

Light - These plants prefer full sun, high light conditions. They have been reported to be day neutral (Miller, *et al.* 2000).

Temperatures - Hot summer greenhouse conditions are fine as long as the plants get sufficient water. In these studies, greenhouse average daily temperatures ranged from 76 to 85 F (24C - 29C) each year, with many days of 100-105 F (38-40C) maximum daily temperature. Evaporative cooling was not used, these plants grow well in the summer heat in Kentucky. The non-patented varieties can be kept over winter as stock plants, but they need to be kept in a warm greenhouse, they cannot be stored or grown at temperatures less than 55 F (13 C).

Spacing - Plants in these studies were grown at 9 plants ft⁻². It seems somewhat lower density, 7-8 plants ft⁻², could increase per plant yields and make harvest easier.

Irrigation - Ebb flood irrigation was automated for these trials and made watering easy. Overhead watering is possible, but the plants may be knocked down.

Support - *Angelonia* plants were grown without support in these trials. One layer of cut flower mesh is probably a good idea, but the plants are difficult to get into for harvest. If fertilizer practices can be optimized, support may not be necessary.

Fertilizer - Less fertilizer is better than more, but I don't have specific recommendations (I'm evaluating fertilizer this summer). Angelonia is a sub-shrub from Brazil, the bases of the stems may get woody on older plants. It seems best to cut stems as low as possible at harvest and allow new shoots to arise from the base. It also seems best to remove all stems over the 2-3 weeks of harvest to allow the new shoots to develop together. My current feeling is that the plants should be fertilized at 150-200 ppm for 2-3 weeks after harvest to get new shoots growing rapidly, then reduce fertilizer to zero up to harvest. This allows strong straight stems to form with few lateral branches. It seemed clear that the stems, especially AngelMist™ Lavender, were soft and floppy with many lateral branches (especially the pinks) when fertilizer levels were too high.

Insects and disease - These plants are quite free of insects and disease. Whitefly will get on them if the insects are around in high numbers. I thought I had seen thrips damage (thrips were in neighboring greenhouses), but I'm confident the damage was symptoms of the cucumber mosaic virus.

Vase life - Our preliminary trials showed cut stems had a vase life of 14-18 days. The flowers continue to develop, but colors do fade as flowers open. The cut stems use quite a bit of water in a vase.

Fragrance (odor) and glandular hairs - Angelonia leaves and stems are covered with glandular hairs. These hairs exude sticky aromatic compounds, some workers and florists might find this

objectionable. Workers will definitely have to wash their hands after handling the stems and removing the lower leaves. If the lower leaves have been removed, florists shouldn't have too much difficulty with the stickiness of the leaves and stems. Each person will have to decide how they feel about the fragrance; I feel it is neither a major plus nor major minus.

Literature Cited

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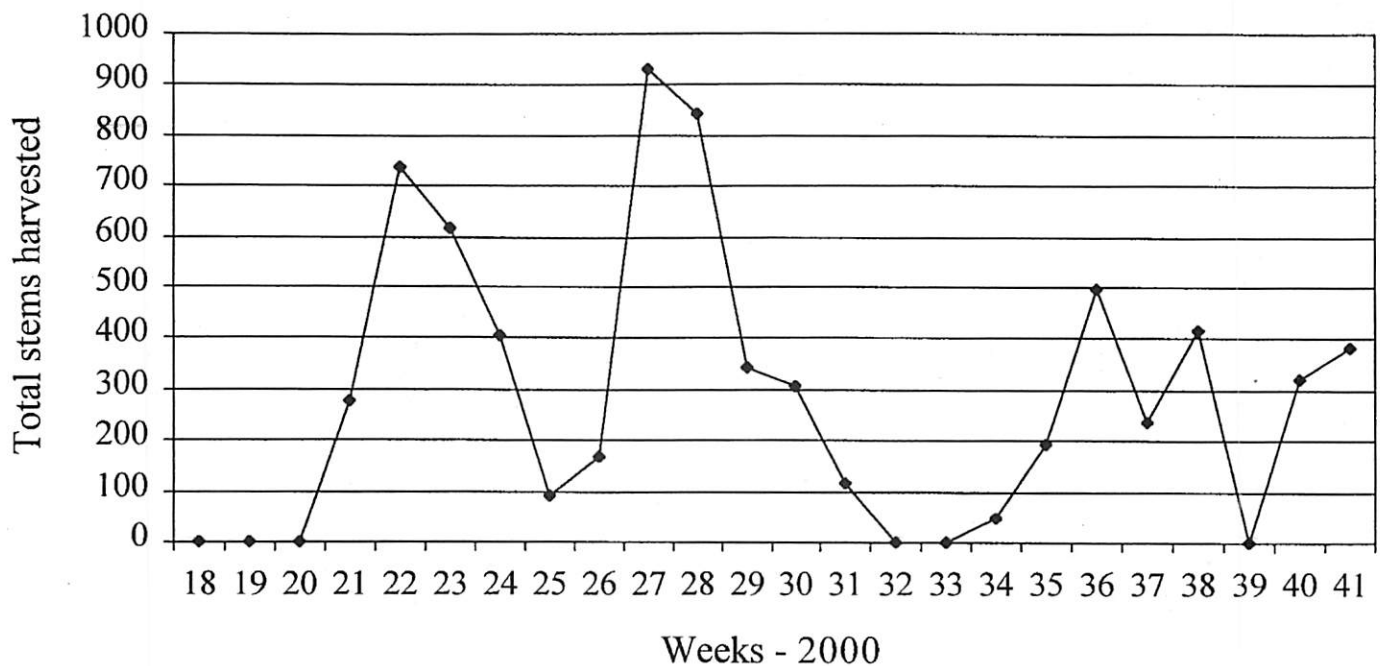
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Table 1. Stem length and stem length grades at harvest for nine *Angelonia* cultivars.

	Mean stem length (in)	Mean stem length (cm)	Percent in stem length grades				
			36-45 cm	46-55 cm	56-65 cm	66-75 cm	> 76 cm
Summer 1999							
Purple/White	24.0	61.2	13 %	34 %	17 %	20 %	17 %
Summer 2000							
Purple/White	23.6	60 a ^x	6	25	40	23	6
White	22.4	57 ab	8	36	38	13	3
White AM	21.6	55 b	14	40	31	14	2
Purple AM	21.6	55 b	19	35	26	15	4
Purple	21.2	54 bc	19	35	26	15	4
Lavender AM	20.9	53 bc	19	45	30	6	0
Pink	20.0	51 c	26	47	23	4	0
Pink AM	19.7	50 c	29	48	20	3	0
Deep Plum AM	18.9	48 c	41	40	17	2	0

x - Means in the same column with the same letter are not significantly different at the 0.05 level of probability according to the Least Means Square test.

Table 2. Yield of cut stems for nine *Angelonia* cultivars.

	Flowers per plant	Flowers per ft ²	Flowers per m ²
Summer 1999			
Purple/White	6.5	59	632
Summer 2000			
Purple AM	13.2 a ^x	119	1286
White AM	8.9 b	81	869
Lavender AM	8.9 b	80	863
Pink	8.5 c	77	830
Pink AM	8.4 c	76	816
Purple/White	8.2 c	74	795
White	8.0 c	72	774
Purple	7.3 d	66	713
Deep Plum AM	6.5 e	58	629

x - Means in the same column with the same letter are not significantly different at the 0.05 level of probability according to the Least Means Square test.