

Chilling Injury in Tropical Foliage Plants: I. *Spathiphyllum*¹

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The genus *Spathiphyllum*, commonly known as Peace Lily, has about 36 species. Most species originate in Central and South America, but two have their native habitat in the Malay Archipelago. Because of their elegant white spathes, deep green foliage, and ability to tolerate low light, Peace Lily has become one of the most popular ornamental foliage plants (Chen et al. 2005).

Spathiphyllum, like most other foliage plants with tropical origin, is sensitive to chilling temperatures. A chilling temperature can be any temperature that is cold enough to cause injury but not cold enough to freeze the plant, usually ranging from just above 32°F to 59°F. Chilling injury has been a significant cause of losses in foliage plant production, transportation, and interiorscaping.

A general consensus among growers is that *Spathiphyllum* is relatively chilling resistant compared to other foliage plants such as *Aglaonema*. As a result, comparatively little attention has been given to maintaining appropriate greenhouse temperatures for this plant in winter and early spring. Also, limited information is available on how *Spathiphyllum* responds to chilling temperatures.

A systematic evaluation of foliage plants in response to chilling temperatures has recently been initiated in our

program. Here is a summary of chilling responses of 15 *Spathiphyllum* cultivars with emphases on chilling injury symptoms and cultivar differences in chilling resistance (Qu et al. 2000).

Chilling Injury Symptoms

Chilling injury initiated from leaf tips and edges and progressed inwardly, with injured leaf areas becoming necrotic, then turning black, and, finally, drying up completely. Symptoms appeared within 24 hours for 'Mini' and 5 days for '5598' after initial exposure to 38°F. Degree of the visual injury ranged from minor necrotic lesions on leaf tips or edges to the complete death of plants, depending on cultivars, when exposed to 38°F.

In general, mature leaves were more sensitive to chilling than young leaves. Prolonged exposure to either 38°F or 45°F caused more injury than a shorter period of exposure at these temperatures, and injury was more pronounced at 38°F than at 45°F. Therefore, chilling injury can be lessened if preventative actions are taken to reduce either the severity or the duration of chilling, or both, during production.

No visual injury occurred in plants exposed to 52°F. However, when growth indices (Growth index = [(canopy's

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widest width + width perpendicular) ÷ 2] x plant height) were measured 45 days after chilling, they were found to be smaller than those of the controls (Table 1), suggesting that plant growth was actually affected by chilling exposure. This could explain why some cultivars recover slowly in spring even when temperature becomes optimal and nutrient supply is adequate.

Table 1. Growth index of eight *Spathiphyllum* cultivars 45 days after exposure to 52°F for 5 or 10 days in contrast to that of control plants.

Cultivar	Days Being Chilled		
	0 ^y	5	10
5598	370.5	223.8	200.2
Annette	283.1	227.8	181.7
Debbie	276.3	249.9	200.6
Viscount	350.6	301.9	181.5
Little Angel	265.5	215.3	199.5
Connie	502.9	332.9	308.5
Lynise	474.8	424.9	387.1
Mini	379.8	194.5	202.3

^zGrowth index (cm²)=[(plant width 1 + plant width 2) ÷ 2] x plant height.
^yControl plants grown in a shaded greenhouse with a temperature range of 18°C to 32°C (64.4°F to 89.6°F).

Compared to *Aglaonema* cultivars, which are often visibly injured at 50°F, *Spathiphyllum* cultivars indeed appear to be more resistant to chilling temperatures. Growers, however, should be particularly aware of the invisible effect of chilling in *Spathiphyllum*, which may be wrongly diagnosed as insufficient fertilization or other culture practices.

Cultivar Differences in Chilling Resistance

Distinct chilling resistance exists among *Spathiphyllum* cultivars with leaf area injury ranging from 2.5% to 100%. Based on the percentage of injured leaf areas, resistant cultivars are '5598', 'Annette', '0597-3', and 'Debbie'; moderately resistant: 'Viscount' and 'Classic Viscount'; intermediately resistant: 'Little Angel', 'Petite', and 'Connie'; sensitive: 'Vicki Lynn', 'Starlight', and 'Lynise'; and highly sensitive: 'Mini', 'UF576-14', and 'UF474-1' (Table 2).

In summary, chilling injury in *Spathiphyllum* can be either visible or invisible. Visible injury ranging from necrotic lesions to complete plant death occurred when plants were exposed to 38°F or 45°F for 5 days. The reduction or delay in plant growth mainly reflects invisible injury when *Spathiphyllum* is exposed to 50°F. Cultivars differ significantly in resistance to chilling. Using resistant cultivars may reduce

the chance of chilling injury in production and transport as well as decrease greenhouse heating costs.

Table 2. Classification of chilling responses of 15 *Spathiphyllum* cultivars based on the percentage of injured leaf area three days after exposure to 38°F for five days.

Cultivar	% injured leaf area	Classification of chilling resistance
5598	2.5	Resistant
Annette	3.0	
0597-3	6.1	
Debbie	9.0	
Viscount	16.0	Moderately
Classic Viscount	16.8	resistant
Little Angel	34.4	Intermediately
Petite	35.7	resistant
Connie	35.9	
Vicki Lynn	56.7	Sensitive
Starlight	58.3	
Lynise	60.2	
Mini	95.5	Highly
UF576-14	100.0	sensitive
UF474-1	100.0	

Literature Cited

- Chen, J., McConnell, D.B., Norman, D.J., and Henny, R.J. 2005. The foliage plant industry. *Horticultural Reviews* 31:45–110.
- Qu, L., Chen, J., Henny, R.J., Caldwell, R.D., and Robinson, C.A. 2000. Response of *Spathiphyllum* cultivars to chilling temperatures. *Proc. Fla. State Hort. Soc.* 113:165–169.