The Journal of Extension

Volume 45 | Number 1 Article 23

2-1-2007

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Recommended Citation

Fidanza, M. A., Clarke, B. B., Agnew, M. L., & Kaminski, J. E. (2007). Pesticide Application Research Demonstrated at a Field Day Event. *The Journal of Extension, 45*(1), Article 23.
https://tigerprints.clemson.edu/joe/vol45/iss1/23

February 2007 // Volume 45 // Number 1 // Ideas at Work // 1IAW7

Pesticide Application Research Demonstrated at a Field Day Event

Abstract
A field day event was used to demonstrate the value of proper pesticide application methods to turfgrass. A single fungicide was applied through four nozzle-types and four water-carrier volumes targeting a common foliar disease in turfgrass. Most golf course superintendents surveyed use the same nozzle-type for all pesticide applications, but this field study indicated better disease control from the fungicide applied through certain nozzle-types and water-carrier volumes. As a result, most superintendents intended to make improvements to their pesticide application programs, and many had a highly favorable view of including this type of research at future field day events.

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Introduction

Fungicides, herbicides, insecticides, and plant growth regulators are classes of plant protection products commonly applied to turfgrasses on golf courses and in many segments of the green industry (Beard, 2002; Leslie, 1994 ; McCarty, 2001; Turgeon, 2002). Integrated pest management research in turfgrass science has traditionally focused on product efficacy and performance on diseases, insect pests, and weeds (Watschke, Dernoeden, & Shetlar, 1995). Information is sparse, however, on the best or optimum methods for applying plant protection products to turf (Couch, 1995; Fidanza et al., 2004; Schumann & Wilkinson, 1992).

Proper selection of nozzle-type and water-carrier volume could potentially improve the efficacy of many plant protection productions (Hewitt, Valcore, & Bryant, 1996; Matthews, 2004). Therefore, the research objective of the field study reported here was to compare a single fungicide for effective disease control in turfgrass when applied through a combination of different nozzle-types and water-carrier volumes. The primary Extension or outreach objective of the field study, however, was to evaluate the effectiveness or value of the research as demonstrated to practitioners or golf course superintendents at a field day event.

Materials and Methods

Experiment

The field study was conducted on creeping bentgrass (Agrostis stolonifera L. 'Independence') at Rutgers University (Hort Farm II, New Brunswick, NJ). The site was maintained as a putting green and mowed regularly with a reel mower to a height of 0.156 inches, and clippings were removed. The treatments consisted of a contact fungicide (Daconil Ultrex 82.5WDG at 1.8 oz. per 1000 square feet [active ingredient = chlorothalonil], Syngenta Crop Protection, Greensboro, NC) applied through a combination of four nozzle-types (Air Induction TeeJet, Turbo TeeJet, XR TeeJet, and Delavan Raindrop) and four water-carrier volumes (0.5, 1, 2, and 4 gallons water per 1000 square feet).

All treatments were applied through a Gregson-Clark Spreader-Mate (www.GregsonClark.com) to duplicate actual pesticide application equipment and practices used by golf course superintendents. Individual plots measured 5 by 5 feet, and all 17 treatments (i.e., 16 nozzle-type/water-carrier treatments plus and untreated check) were arranged as a randomized complete-block design with three replications. All treatments were applied on 14-day intervals on June 30, July 13 and 28, 2005.

All plots were evaluated visually for dollar spot (Sclerotinia homoeocarpa F.T. Bennett) disease by counting the number of active infection centers per plot of dollar spot. Data were subjected to analysis of variance and treatment means were scrutinized by Fisher's protected least significant difference test at $P < 0.05$ (Mead, Curnow, & Hasted, 2003).

Survey

For the Rutgers Turf Field Day on August 4, 2005, all individual plots were labeled with specific treatment information, and a one-page handout was made available that provided a data summary showing better disease control from the fungicide applied through certain nozzle-types and water-carrier volumes. Also, the sprayer apparatus was available for visual inspection.

After observing the study site and reviewing the data, golf course superintendents in attendance were asked to complete an eight-question survey. The first three questions had a structured response, and responses for the remaining five questions were based on a seven-point modified Likert-scale, where lowest rating = 1, average rating = 4, and highest rating = 7 (Likert, 1967).

Results and Discussion

Forty-two surveys were collected, and responses were summarized. The first three questions provided background information on the attitudes of golf course superintendents toward the application of plant protection products (Table 1). The majority of respondents, or 72%, replace sprayer nozzles once per year. Informal conversations with these superintendents revealed that new nozzles are typically installed during routine winter or early spring maintenance of turf equipment.

Table 1.
Survey Results of Golf Course Superintendents Attending the Fungicide Nozzle-Type and Water Carrier Volume Research Site at the 2005 Rutgers Turfgrass Research Field Day, New Brunswick, NJ, Part 1

Percent[z]	Response
With the application of plant protection products through a sprayer, how often do you replace or change the nozzles?	
5	Never.
72	Once a year.
18	Twice per year.
5	Three or more times per year.
0	Not sure.
With the application of plant protection products through a sprayer, do you . . .	
68	Use the same nozzle for everything.

32	Use different nozzles or nozzle-type depending on products applied.
0	Not sure.
With the application of plant protection products through a sprayer, do you . . .	
41	Use the water carrier volume for everything.
59	Use different water carrier volume depending on products applied.
0	Not sure.
[z]Mean of responses from golf course superintendents expressed as a percentage (n = 42).	

Those who replace nozzles more than once per year attribute that practice specifically to wear and damage of the nozzle orifice, which can impede proper spray distribution and coverage (Couch, 1995; Hewitt, Valcore, & Bryant, 1996). It is unknown from this survey, however, how many routinely check the nozzles and spray patterns regularly throughout the year. Although 68% use the same nozzle-type for all pesticide applications, 59% use different water carrier volumes as determined by which plant protection products are being applied (Table 1).

The remaining five questions pertained to attitudes toward pesticide application research displayed and actively demonstrated at the Rutgers Turf Field Day (Table 2). The majority, or 81%, had a highly favorable (i.e., ≥ 6 rating) attitude toward the effectiveness of this type of research demonstrated at the field day event. Most, or 78%, indicated the research had a highly favorable impact toward making possible improvements to their current pesticide application methods. Although 82% had a highly favorable view on the importance of this research demonstrated during the field day, slightly less, or 72%, were highly in favor of funding this kind of research. Last, 82% responded with a highly favorable attitude toward including this type of research at future field day events.

Table 2.
Survey Results of Golf Course Superintendents Attending the Fungicide Nozzle-Type and Water Carrier Volume Research Site at the 2005 Rutgers Turfgrass Research Field Day, New Brunswick, NJ, Part 2

Respond to the Following Questions:	**Lowest Rating 1**	**2**	**3**	**Average Rating 4**	**5**	**6**	**Highest Rating 7**
	--- %[z] ---						
Rank the effectiveness of this type of research to help demonstrate proper pesticide application theory, methods, and techniques.	0	0	5	5	9	45	36
Rank the overall impact of this research in terms of making changes or improvements to your pesticide application procedures, methods, and techniques.	0	0	0	8	14	23	55
Rank the overall importance of this type of research for your segment of the green industry.	0	0	0	9	9	27	55
Rank the overall importance of providing funding and support this type of research for your segment of the green industry.	0	0	5	5	18	41	31
Rank the overall importance of including this type of research at future field day events.	0	0	0	5	13	32	50
[z]Mean of responses were based on a 7-point modified Likert-type scale where							

lowest rating = 1, average rating = 4, and highest rating = 7.

Summary

In conclusion, most practitioners or golf course superintendents in attendance at the Rutgers Turf Field Day had a highly favorable view of the active demonstration of pesticide application research. The majority of superintendents surveyed had indicated they use the same nozzle-type for all pesticide applications; however, results from the field study indicated better disease control from the fungicide applied through certain nozzle-types and certain water-carrier volumes. Although most superintendents indicated that the research would have a highly favorable influence on improving their pesticide application methods, a follow-up survey would be needed to monitor this positive effect over time.

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