

# Comparative trials of herbicides for control of *Trapa natans* and *T. bispinosa* var. *iinumai* in the presence of *Heteranthera dubia* and *Vallisneria americana*

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## ABSTRACT

Water chestnut is a problematic annual rooted aquatic herb native to Eurasia and Africa. Two species are naturalized in the United States, *Trapa natans* and *Trapa bispinosa* var. *iinumai*. Whereas *T. natans* has been present since the late 1800s, a cryptic introduction of *T. bispinosa* var. *iinumai* was confirmed in 2014 and little is known of its biology or ecology. Aquatic herbicides have been used to control *T. natans*, but the response of *T. bispinosa* var. *iinumai* has not been experimentally evaluated to date. Therefore, repeated greenhouse trials were conducted to investigate the sensitivity of *T. bispinosa* var. *iinumai* to aquatic herbicides under various concentration exposure time (CET) scenarios. Treatment effects on biomass and propagules for both species of *Trapa* and key nontarget (native) species, *Vallisneria americana* and *Heteranthera dubia*, were determined for 2,4-D, flumioxazin, imazamox, and recently registered florpyrauxifen-benzyl. Trial differences were detected and are attributed to environmental conditions of each trial and plant age. Data indicate that both 24-h and static applications of flumioxazin at 429 g ai ha<sup>-1</sup> resulted in 86 to 96% control and subsurface applications of florpyrauxifen-benzyl at 48 µg ai L<sup>-1</sup> were highly effective with 89 to 98% control for target species evaluated, while minimally affecting nontarget *V. americana*. Results for *H. dubia* were variable between trials, with higher sensitivity observed for one trial than the other, indicating that plant age may affect efficacy of herbicides evaluated. Both 2,4-D and imazamox resulted in limited control of the target species, 58 to 68% and 35 to 70% control, respectively. This research indicates that the cryptic invader, *T. bispinosa* var. *iinumai*, exhibited similar or higher sensitivity to herbicides and CETs evaluated than its congener, *T. natans*.

*Key words:* chemical control, concentration exposure time, invasive, native, selectivity, water chestnut.

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