Evaluation of Imazapyr, Glyphosate, and Triclopyr for Japanese Knotweed (*Polygonum cuspidatum* Sieb. & Zucc.) Control

Introduction

Japanese knotweed is a federally listed invasive perennial native to Asia (National Agricultural Library 2004). This herbaceous plant (sometime referred to as semi woody) was introduced into England in the early 1800s and was subsequently introduced into North America as an ornamental (Figueroa 1989, Uva et al 1997). This species has now spread across the Pacific Northwest, Midwest, and eastern United States (USDA NRCS 2004).

Japanese knotweed is problematic for land managers due to its aggressive nature and reproduction capabilities. The plant can establish itself on a wide array of site conditions but can establish and grow exceedingly well in areas of partial to high sunlight and moist well-drained soils such as roadsides, utility rights-of-way, and river and stream banks (McCormick 2000, Uva et al 1997). Stems are hollow and jointed, much like bamboo, and can reach heights up to 2 meters (approximately 10 feet). Plants form either male and female white flowers (dioecious) in late summer and form three sided seed like fruit. There is some confusion as whether or not seeds produced from plants naturalized in the United States are viable. Pure strains of Japanese, giant, or Himalayan knotweed are thought not to produce viable seed while hybrid varieties can produce viable seeds (Soll 2004). Japanese knotweed can also reproduce vegetatively from thick rhizomes that can reach 40 to 60 feet in length and annual growth of 8 feet is not uncommon (McCormick 2000). This vegetative reproduction can lead to the formation of dense colonies of Japanese knotweed that can out compete native species. Above ground portions usually die with a hard frost while the below ground rhizomes remain viable for growth the following year.

Individual plant parts created from mechanical mowing can remain viable and lead to the spread of this plant. Due to its habitat usually occurring near flowing water, flooding disturbances can transport plant parts to be deposited in uncolonized areas further compounding the problem. Homeowner mowing clippings and vehicle transport of plant parts have also lead to the spread of Japanese knotweed (Figueroa 1989).

Methods and Materials

A study was initiated in June of 2005 to evaluate herbicides labeled for use near and around aquatic areas. Treatments included glyphosate (formulated as Aquamaster®), imazapyr (formulated as Habitat®), and triclopyr (formulated as Garlon 3A®). The study was located along Bonnyman Road in Perry County, KY. Five treatments were installed in a completely randomized block design with three replications and applied at 50 GPA using a boomless tip mounted on a CO_2 sprayer on an ATV. All treatments included NIS at 0.25 % v/v. Plots were evaluated for percent control (estimated by burndown) at 21 and 58 DAT.

Results and Discussion

The combination of Aquamaster and Garlon 3A provided significantly higher control levels (88%) at 21 DAT than all other treatments (Table 1). Aquamaster at 5 qt / ac provided the next highest level of control (57 %) at the same evaluation interval. Habitat at 3 pt / ac was not effective (12 %) at 21 DAT. The Aquamaster / Garlon 3A tank mix resulted in high control levels (95 %) at 58 DAT and was statistically higher than all other treatments. There were no statistical differences among the remaining treatments at 58 DAT and these treatments did not exceed 42 % control.

The Habitat at 3 pt / ac treatment provided the highest level of control (95 %) 1 growing season after treatment (1 GSAT) (Table 1). The Habitat alone treatment also resulted in the lowest amount of variance in control levels 1 GSAT (Figure 1). This indicates the consistent level of control provided by Habitat at 3 pt / ac in this trial. Aquamaster alone and Aquamaster + Habitat provided the next highest levels of control (82 % and 77 % respectively) at the same evaluation interval. There were no significant differences between these three treatments 1 GSAT. Treatments using Renovate 3 resulted in extremely poor control levels 1 GSAT. This indicates triclopyr's ability to provide quick burndown of Japanese knotweed in the same growing season of application but its inability to provide long term control.

Table 1: Control of Japanese Knotweed

Trt No.	Type	Treatment Name	Rate	Rate Unit	Percent Control 31 DAT	58 DAT	58 DAT(t)	333 DAT
1	HERB HERB ADJ	Aquamaster Habitat NIS	5 4 0.25	QT/A FL OZ/A % V/V	40b	30b	30b	77a
2	HERB ADJ	Aquamaster NIS	5 0.25	QT/A % V/V	57b	42b	39b	82a
3	HERB ADJ	Habitat NIS	3 0.25	PT/A % V/V	12c	23b	23b	95a
4	HERB ADJ	Renovate 3 NIS	2 0.25	QT/A % V/V	40b	47b	42b	0b
5	HERB HERB ADJ	Aquamaster Renovate 3 NIS	5 2 0.25	QT/A QT/A % V/V	88a	95a	95a	10b
6	CHK	Untreated Check			0	0	0	0
LSD (P=.05)					20.6	26.3	0.3t	20.4
Standard Deviation					10.9	14.0	0.1t	10.8
CV					23.1	29.55	8.56	20.58
Grand Mean					47.33	47.27	1.62t	52.67
Bartlett's X2					8.894	10.379	9.488	0.78
P(Bartlett's X2)					0.064	0.035*	0.05	0.677

Means followed by same letter do not significantly differ (P=.05, LSD)
t=Mean descriptions are reported in transformed data units, and are not de-transformed.
Untreated treatment(s) 6 excluded from analysis.
Data Column 3: TL[Data Column 2] = LOG([Data Column 2]+ 1)

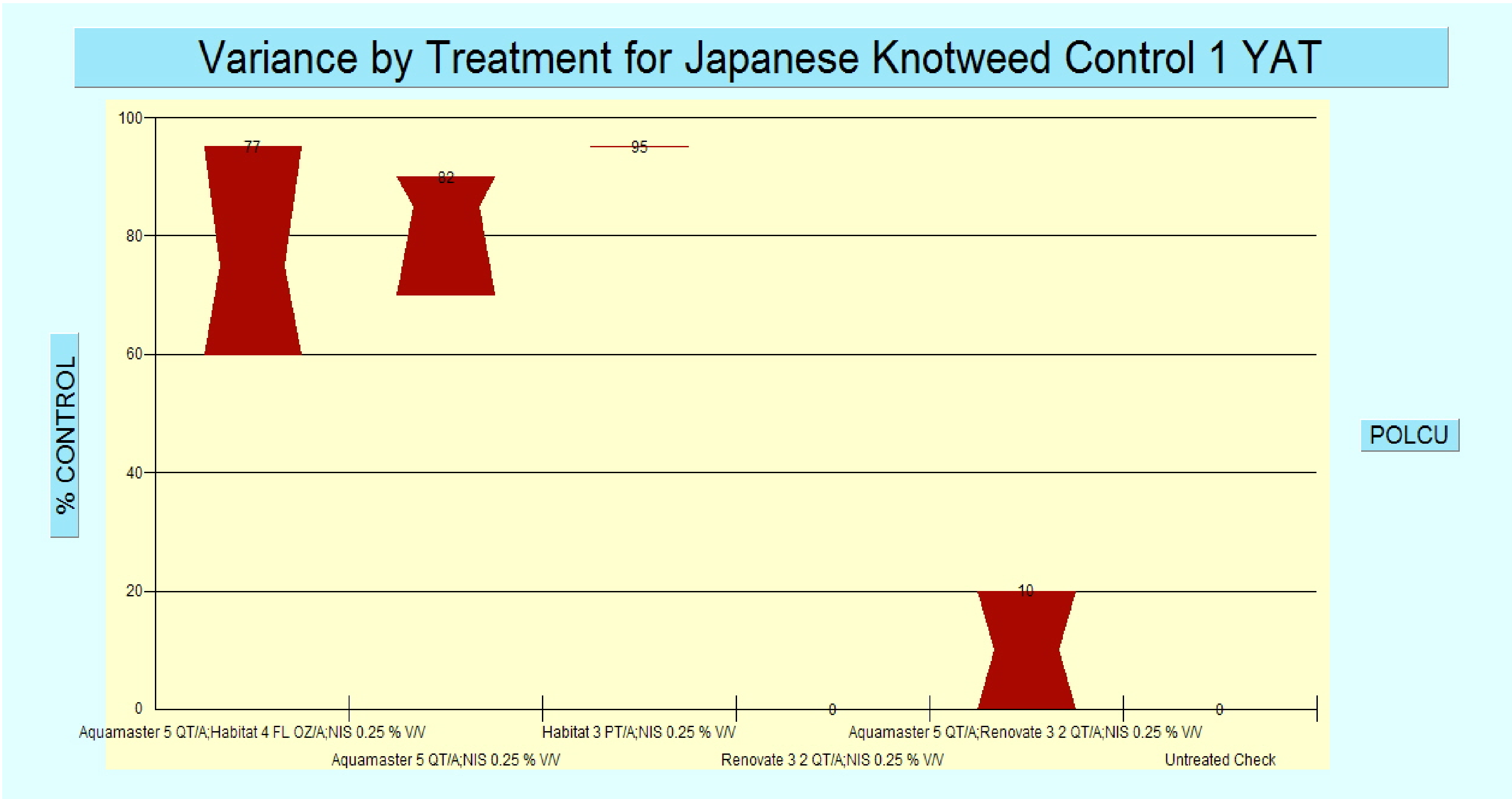

Figure 1: Treatment Variance for Japanese Knotweed Control 1 Growing Season after Treatment.

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