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ENH843

Chilling Injury in Tropical Foliage Plants: II. *Aglaonema* [1]

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Aglaonema, commonly called Chinese evergreen, is a member of the family Araceae and comprises 21 known species that are native to southeast Asia where they grow in the humid, heavily shaded tropical forest (Huxley 1994). Cultivated in the East for centuries, *Aglaonema* was believed to bring fortune to life and probably was introduced to the western world in 1885 (Brown 2000). Currently, *Aglaonema* are among the most popular tropical ornamental foliage plants because of the attractive foliar variegation, low light and humidity tolerances, and few pest problems (Chen et al. 2005).

A major limitation in the production of *Aglaonema* is chilling injury when plants are exposed to temperatures from just above 32°F to 59°F (Chen et al. 2001a, 2001b; Fooshee and McConnell 1987; Henley et al. 1998; Hummel and Henny 1986). Chilling injury to *Aglaonema* may also occur during shipment, retail display, and interior decoration (Blessington and Collins 1993; Griffith 1998; Joiner 1981).

With recently increased release of *Aglaonema* cultivars, hybrids with different variegation patterns, showy petiole and stem colors, and varying growth habits have become available (Cialone 2000). However, the response of these new cultivars to chilling temperatures is largely unknown. This report intends to summarize chilling injury symptoms in *Aglaonema* and cultivar differences in resistance to chilling temperatures (Chen et al. 2001a; Henley et al. 1998).

Figure 1. *Aglaonema* 'Silver Queen' was injured at 55°F; the injured leaves were indicated by arrow.

Twelve *Aglaonema* cultivars were grown in 8" pots under greenhouse conditions. After attaining marketable sizes, these plants were chilled at 35°F, 45°F, and 55°F for 24 hours in walk-in coolers. Chilling injury symptoms were characterized and percentages of injured leaves were determined daily for the next 10 days. Since *Aglanomena's* aesthetic

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appearance is directly related to foliage color and quality, any damage on leaves, regardless of severity, can greatly reduce its ornamental value in the market place (Chen et al. 1998; Henley et al. 1998). Therefore, the percentage of injured leaves was the primary parameter used to determine the sensitivity of cultivars to chilling temperatures.

Chilling Injury in

Dark and greasy patches appeared between midvein and leaf margin on the upper surface of leaves two days after chilling at 35°F, 45°F, or 55°F (Figure 1). Injured areas or individual patches were irregular, varying from 10% to 80% of the entire leaf area. If injured areas totaled less than 50%, leaves could stay alive for months; whereas if more than 50%, leaves could became yellow and finally abscised. The number of leaves injured continuously increased for up to 10 days, but no further injured leaves appeared 10 days later.

Leaves of different maturity expressed dissimilar responses to chilling temperatures. Mature and old leaves appeared to be much more sensitive to chilling than young leaves. Among the injured leaf totals, mature leaf injury ranged from 45% to 100% and old leaves from 14% to 53%, but young leaf injury was only 0% to 6% depending on cultivar (Table 1).

Table 1. Percentages of leaf injury categorized by leaf maturity[z] 10 days after 24-hour chilling at 35°F.

	Leaf maturity		
Cultivar	**Young**	**Mature**	**Old**
Emerald Star	0.0	0.0	0.0
Stars	0.0	0.0	0.0
Jewel of India	0.0	0.0	0.0
Black Lance	0.0	100.0	0.0
Maria	0.0	66.6	33.4
Green Lady	1.0	46.6	52.4
Green Majesty	0.0	60.2	39.8
Royal Queen	0.0	46.9	53.1
Moonshine	2.5	50.1	47.4
Silver Queen	4.7	54.4	40.9
Manila Pride	0.0	85.6	14.4
Silver Frost	6.5	45.4	48.1

[z] Young: the most recently fully expanded leaves up to and including the newest unfurled leaf; mature: leaves immediately below the young leaves down to the old leaves; and old: about three to four basal leaves. The sum of the percentage of injured young, mature, and old leaves equals to 100%.

Cultivar Differences in Chilling Resistance

Cultivars were significantly different in resistance to chilling temperatures (Table 2). 'Silver Queen', one of the most popular cultivars in the foliage plant industry, was extremely sensitive to chilling, with 30%, 38%, and 68% of leaves injured at 55°F, 45°F, and 35°F for 24 hours. 'Maria', a cultivar well known for its chilling resistance, was not the most resistant one tested. Ten days after chilling at 35°F for 24 hours, 32% of 'Maria's' leaves were injured, but there was no discernable injury on 'Emerald Star', 'Stars', or 'Jewel of India'. 'Emerald Star', 'Stars', and 'Jewel of India' were the most chilling resistant cultivars. In addition, 'Black Lance' and 'Green Lady' appeared to be slightly better than or at least equal to 'Maria' in chilling resistance. Cultivation of the resistant cultivars will reduce chilling injury and energy used for heating during production.

Cultivars also differ in their sensitivity to critical chilling temperature, i. e. a temperature at which chilling injury occurs (Table 2). For example, 10 days after 24-hour chilling, 'Silver Frost' had no injury at 55°F and only 5% leaf injury at 45°F, but 80% of the leaves were injured when exposed to 35°F. A similar pattern occurred in 'Maria' and 'Green Lady'. In contrast, 'Silver Queen' and 'Royal Queen' had 30% and 14% injured leaves, respectively, 10 days after chilling at 55°F. Implications are that critical chilling temperatures of 'Silver Frost', 'Maria', and 'Green Lady' are around 45°F, whereas critical temperatures of 'Silver Queen' and 'Royal Queen' are above 55°F. Critical chilling temperature distinctions are potentially important in *Aglaonema* production because growers will be able to manage their greenhouse temperatures based on cultivar-dependent chilling temperature sensitivity ranges.

In summary, chilling injury in *Aglaonema* was characterized by dark and greasy-appearing patches on injured leaves. Young leaves appeared to be more resistant to chilling temperatures than either mature or old leaves. Significant chilling resistance exists among *Aglaonema* cultivars, a genus considered extremely sensitive to chilling temperatures. 'Emerald Star', 'Stars', and 'Jewel of India' withstood exposure to 35°F without injury, whereas 'Silver Queen' was injured at 55°F. In addition, cultivars differed in their sensitivity to critical chilling temperatures. Use of resistant cultivars may greatly reduce the chance of chilling injury during production and transportation and also conserve energy used for greenhouse heating. However, if chilling-sensitive cultivars must be grown, greenhouse

facilities should allow for maintaining temperature above 60°F.

Table 2. Percentages of injured leaves of 12 *Aglaonema* cultivars 10 days after 24-hour chilling at 35°F, 45°F, or 55°F.

	Chilling temperature		
Cultivar	**35°F**	**45°F**	**55°F**
Emerald Star	0.0	0.0	0.0
Stars	0.0	0.0	0.0
Jewel of India	0.0	0.0	0.0
Black Lance	18.3	12.0	0.0
Maria	32.0	8.3	0.0
Green Lady	34.0	9.0	0.0
Green Majesty	50.0	17.3	4.7
Royal Queen	51.0	34.1	14.0
Moonshine	54.0	10.0	2.0
Silver Queen	68.3	37.7	29.7
Manila Pride	73.0	15.3	13.3
Silver Frost	80.0	4.7	0.0

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