

Plant Evaluation Notes

An Evaluation Study of Tricyrtis

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The subtle blossoms of *Tricyrtis*, or toad lily, bloom in late summer and autumn, a time of year when color is rare in shade and woodland gardens. Uncommon beauty, late-season blooms and adaptability to shade give the toad lilies exceptional garden merit.

There are 16 herbaceous perennial species of *Tricyrtis*, native from the eastern Himalayas to China, Japan, Taiwan and the Philippines, growing in tall grass near the edge of mountain woodlands or in damp, shady ravines. Toad lilies have vertical to slightly arched stems, and most spread by creeping rhizomes. Leaves vary by species and can be lance- to egg-shaped, hairy to hairless, concolorous or mottled, and with or without a clasping base that surrounds the stem. The white or yellow flowers are borne in terminal and/or axillary clusters, and typically begin blooming in early autumn. Flowers may appear lavender or purple rather than white due to the degree of purple blotching on the tepals, the segments of a flower that cannot be distinguished as a petal or sepal. Like other members of the Lily family, or Liliaceae, *Tricyrtis* flowers are composed of mostly equal-sized segments, three inner tepals and

three outer tepals. The tepals usually form an upward- or downward-facing funnel, and pouch-like appendages are located at the base of each outer tepal.

Toad lilies are perfect plants for moist woodlands or shady gardens. In cultivation, they grow best in a moist, humus-rich soil, in light to moderate shade. Foliage may scorch in full sun, but plants will tolerate more sunlight if given adequate soil moisture. Leaves emerge in late spring, usually avoiding frost, but flowers and leaves can be damaged by early autumn frost. The flowers open late in the season when many other perennials, especially woodland species, have finished flowering for the year. The flowers are produced for a long period and, if unharmed by killing frosts, will continue blooming into November. Garden companions include hosta, fern, hellebore, astilbe, Solomon's seal and Rodgersia.

Until recently, toad lilies were neither common nor well known in the horticultural world. Few gardening references included information on more than a species or two, and historically, nurseries offered only a limited number of species for sale. Today, however, toad lilies are experiencing an explosion in the horticultural market, with many new cultivars

and hybrids being introduced from Japan and the United States, including forms with variegated foliage and dwarf habits. Many are available only from specialty nurseries, or in limited quantities, but several species have become common in garden centers and nurseries everywhere. *Tricyrtis* is no longer a botanical curiosity or specialty plant, but is recognized as an outstanding perennial for late-season interest in shade and woodland gardens.

The Evaluation Project

The Chicago Botanic Garden (USDA Hardiness Zone 5b, AHS Plant Heat-Zone 5) conducted an evaluation study of 24 taxa of *Tricyrtis* from 1990 to 1999, although not all taxa were grown for the full 10 years. The initial evaluation group contained plants that were readily available in 1990, with additional taxa incorporated periodically during the term of the project.

Due to the unavailability of research information on *Tricyrtis*, not much was known about the cultivation of toad lilies in the Chicago area. The degree of winter hardiness was an uncertainty, and the particulars of diseases and pests that afflicted toad lilies were unknown. A comprehensive evaluation of the toad lilies was undertaken, with winter hardiness of primary consideration. Each taxon was evaluated on five criteria: 1) floral display, including flower color, flower size, flower production and bloom period; 2) habit display, including height measurements, spreading potential, foliage quality and habit quality; 3) winter hardiness; 4) cultural adaptability; and 5) disease and pest resistance. Plant traits and evaluation specifics for the taxa that completed more than four years of the trial are shown in Table 1. A summary rating was assigned to each taxon based on flower production, habit quality, plant health, winter injury and disease or pest problems. A five-star rating signifies an exceptional performance, whereas a one-star rating indicates a very poor performance.

Although 24 taxa were evaluated in the 10-year project, only 16 taxa successfully completed four or more years of testing. Four



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Tricyrtis latifolia

taxa were eliminated from the project in 1995 after being verified as taxonomically identical to plants already under evaluation. The characteristics of *Tricyrtis dilatata* were verified as identical to the synonymous species *T. macropoda*. No differences in characteristics were observed between the plants of *T. formosana* var. *stolonifera* and *T. formosana*, the former considered a synonym of the latter (Mathew 1985). Plants received from Heronswood Nursery as *T. maculata* closely matched the characteristics of *T. formosana*, and were subsequently purported to be a hybrid between *T. formosana* and *T. hirta*, according to plantsman Dan Hinkley of Heronswood Nursery. All plants received as *Tricyrtis* ‘T&M Hybrids’ proved to be *T. hirta* and were removed from evaluation. In addition, four taxa including *Tricyrtis hirta* ‘Golden Gleam’, *T. formosana* ‘Amethystina’, *T. ‘White Flame’* and *T. ‘Adbane’* died within the first or second year, but were not replaced for further testing.

The test site featured two mature red oaks that provided natural shade for the majority of the toad lilies. The site received morning sun for several hours, but was in medium dappled shade for the remainder of the day. Only *Tricyrtis hirta* ‘Miyazaki’ received full mid-day sun during the summer months. All plants were sheltered from wind by wooden fences that surrounded the garden. The clay-loam soil

was well-drained and periodically droughty, and had an average pH of 7.5 throughout the evaluation term.

Maintenance practices were kept to a minimum to simulate home garden culture. Overhead sprinklers provided water as needed, and no fertilizer was applied. An 18-inch-high wire mesh fence, to deter rabbits from eating the plants, enclosed the plot beginning in the third season. A mulch consisting of shredded leaves and wood chips was placed around the plants for aesthetic purposes, water conservation and weed suppression.

Observations

Floral, foliar and habit traits were observed and compared for each toad lily during the growing season. The flowers are typically upward-facing, funnellform and white or yellow with purple or maroon spotting. The pendulous, tubular flowers of *Tricyrtis macranthopsis* are a clear yellow with reddish-brown spotting inside, and easily distinguished from other toad lilies. The flowers of *T. macropoda* are unique among the toad lilies because the tepals are fully reflexed at maturity, resulting in one of the smallest flowers. The flowers of ‘Tojen’ are distinct from other toad lilies—the outer tepals are white with lavender margins and the inner tepals are clear white, without spotting. The white flowers of *T. hirta* ‘Alba’ are actually marked with pale

green spots, and the flowers of ‘Kohaku’ were the largest and showiest of all.

Flowers are borne at the terminals and/or in the upper leaf axils of most species. The *Tricyrtis hirta* cultivars produced clusters of large, showy flowers in the leaf axils along the entire stem, a trait that created a more impressive floral display than on other species. Flower coverage at peak bloom—usually two to three weeks after the first flowers opened—was typically under 40% on most species, but long bloom periods compensated for the low coverage. *Tricyrtis formosana* and *T. hirta* ‘Miyazaki’ had the best floral show with more than 80% of the flowers open at once.

Most of the toad lilies had green leaves, although a number of cultivars displayed variegated or chartreuse foliage. The strongest variegation was the creamy-white margins of *Tricyrtis hirta* ‘Albomarginata’. The soft yellow margins of *T. hirta* ‘Miyazaki Gold’ and *T. hirta* ‘Variegata’ were similar, but more pronounced on the former and faded to lighter green by the late season on the latter. The chartreuse leaves of ‘Lemon Lime’ were marked with small green spots, and the large, lush, spring-green leaves of ‘Tojen’ nicely complemented its handsome burgundy stems. *Tricyrtis formosana* had the darkest green leaves, and *T. macranthopsis* was the only toad lily with glossy foliage. The elliptic- to ovate-shaped leaves of *Tricyrtis latifolia* and

Table 1: Plant Characteristics and Performance Summary Ratings

Overall Rating	<i>Tricyrtis</i>	Flower Color ¹	Flower Size	Flower Coverage ²	Bloom Period	Plant Height	Plant Habit	Anthraco- nose Levels ³
★★★★★	<i>Tricyrtis formosana</i>	white, dark purple	1¼ - 1½ in.	high	late Aug-early Nov	36-40 in.	upright stems	none
★★★★	<i>Tricyrtis hirta</i>	white, pale purple	1 - 1½ in.	moderate	early Oct-mid Nov	24-36 in.	arched stems	minor, 1995-99
★★★	<i>Tricyrtis hirta</i> ‘Alba’	white, pale green	1 - 1¼ in.	moderate	mid Sep-late Oct	36-40 in.	arched stems	minor to severe, 1995-99
★★★	<i>Tricyrtis hirta</i> ‘Albomarginata’	white, purple	1½ in.	low	late Sep-mid Nov	20-27 in.	arched stems	minor to severe, 1996-99
★★★	<i>Tricyrtis hirta</i> var. <i>masamunei</i>	white, purple	1¼ in.	low	early Sep-early Nov	16-24 in.	arched stems	minor, 1998-99
★★★★★	<i>Tricyrtis hirta</i> ‘Miyazaki’	white, pale purple	1½ - 1¾ in.	high	late Sep-early Nov	24-30 in.	arched stems	none
★★★★	<i>Tricyrtis hirta</i> ‘Miyazaki Gold’	white, pale purple	1½ in.	low	late Sep-early Nov	18-24 in.	arched stems	minor, 1995-99
★★★★	<i>Tricyrtis hirta</i> ‘Variegata’	white, pale purple	1 - 1½ in.	moderate	early Oct-early Nov	18-22 in.	arched stems	minor, 1995-97
★★★★	<i>Tricyrtis hirta</i> ‘White Towers’	white	1¼ - 1½ in.	low	late Sep-early Nov	28-32 in.	arched stems	minor, 1995-97
★★★	<i>Tricyrtis</i> ‘Kohaku’	white, deep maroon	1½ - 2 in.	low	late Sep-early Nov	13-17 in.	upright stems	moderate to severe, 1996-98
★★★★	<i>Tricyrtis latifolia</i>	yellow, purple	1¼ - 1¾ in.	low	late Jun-early Aug	29-36 in.	upright stems	none
★★	<i>Tricyrtis</i> ‘Lemon Lime’	white, purple	¾ in.	low	late Sep-early Nov	8-12 in.	arched stems	moderate, 1996-99
★★★	<i>Tricyrtis macranthopsis</i>	yellow, reddish-brown	1¾ in.	low	late Sep-late Oct	10-14 in.	arched stems	none
★★★★	<i>Tricyrtis macropoda</i>	white, pale purple	¾ - 1¼ in.	moderate	late Aug-early Oct	28-36 in.	upright stems	minor, 1995-99
★★★★	<i>Tricyrtis</i> ‘Sinonome’	white, purple	¾ - 1½ in.	low	late Sep-early Nov	30-40 in.	upright stems	none
★★★★	<i>Tricyrtis</i> ‘Tojen’	lavender and white	1½ in.	low	mid Aug-early Nov	24-40 in.	upright stems	none

Overall ratings: ★★★★★ excellent; ★★★★ good; ★★★ fair; ★★ poor; ★ very poor.

¹Predominant flower color listed first, secondary color of spots listed after comma.

²Flower coverage at peak bloom: low =<40%; moderate =40-70%; high =>70%.

³Levels of anthracnose and the years the disease was observed: minor = <25%; moderate = 26-50%; severe = >51%



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Tricyrtis macranthopsis

T. macropoda were up to 3 inches wide and uniquely different from the broad, lance-shaped leaves of the other toad lilies being evaluated.

Plant habits were either upright or bowed, with arched stems varying from gently nodding to 45 degrees. The stems of *Tricyrtis hirta* often arched in the same direction, thus giving the plants a graceful, flowing quality. All the toad lilies were rhizomatous, although some taxa spread more quickly than others to form large masses. The most vigorously spreading taxa included *Tricyrtis formosana*, *T. hirta*, *T. hirta* 'Miyazaki', *T. latifolia* and *T. macropoda*. Spreading was not observed on 'Lemon Lime' and *T. macranthopsis*. Division was not required on any plants. Robust habits were noted on *T. formosana*, *T. hirta*, *T. hirta* 'Miyazaki' and 'Miyazaki Gold', *T. latifolia*, *T. macropoda*, 'Sinonome' and 'Tojen'. Lax or lodged stems and open plant centers were observed in one or more years on *T. hirta* 'Alba', 'Kohaku', *T. latifolia* and *T. macranthopsis*. The leaves and stems of the early-blooming *Tricyrtis latifolia* began to go dormant shortly after the last flowers faded in August.

Although winter hardiness was a primary consideration of the trial, cold temperatures did not prove to be a significantly detrimental problem for the toad lilies. Crown injury was the most common damage and was observed in one or more years on the following taxa: *Tricyrtis hirta* in 1991-92 and 1995-96, *T. hirta* 'Miyazaki' in 1991-92 and 1995-96, *T. hirta* 'Variegata' in 1994-95 and 'Sinonome' in 1994-95. The rhizomatous nature of the toad

lilies allowed these plants to rebound each season and reform into large, vigorous clumps. The only toad lilies that died during the first winter were *T. formosana* 'Amethystina' in 1992-93 and *T. hirta* 'Golden Gleam' in 1996-97. Frost injury to flowers and foliage was noted each autumn, but without an early killing frost, many plants often continued flowering into November. Severe damage to both stems and flowers was observed at temperatures below 28 degrees Fahrenheit.

Most of the toad lilies adapted to the culture of the test site and developed into healthy, robust plants. The garden was shaded for most of the day, except in one corner of the bed where *Tricyrtis hirta* 'Miyazaki' grew. These plants did not appear to be adversely affected by the midday sun, although the leaves were usually a lighter green than other *T. hirta* cultivars. The foliage of *T. hirta* 'Variegata' was scorched in 1994 after an overhead limb was removed from a red oak, suddenly increasing sunlight on the plants. Water was supplemented by overhead irrigation as needed, and competition from the red oaks for moisture was an ongoing issue. The inconsistent moisture level of the test plot did not appear to adversely affect the development or vigor of most of the toad lilies. The toad lilies that did not acclimate to or thrive in the test site were 'Lemon Lime', which was weak each year; 'White Flame', which died during its first growing season; and 'Golden Gleam', which died during the first winter. In general, the variegated cultivars were not as vigorous as the plants with green leaves. *Tricyrtis macranthopsis* developed at a slower rate than any other toad

lily. It did not increase significantly in size until the fourth year, when it went from several to at least 10 stems per crown.

Rabbits were the only serious pest observed on toad lilies in the early trial years. Most plants were damaged during the spring and early summer before a protective wire mesh fence was installed around the plot in 1993. Browsed plants usually regenerated shorter stems and began flowering up to several weeks later in the season. Rabbit damage was also observed in the last years of the trial on plants that had spread under or outside of the protective fence. Minor damage from earwigs and slugs was also periodically noted, but never to a level that harmed the health or ornamental quality of the plants.

The fungal disease anthracnose was an unexpected problem for the toad lilies, because it is not referenced as a disease of *Tricyrtis*. Leaves with orange-brown spots were first discovered in early July of 1995 and sent to the University of Illinois Cooperative Extension Service for testing. The service observed that the leaves were infected with anthracnose caused by the fungus *Colletotrichum*. The disease was characterized by orange-brown spotting, starting at the base of the plants and moving upward as it spread. The spots sometimes turned into lesions that covered entire leaves and resulted in unsightly foliage. Poor air circulation and moist conditions provided the ideal environment for fungal development, and splashing water during overhead irrigation facilitated the spread of the fungus. Plants were not treated with fungicides, but stems and leaves were removed from the garden each autumn.

Anthracnose leaf spot was observed in all years between 1995 and 1999 on *Tricyrtis hirta*, *T. hirta* 'Alba', *T. hirta* 'Miyazaki Gold', 'Lemon Lime' and *T. macropoda*. Toad lilies with minor infection in two years of the evaluation only included *T. hirta* var. *masamunei*, *T. hirta* 'Variegata' and *T. hirta* 'White Towers'. Anthracnose was severe by 1998 on *T. hirta* 'Albomarginata' and 'Kohaku'. The toad lilies that were not infected by anthracnose were *T. formosana*, *T. hirta* 'Miyazaki', *T. latifolia*, *T. macranthopsis*, 'Sinonome' and 'Tojen'.

Summary

Toad lilies are noteworthy perennials for their late-season flowers, and with few exceptions are superb garden plants for the Midwest. The toad lilies bloom at a time in the shade garden when most other plants have long fin-



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Tricyrtis 'Tojen'

ished flowering. Although the floral display is most effective in large groups or masses, single toad lily plants provide a pleasant accent or companion to other shade plants. The subtle charm of the blossoms is best observed at a close range, especially near the front or middle of the garden or border.

Of the 24 *Tricyrtis* taxa that began the project, two-thirds completed four or more years of evaluation. And two-thirds of those plants finished the trial with good to excellent final ratings, which were based on flower production, ornamental quality, plant health, winter hardiness and disease or pest resistance. The toad lilies were generally adaptable to the shady but periodically droughty conditions of the test site. The inconsistent soil moisture was not conducive to healthy growth for all the toad lilies. Those whose development was impaired by the cultural conditions of the test site included *Tricyrtis macranthopsis* and the variegated cultivars 'Lemon Lime', 'Golden Gleam' and 'White Flame'.

Excellent ratings were given to *Tricyrtis formosana* and *T. hirta* 'Miyazaki' because of their superior floral displays, robust habits, winter hardiness and disease resistance. Flower production on the other toad lilies was usually low at peak bloom, but extended flowering periods of six to 10 weeks were not uncommon. Healthy, robust plants were also noted for *T. hirta*, *T. hirta* 'Miyazaki Gold', *T. latifolia*, *T. macropoda*, 'Sinonome' and 'Tojen'. Whether stem habits were vertical or



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Tricyrtis hirta 'Variegata'

arched, most remained upright during the summer and few plants displayed weak stems or open crowns. Only *Tricyrtis hirta* 'Alba', 'Kohaku', *T. latifolia* and *T. macranthopsis* periodically displayed open crowns due to lax or fallen stems. The majority of plants were long-lived and vigorous, but did not require division.

Winter injury was rarely observed and insignificant when it occurred. Only two toad lilies experienced total plant loss during winter—*Tricyrtis formosana* 'Amethystina' and *T. hirta* 'Golden Gleam'. Unfortunately, neither plant was retested, so winter hardiness cannot be judged definitively. The flowers and leaves of toad lilies are sensitive to frost, and damage was observed as early as the beginning of October or as late as mid-November. Early frosts are particularly devastating because without extreme cold temperatures, many plants will continue to produce flowers into November.

Anthraxnose leaf spot was the only disease observed on the toad lilies. Fungal levels were probably high due to the monoculture of the test site, and infection was precipitated by the dispersal of fungal spores in water splashed during overhead irrigation. The lack of information about anthracnose on *Tricyrtis* limits the understanding of how widespread or potentially damaging this disease might be. Preventative measures include minimizing overhead irrigation and removing fallen and symptomatic leaves to reduce the amount of



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Tricyrtis formosana

bacteria in the leaf litter surrounding the plants. All toad lilies were susceptible to damage from rabbits, and without protection were seriously browsed in the early season and to a lesser extent in the late season. Regeneration of stems occurred but the plants were shorter with a delayed flowering period. A wire mesh fence, 18 inches tall, surrounding the toad lilies effectively controlled the browsing damage caused by rabbits.

There are many selections of *Tricyrtis* offered today that were unavailable in 1990. Some of the new cultivars have become available only in the last few years from specialty nurseries in Japan and the United States. Cultivars with variegated or non-green leaves are particularly popular, but carry a higher price tag than those that have been around for a while. Whether you choose a rare or a time-tested toad lily, the plant's unusual blossoms and graceful habit will make an impact in the autumn shade garden.

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The Plant Evaluation Program is supported by the Searle Research Endowment, the Woman's Board of the Chicago Horticultural Society and the Stanley Smith Horticultural Trust. Special thanks to Thomas E. Clark, Lynette Rodriguez, Andra Windorf Nus, Cathy M. Jones and Jenny S. Lee for their help in collecting data.

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