Evaluation of Three Glyphosate Products for Controlling Adventitious Sprouting of Melaleuca and Brazilian Pepper Tree Stumps

Ken Langeland
University of Florida, Institute of Food and Agricultural Sciences
Agronomy Department and Center for Aquatic and Invasive Plants
7922 NW 71st Street
Gainesville FL 32653
kal@mail.ifas.ufl.edu

Figure 1. The final cut was made as close to the ground as possible and herbicide was applied to the area just inside the bark with a dropper bottle.

Introduction

The active ingredient glyphosate was reported to have herbicidal activity in 1971 (Baird et al. 1971). Because it is an acid, glyphosate can be formulated as an aqueous solution of one of its salts. Since its introduction by Monsanto Company in 1974, the isopropylamine salt has been the most common formulation used in the United States. Products that contain different concentrations of glyphosate and adjuvants have been marketed over the years. Common products for terrestrial use contain 41.0% glyphosate as the isopropylamine salt, which is equivalent to 3 lb glyphosate acid per gallon, plus added surfactant. Products registered for aquatic use contain 53.8% glyphosate as the isopropylamine salt, which is equivalent to 4 lb glyphosate acid per gallon, and contain no surfactant. Touchdown, a recently developed product by Syngenta, contains 28.3% glyphosate as the diammonium salt of glyphosate, which is equivalent to 3 lb glyphosate acid per gallon, plus added surfactant (Table 1).

The purpose of this study was to evaluate the activity of Touchdown, Roundup Pro (3 lb glyphosate acid per gallon) and Rodeo (4 lb glyphosate acid per gallon) for controlling adventitious sprouting of stumps following felling of melaleuca and Brazilian pepper trees. Arsenal, which contains the active ingredient imazapyr, and Garlon 3A, which contains the active ingredient triclopyr, were included in the study for melaleuca and Brazilian pepper, respectively, because they are commonly used herbicides for treating melaleuca and Brazilian pepper stumps.

Methods and Materials

Five melaleuca stumps each were treated with 100% Touchdown, 50% Touchdown, 100% Roundup Pro, 50% Roundup Pro, 75% Rodeo, or 25% Arsenal on February 20, 2001. Five Brazilian pepper stumps each were treated with 100% Touchdown, 50%

Table 1. Herbicide products that contain the active ingredient glyphosate.

Active ingredient	Products	Application Methods	Comments
Glyphosate (4 lb/gallon[1])	Rodeo, Aquamaster, Aquaneat, Eagre, Aquapro, Glypro, Glyphosate Herbicide, Accord	Cut stump Foliar	Available from agricultural suppliers. May be applied directly to water.
Glyphosate (3.7 lb/gallon)	Roundup Weed & Grass Killer Super Concentrate	Cut stump Foliar	Available from retail garden suppliers. May not be applied directly to water.
Glyphosate (3 lb/gallon)	Roundup Pro, Credit, Glyphos, Glypro Plus, Rattler, Honcho, Glyphosate Herbicide VMF, Touchdown Pro	Cut stump Foliar	Available from agricultural suppliers. May not be applied directly to water.

[1]Based on the acid.

Touchdown, 100% Roundup Pro, 50% Roundup Pro, 75% Rodeo, or 50% Garlon 3A on February 21, 2001. All herbicide dilutions were made with water. Melaleuca trees were located on property owned by Lee County on the north side of Corkscrew Road, 3.8 miles east of the Interstate 75 exit. Brazilian pepper trees were located at the north end of the Florida Atlantic University Natural Area Preserve, Boca Raton, Florida. All trees were felled with a chain saw and the final cut was made as close to the soil surface as possible (Figure 1). Within five minutes of cutting, sufficient herbicide solution was applied from a dropper bottle (Figure 1) to thoroughly wet the stump surface just inside the bark (the area of active vascular tissue). The diameter of each stump was measured and recorded. The volumes of herbicide solution applied to melaleuca stumps were recorded, and the amount of herbicide solution applied per stump diameter was estimated by dividing the volume of herbicide solution applied to all replications by the average stump diameter. Melaleuca stumps were evaluated for adventitious sprouting on March 14, May 16, July 26, and September 20, 2001. Brazilian pepper tree stumps were evaluated on March 13, May 3, July 12, and September 20, 2001.

Figure 2. By 84 days after application all herbicide treated melaleuca stumps were exhibiting signs of mortality.

Figure 3. By 84 days after application, untreated melaleuca stumps averaged 10 adventitious stems per stump.

Results and Discussion

Melaleuca stumps ranged from 9cm to 35cm (average=22cm), a good representation of stump sizes that would typically be treated. None of the herbicide treated melaleuca stumps sprouted adventitious stems at any of the evaluation periods, the longest being over 7 months (September 20), while all untreated stumps vigorously sprouted (Table 2). By 84 days after application (May 16) all herbicide treated stumps were exhibiting signs of mortality (desiccation and separation of the bark from the wood, Figure 2), while untreated stumps averaged 10 adventitious stems per stump (Figure 3).

Brazilian pepper stumps ranged from 6cm to 30cm in diameter (average=13cm). Sprouting of Brazilian pepper stumps was not observed until 70 days after application (May 3) and then only from untreated stumps (Table 3). At this time, four of five untreated stumps had three to nine sprouts (Figure 4). All untreated stumps were sprouting 140 days after application (July 12). All herbicide treated stumps were exhibiting signs of mortality (Figure 5) 140 days after application, with only one sprout observed on one replication of a stump treated with 75% Rodeo. This sprout was stunted compared to sprouts on untreated stumps and displayed glyphosate symptoms (stunting and chlorosis). Herbicide treated stumps had not sprouted 210 days after application (September 20), other than the one sprout observed on the Rodeo treated stump, which still exhibited glyphosate symptoms.

In this study, where herbicide was applied only to the cut surface just inside the bark, the average volume of herbicide solution applied to melaleuca stumps was 1.5 ml/cm of stump diameter. In another study (unpublished data), where the herbicide solution was applied to the entire cut surface, 6.5ml/cm herbicide solution was applied. This suggests that substantial reduction in herbicide use can be achieved by applying herbicide solution only to the area of active vascular tissue. This will, however, depend on the total amount of active ingredient applied, which will depend on the concentration of active ingredient in the herbicide solution. Laroche et al. used only 1ml/inch (0.39 ml/cm) diameter breast height of undiluted Garlon 3A or Rodeo, which resulted in killing of 85% of treated stumps.

Table 2. Adventitious sprouting (% of 5 replications) of melaleuca stumps treated with herbicide February 20, 2001.

Herbicide	March 14	May 16	June 26	September 20
Touchdown 100%	0	0	0	0
Touchdown 50%	0	0	0	0
Roundup Pro 100%	0	0	0	0
Roundup Pro 50%	0	0	0	0
Rodeo 75%	0	0	0	0
Arsenal 25%	0	0	0	0
Untreated	0	100	100	100

Table 3. Adventitious sprouting (% of 5 replications) of Brazilian pepper tree stumps treated with herbicide February 21, 2001.

Herbicide	March 13	May 3	June 12	September 20
Touchdown 100%	0	0	0	0
Touchdown 50%	0	0	0	0
Roundup Pro 100%	0	0	0	0
Roundup Pro 50%	0	0	0	0
Rodeo 75%	0	0	20	20
Garlon 3A 50%	0	0	0	0
Untreated	0	80	100	100

The results of this study suggest that all three formulations of glyphosate are effective for controlling adventitious sprouting of melaleuca and Brazilian pepper tree stumps, and as effective as Arsenal for melaleuca and Garlon 3A for Brazilian pepper. These results are consistent with those of Laroche et al. for melaleuca. Pernas et al. reported that glyphosate alone does not provide the same level of control of melaleuca stumps as imazapyr and suggested mixing 10% Arsenal with 25% to 50 % Rodeo. Differences in the effectiveness of herbicides may be due to factors such as soil moisture, tree size, season of application, or the volume of herbicide solution applied. Additional studies are needed to evaluate factors that can influence the effectiveness of herbicides for controlling adventitious sprouting of the stumps of felled trees.

Figure 4. By 70 days after application, four of five untreated Brazilian pepper stumps had three to nine sprouts.

Figure 5. By 70 days after application, herbicide treated Brazilian pepper tree stumps were exhibiting signs of mortality.

Acknowledgements

Appreciation is expressed to Roger Clark, Lee County Parks and Recreation for his assistance in locating a site for treatment of melaleuca trees and to Dan Austin for assisting with access to the FAU Preserve. This study was funded in part by a grant from Syngenta Crop Protection, Inc. The herbicides used in this study were provided by Syngenta Inc., Monsanto Co., BASF Inc., and Dow AgroSciences. Published with the approval of the Florida Agricultural Experiment Station as Journal Series No. N-02179.

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