

Japanese Climbing Fern Control Trials In Planted Pine

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Introduction

Japanese climbing fern (*Lygodium japonicum*; Figure 1), native to Eastern Asia, is naturalized across the Southeastern US. It is a Florida Exotic Pest Plant Council (FLEPPC) Category I invasive plant that occurs in some 29 counties in Florida, particularly in the north central, north and west regions. Japanese climbing fern forms dense mats over ground cover and climbs into tree canopies. This species has not been observed to form the dense arboreal blankets in tree canopies seen with Old World climbing fern (*Lygodium microphyllum*), possibly due in part to freeze damage in populations above the Florida frost line. Both species of *Lygodium* were added to the Florida Department of Agriculture and Consumer Services (FDACS) noxious weed list, Rule 5B-57.007, FAC, in 1999. This rule prohibits introduction, cultivation and transport without a permit issued by FDACS.

In northern Florida, entrepreneurs lease rights on pine plantations to rake pine straw to bale and sell as landscape mulch. Many of these tree farms are infested with Japanese climbing fern (Figure 4). Pine straw bales have been a suspected vector for the disbursement of viable Japanese climbing fern plant parts and spores for several years. Numerous observations of fertile leaflet fragments in baled pine straw have been made in the Panhandle (personal observation). The end use of these bales is in residential, commercial, and right of way landscape beds. These sites would offer suitable conditions for *Lygodium* growth (Figure 2).

Recent official complaints concerning transport of Japanese climbing fern in baled pine straw initiated action by FDACS as a violation of Rule 5B-57, for possession and transport of a prohibited agricultural weed. FDACS arranged a meeting with members of the pine straw industry to discuss standardization of practices and to offer the pine straw industry the opportunity to address this problem and find an industry-initiated solution. The Florida Department of Environmental Protection's Upland Invasive Plant section was invited to this meeting and agreed to design climbing fern control trials in planted pines. Controlled field trials with calibrated agricultural equipment might yield information useful to control of this species on conservation lands, as well.

Materials and Methods

Trials were conducted at one site in Hamilton County and one in Calhoun County. The trials were designed to emulate typical forestry applications used by pine straw producers. Tractor broadcast spray equipment was calibrated by measuring spray volume per minute delivered and width of the spray pattern. Time to traverse the plots was adjusted to assure application rates were as close to design as practical. Plot sizes were 300 feet long by 21 feet wide at the Calhoun site and 25 feet wide at the Hamilton site. One row was left untreated between each treatment row as a buffer. Table 1 lists herbicides and rates used in the trial plots.



Figure 1. (above) Japanese climbing fern (*Lygodium japonicum*) fertile frond



Figure 2. (right) Japanese climbing fern in a pine straw mulched landscape.

One plot outside of the test area was sprayed by the pine straw farmer's foreman, Tick, using an unspecified "Tick's Roundup-Garlon 4 Brew." This plot was an actual operational control that we observed.

Treatments were evaluated at 0, 15, 30, 60, 90, 180, 270 (300 days for Hamilton County), and 400 (Calhoun County only) days after treatment (DAT). Evaluations were made by two or more people walking the plots and independently ranking percent cover of live *Lygodium*. Within each plot, percent cover of living

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	BROADCAST APPLICATION RATE		AMOUNT OF PRODUCT IN THE MIX	
	Low Rate	High Rate	Hamilton	Calhoun
Herbicide				
Accord	2 Qts/a	6 Qts/a	1.8%-5.6%	1.4%-4.2%
Garlon 4	1 Qt/a	4 Qts/a	0.9%-3.7%	0.7%-2.8%
Veteran 720	4 Qts/a	8 Qts/a	3.7%-7.4%	2.8%-5.6%
Escort	1 Oz/a	2 Oz/a	---	0.8-1.6 g/gal
Velpar L	2 Qts/a	4 Qts/a	---	1.4%-2.8%

Table 1. Herbicide broadcast application rates and amounts of herbicide in total mix for the low and high rates are provided. Accord (41.5% glyphosate), Garlon 4 (61.6% triclopyr ester), and Veteran 720 (24.58% 2,4-D and 12.82% dicamba) were used at both the Calhoun and Hamilton county sites. Escort (60% metsulfuron methyl) and Velpar L (25% hexazinone) were applied only at the Calhoun County site. A nonionic surfactant (Kinetic) was used at 0.5% with each herbicide mix.

Lygodium was scored from 0 to 10 for each 10-yard interval and summed to yield percent cover for the plot. Data from each evaluator were averaged for each plot and then scaled by transforming to percent change from day zero (Figure 3). Initial percent cover ranged from 21% to 47% in the Calhoun County plots and 22% to 45% in the Hamilton County plots.

Results and Discussion

Hamilton County trials were begun on September 26, 2001. All treatments resulted in suppression of *Lygodium* compared with the control plots (Figure 3). However some materials performed much better over the long term. At 15 DAT the Veteran 720 resulted in the most herbicide damage followed by Garlon 4 (Figure 3). The effects of winter burn are evident in data for the control plots; at 180 DAT percent cover was 26% lower than Day 0. By 300 DAT, all trials still showed suppression versus Day 0 and the patterns in the control plots, but only plots treated with Accord exhibited acceptable levels of long-term control.

“Tick’s Roundup-Garlon 4 Brew” plot was sprayed by the contractor. Based on our measure of the width of the tractor spray pattern, this would have nearly doubled his application rate per row because of overlap. This plot also was mowed about two months after treatment, which is a standard industry practice.

Calhoun County trials were begun October 19, 2001. The Escort and Velpar L applications were made 30 days later. The Veteran 720 and Garlon 4 applications worked quickly compared with Accord, Escort and Velpar L (Figures 3 and 4). By 270-400 DAT the Veteran 720 and Garlon 4 plots exhibited much *Lygodium* regrowth and were near or greater than initial population levels. Escort plots (240 DAT) exhibited good overall control with greater than 80% suppression of *Lygodium* and extensive green healthy natives present. By 370 DAT *Lygodium* in the Escort plots was beginning to recover. Accord at 270 and 400 DAT resulted in more than 80% suppression but there was much more damage to native understory plants relative to Escort plots. The winter burn in controls was approximately 29% at 180 DAT.

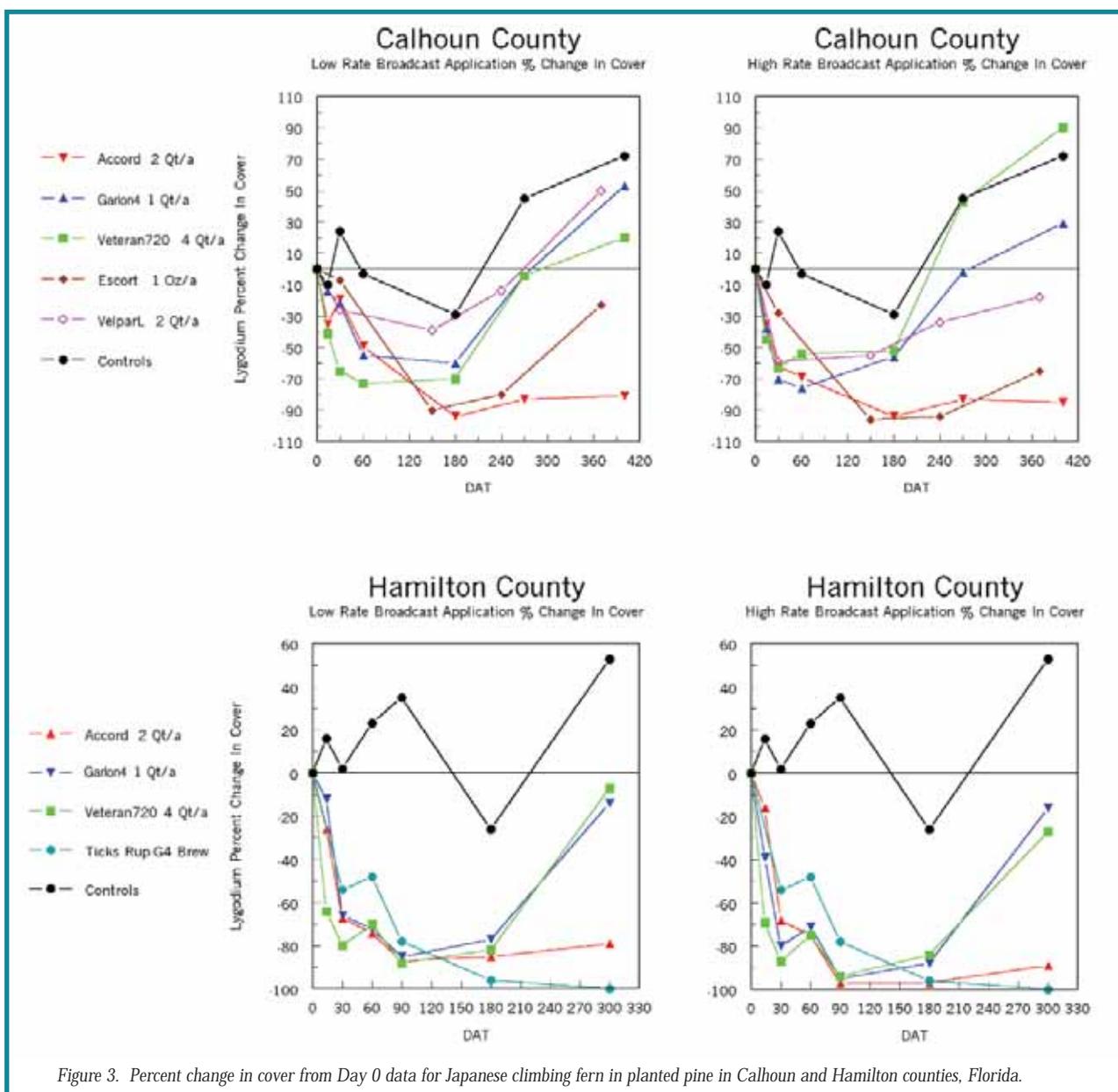


Figure 3. Percent change in cover from Day 0 data for Japanese climbing fern in planted pine in Calhoun and Hamilton counties, Florida.



Figure 4. Photopoints from the Calhoun County Japanese climbing fern control plots. Garlon 4 and Veteran 720 produced a quick knockdown of lygodium but control was of short duration relative to Accord and Escort. Accord gave good long term control of lygodium but induced severe non-target impacts to understory plants. Escort also produced excellent long term lygodium control but with less impact to native understory plants.

Accord and Escort both were very effective at long-term control of Japanese climbing fern. Escort performance at 1-2 oz/a was desirable from a natural resource perspective because of the reduced non-target damage of understory plants relative to Accord. However, Escort would be inadequate for the needs of the pine straw farmers because the industry desires long term bare ground knockdown of all understory plants without impact to pine trees. Based on our results we would recommend 6 quarts of Accord (Roundup) per acre to the pine straw farmers. The results in the Hamilton County “Tick’s Roundup-Garlon 4 Brew” plot indicate that a higher rate of a Roundup-Garlon 4 mix also may be sufficient for the pine straw farmer’s needs.

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Economic Uses of Ferns

From the chapter, Economic Uses of Ferns, from *Ferns of The Tropics* by Wee Yeow Chin, Timber Press, Inc., Portland, OR (1998):

“In New Guinea, the extremely long and tough frond stalks of the Climbing Fern (*Lygodium*) are used as a binding and lashing twine or woven into basketware, known as “Buka baskets.” In the Philippines, the leaf stalks of *Lygodium salicifolium* are similarly made into baskets, hats and fancy cases. The Thais split the leaf stalks lengthwise and weave them into elegant ladies’ handbags... For many centuries the Chinese used... *Lygodium microphyllum* to arrest bleeding.”