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To direct, fund, promote and communicate horticultural research, which increases the quality and value of ornamental plants, improves the productivity and profitability of the nursery and landscape industry, and protects and enhances the environment.

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Influence of Herbicides on Shipping Quality of Landscape Plants[1]

Joanna Hubbard, Ted Whitwell and John Kelly[2]
Department of Horticulture
Clemson University
Clemson, SC 29634

Abstract

Japanese barberry 'Crimson Pygmy', Crape myrtle 'Byers Hardy Lavender' and azalea 'Girard Scarlet' were treated with either Southern weedgrass control (pendimethalin) at 3.4 kg a.i./ha (3.3 a.i.lb/A) or Ornamental Herbicide-2 (oxyfluorfen + pendimethalin) at 3.4 kg a.i./ha (3.3 lb a.i./A) or 6.7 kg a.i./ha (6.6 lb a.i./A) prior to simulated shipping in an enclosed environment. No injury was observed on any plants as a result of herbicide treatments.

Index words: container production, nursery production, oryzalin, oxyfluorfen, pendimethalin, post harvest storage

Species used in this study: Japanese Barberry (*Berberis thunbergii* DC var. atropurpurea 'Crimson Pygmy'); Crape Myrtle (*Lagerstroemia indica* L. 'Byers Hardy Lavender'); Azalea (*Rhododendron* × 'Girard Scarlet')

Herbicides used in this study: Ornamental Herbicide-2 (oxyfluorfen + pendimethalin), 2-chloro-1-(3-ethoxy-4-nitrophenoxy)4-(trifluoromethyl)benzene + N-(1-ethylpropyl)-3,4-dimethyl-2,6-dinitrobenzeneamine; Southern weedgrass control (pendimethalin).

Significance to the Nursery Industry

Problems encountered with shipments of containerized landscape plants include symptoms such as flower or fruit drop, distorted leaves and yellowing or browning of the foliage. Such injury may cause serious economic losses as well as damaging customer-grower relationships. Cross-country shipments of nursery stock may require up to 4 days with plants being held in the dark. It is possible that the use of volatile herbicides during production is responsible for this injury. Therefore, it is important for growers to know which plants are most susceptible to injury and how long shipping should be delayed after herbicide application to avoid injury. Two commercially important herbicides, Southern weedgrass control and Ornamental Herbicide-2 were applied to three landscape plant species immediately prior to shipping. No injury symptoms due to herbicides were observed after removal from simulated shipping conditions.

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[2]Former Graduate Research Assistant and Professors, resp.

Introduction

Garden center retailers and landscapers have occasionally noticed unexplained problems with shipments of containerized landscape plants. Postharvest losses are often associated with high temperatures or ethylene in the shipping environment, however the symptoms reported by many nurserymen are more indicative of herbicide injury. These symptoms include flower or fruit drop, distorted foliage and foliar chlorosis and necrosis which can be economically damaging to the grower and/or retailer/landscape contractor. No research has been conducted on postharvest shipping and storage problems specifically involving herbicide-treated nursery stock. Many of the herbicides used by nurserymen are volatile including the dinitroanilines (3) and the diphenylethers (4) and their vapors have been shown to cause phytotoxicity (1, 5). Ornamental Herbicide-2 [(OH-2) oxyfluorfen (2%) + pendimethalin (1%)] and Southern weedgrass control (pendimethalin 2.7%) are preemergence herbicides commonly used in container nurseries for control of annual grass and small-seeded broadleaf weeds. Oxyfluorfen is a diphenylether and pendimethalin a dinitroaniline so both herbicides have potential for damaging nursery stock through volatilization during shipment. Potential injury from herbicide volatility is enhanced when the herbicides are used in enclosed structures and as a result these herbicides are not labeled for use in greenhouses or over-

wintering structures. Cross-country shipments of nursery stock may require up to 4 days or more with plants being sealed in the dark. Thus, it is possible that shipping tightly packed plants in a warm, sealed environment too soon after herbicide application may cause similar injury to that observed in greenhouses and overwintering structures (6). The objective of this study was to determine if OH-2 and Southern weedgrass control applications to selected landscape plants affects the shipping quality of container nursery stock.

Materials and Methods

Experiments were conducted during the summer of 1990 to evaluate injury caused by Southern weedgrass control and OH-2 as a result of shipping plants after herbicide application. Japanese barberry, crape myrtle and azalea liners which had been grown in 10 cm (4 in) pots were transplanted April 15, 1989 into containers 3.6 liter (#1) with commercial potting media. Plants were grown outside at 30 cm (12 in) spacing, fertilized with 17N-3P-8.3K (17-7-10) and irrigated overhead daily. In experiment 1, herbicide treatments were single applications of 3.4 kg a.i./ha (3.3 lb. a.i./A) OH-2 and Southern weedgrass control. Treatments were applied May 22 and August 30, 1990. In experiment 2, herbicides were applied at rates of 3.4 kg a.i./ha (100 lb/ha) and 6.7 kg a.i./ha (6.6 lb. a.i./ha) OH-2 on July 5, 1990. A randomized complete block design was used with four replications. Treatments were applied in pre-weighted aliquots using a hand-held shaker jar. Pots were irrigated with 3 cm (1.25 in) water within 90 minutes after treatment. Eighteen hours after herbicide application, plants were placed in the dark in simulated storage incubators for 3 days at 30°C (86°F). All replications of each herbicide treatment were confined to a single incubator to avoid cross contamination of vapor injury. In experiment 1, there was a large amount of free space in the incubators so when this experiment was repeated, media filled pots containing no plants were also treated with herbicide and placed in the incubators to reduce free space and increase the potential for volatile concentration. In experiment 2, each plant to be shipped was sealed individually in a plastic bag before being placed in the incubators to further minimize the amount of free space and concentrate herbicide volatiles. On removal from the incubators, plants were returned to original growing conditions and data collected daily for one month for leaf distortion, chlorosis, stunting, leaf drop and other irregularities.

Results and Discussion

There were no significant differences for any visual injury symptom one month after application. Plants grew with no observable damage regardless of herbicide, rate, shipping temperature or duration. Anticipated damage symptoms included leaf necrotic areas and possibly growth distortions as illustrated by Derr and Appleton (2) from direct applications of oxyfluorfen and oryzalin herbicides. Possible reasons for not observing injury include lower volatility than expected from the granular herbicides used in the study and also the relatively small amount used in each pot [0.23 g (0.008 oz)]. Treating large areas such as in winter protection houses provides areas around the containers as well as in containers for herbicide coverage and may lead to greater concentration of volatiles that may injure sensitive plants.

This study concluded that simulated shipping of these plants 18 hours after treatment with Southern weedgrass control or OH-2 was not deleterious and injury during shipping which has been attributed to herbicides may be due to other factors.

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