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Green Circle Growers, Inc.
Oberlin, Ohio

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PREFACE

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ACKNOWLEDGMENTS AND AVAILABILITY OF REPORT

This report was prepared by Steven W. Lenhart, C.I.H., of the Hazard Evaluations and Technical Assistance Branch, Division of Surveillance, Hazard Evaluations and Field Studies (DSHEFS) and by Michael J. Colligan, Ph.D. and Raymond C. Sinclair of the Education and Information Division (EID). Desktop publishing was done by Caren B. Day.

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SUMMARY

Employee training methods at Green Circle Growers, Inc. in Oberlin, Ohio, were evaluated in response to a health hazard evaluation (HHE) request from the company's human resources manager. Green Circle Growers is a commercial greenhouse company that produces a variety of floriculture and nursery products. At the time of this HHE, the company owned and operated six facilities with 3,080,000 square feet of growing space. Approximately 500 employees made up the full-time, permanent workforce. Seasonal demands in the spring and fall required employment of an additional 150 temporary seasonal employees. The two aspects of employee training evaluated at Green Circle Growers were pesticide safety and hazard communication.

To evaluate the quality of the training program at Green Circle Growers, Inc., a NIOSH researcher videotaped three training sessions. Two training sessions covered pesticide safety, which were presented by two different trainers at two different work sites. The third training session videotaped covered hazard communication and was presented at a third work site by a third trainer. All three trainers were certified applicators of restricted-use pesticides, and the hazard communication trainer was the company's human resources manager. A four-part rating scale was used to objectively evaluate the training sessions. The first three parts of the scale (trainer characteristics, facility characteristics, and presentation characteristics) measured basic attributes of successful training and were identical for all videotapes. The fourth part of the rating scale was content specific and measured how effectively a training session met training objectives detailed in either the Environmental Protection Agency's (EPA) worker protection standard or the Occupational Safety and Health Administration's (OSHA) hazard communication standard.

The results of objective assessments of three training sessions identified deficiencies in Green Circle Grower's employee training program. Recommendations concerning selection and training of trainers, characteristics of good training rooms, presentation of company safety and health policies, and visual aids are given for improving the quality of the training program. Although not required by either the EPA's worker protection standard or OSHA's hazard communication standard, a recommendation is also made that some form of post-training evaluation be performed to ensure that trainees are learning intended training information.

Keywords: SIC 0181 (Ornamental Floriculture and Nursery Products), greenhouses, hazard communication, pesticide safety, training, worker protection standard.

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INTRODUCTION

Researchers from the National Institute for Occupational Safety and Health (NIOSH) evaluated training methods used at Green Circle Growers, Inc. in Oberlin, Ohio, in response to a health hazard evaluation (HHE) request from the company's human resources manager. Green Circle Growers is a large commercial greenhouse company that produces a variety of floriculture and nursery products. Production consists of 45% ornamental bedding plants, 25% flowering potted plants, 20% potted foliage, and 10% propagation material.

Green Circle Growers began operations in 1968 with a few acres of Dutch and bench-type greenhouses for growing bedding plants. Initially, a growing season lasted only five months, from January to Memorial Day. With the addition of various plant varieties, growing seasons now require year-round operation. At the time of this HHE, the company owned and operated six facilities with 3,080,000 square feet of growing space. This production square footage under permanent, environmentally controlled greenhouses ranked Green Circle Growers as the sixth largest grower in the United States for the 1995 production year.[1] Slightly more than half of the production greenhouses at Green Circle Growers were glass structures, and the remainder were gutter-connected double-polyethylene structures. Approximately 500 employees made up the full-time, permanent workforce. Seasonal demands in the spring and fall required employment of an additional 150 temporary seasonal employees from the local job market.

BACKGROUND

The two aspects of employee training evaluated at Green Circle Growers were pesticide safety and hazard communication. On August 21, 1992, the Environmental Protection Agency (EPA) published in the *Federal Register* amendments to 40 CFR 156.10 - Labeling Requirements for Pesticides and Devices to incorporate by reference the Final Rule for Part 170 - Worker Protection Standard. The EPA's Worker Protection Standard (Part 170) was "designed to reduce the risks of illness and injury resulting from occupational exposure to pesticides used in the production of agricultural plants on farms or in nurseries, greenhouses, and forests and also from the accidental exposure of workers and other persons to such pesticides."[2] Part 170 became effective January 1, 1995.

Section 170.130 of the EPA's worker protection standard requires an agricultural employer to train those workers who are potentially at risk for exposure to pesticides in pesticide safety and present such information "to workers either orally from written materials or audiovisually." The person conducting the training is required to be a certified applicator of restricted-use pesticides, a trainer of certified applicators or handlers, or a graduate of an approved pesticide train-the-trainer program. At a minimum, training materials are required by the EPA to convey the following information:

- Where and in what form pesticides may be encountered during work activities.
- Hazards of pesticides resulting from toxicity and exposure, including acute and chronic effects, delayed effects, and sensitization.
- Routes through which pesticides can enter the body.
- Signs and symptoms of common types of pesticide poisoning.
- Emergency first aid for pesticide injuries or poisonings.
- How to obtain emergency medical care.
- Routine and emergency decontamination procedures, including emergency eyeflushing techniques.
- Hazards from chemigation and drift.

- Hazards from pesticide residues on clothing.

- Warnings about taking pesticides or pesticide containers home.

- Requirements of this subpart designed to reduce the risks of illness or injury resulting from workers' occupational exposure to pesticides including application and entry restrictions, the design of the warning sign, posting of warning signs, oral warnings, the availability of specific information about applications, and the protection against retaliatory acts.

Hazard communication training is also given at Green Circle Growers. Section 1910.1200 (h) of the Occupational Safety and Health Administration's (OSHA) hazard communication standard requires that employers "provide employees with information and training on hazardous chemicals in their work area at the time of their initial assignment, and whenever a new hazard is introduced into their work area."[3] Non-manufacturing employers were required to be in compliance with OSHA's hazard communication standard by May 23, 1988. At a minimum, hazard communication training is required by OSHA to convey the following information to employees:

- Any operations in their work area where hazardous chemicals are present.

- The location and availability of the written hazard communication program, including the required list(s) of hazardous chemicals, and material safety data sheets required by this section.

- Methods and observations that may be used to detect the presence or release of a hazardous chemical in the work area (such as monitoring conducted by the employer, continuous monitoring devices, visual appearance or odor of hazardous chemicals when being released, etc.).

- The physical and health hazards of the chemicals in the work area.

- The measures employees can take to protect themselves from these hazards, including specific procedures the employer has implemented to protect employees from exposure to hazardous chemicals, such as appropriate work practices, emergency procedures, and personal protective equipment to be used.

- The details of the hazard communication program developed by the employer, including an explanation of the labeling system and the material safety data sheet, and how employees can obtain and use the appropriate hazard information.

METHODS

To evaluate the quality of the training program at Green Circle Growers, Inc., a NIOSH researcher videotaped three training sessions. Two training sessions covered pesticide safety, which were presented by two different trainers at two different work sites. These two training sessions are designated Tape 1 and Tape 3 in this report. The third training session videotaped covered hazard communication and was presented at a third work site by a third trainer. This training session is designated Tape 2 in this report.

To objectively assess the quality of the three training sessions, a rating scale consisting of four domains or parts was developed. (A copy of the rating scale is included in this report as Appendix A.) The first three domains of the rating scale were identical for all videotapes and measured basic attributes of successful training. The three domains were trainer characteristics (e.g., perceived trainer expertise and enthusiasm), facility characteristics (e.g., quietness and comfort of the training area), and presentation characteristics (e.g., organization of the training and use of examples). The fourth part of the rating scale was content specific and measured how effectively a training session met the training objectives detailed in either the EPA's worker protection standard or OSHA's hazard communication standard. Thus, for

Tapes 1 and 3 (training sessions on pesticide safety) individual items addressed the extent to which a training session described the signs and symptoms of pesticide poisoning, routes of entry of pesticides, first aid procedures, proper work practices, and employee rights under the law. For Tape 2 concerning OSHA's hazard communication standard, items dealing with the extent to which the training explained how to interpret material safety data sheets, how to locate them within the facility, methods of chemical detection, and chemical protection techniques were addressed. The rating scales were constructed using a Likert-type format with five response options (i.e., very much disagree, somewhat disagree, neutral, somewhat agree, and very much agree) such that the higher the numerical score, the more positive the rating.[4]

After development of the rating scales, a convenience sample of individuals was selected to review the three videotaped training sessions and evaluate them using the appropriate four rating domains. The rating panel consisted of five members of the Education and Information Division of NIOSH with experience in the design and evaluation of training programs but with no experience in greenhouse operations or pesticide applications. Each rater was asked to carefully read the rating scales prior to viewing the videotapes to be familiar with the evaluation criteria. A videotape was then viewed, and each rater immediately filled out a rating scale. In addition, reviewers were encouraged to write any qualitative comments or suggestions they felt appropriate on the rating scale. A rest period of approximately five minutes separated successive viewings. Videotapes were viewed in random sequence by different raters to avoid any bias associated with order effects (e.g., progressive boredom or fatigue could have an adverse effect on the ratings of a tape viewed later in the sequence).

RESULTS AND DISCUSSION

One of the pesticide safety training sessions (Tape 1) and the hazard communication training session (Tape 2) were videotaped on October 27, 1994. The other pesticide safety training session (Tape 3) was videotaped on January 12, 1995. The EPA's 43-page guide entitled *Protect Yourself from Pesticides—Guide for Agricultural Workers* was used by both pesticide safety trainers.[5] The hazard communication trainer used the booklet entitled *Green Circle Growers, Inc. Hazard Communication Program* as a training tool. (A copy of the booklet is included in this report as Appendix B.)

All three trainers were certified applicators of restricted-use pesticides, and the hazard communication trainer was the company's human resources manager. The training site for Tape 1 was the break area at Green Circle Grower's plant 1. This pesticide safety training session lasted 22 minutes and was attended by 12 greenhouse workers. The trainer gave a 5-minute introduction before reading the EPA's guide, which took 15 minutes, and the trainer concluded with a 2-minute summary. The hazard communication training (Tape 2) was conducted in the personnel department's conference room at Green Circle Grower's plant 6. This training session lasted 23 minutes and was attended by two new employees of the personnel department. The second pesticide training session was conducted in the upstairs office of Green Circle Grower's plant 4, lasted 42 minutes, and was attended by 10 greenhouse workers. This trainer gave a 10-minute introduction, which consisted primarily of defining terms used in the EPA's guide, before reading the EPA's guide, which took 30 minutes, and the trainer concluded with a 2-minute summary.

Table 1 presents the average ratings and standard deviations for the instructor, facilities, and presentation characteristics of all three training sessions. This evaluation was not formal research in

which the three training sessions were statistically compared to test a hypothesis or to rank order their relative effectiveness. Rather, the purpose of the following information is to provide the management of Green Circle Growers with an objective assessment of the three training sessions videotaped at their facility and, where appropriate, recommend measures that can be taken for improving the company's training program.

A disparity in the perceived styles of the trainers is suggested by the ratings shown in Table 1. For all dimensions, the trainer in Tape 1 received consistently lower ratings than the trainers in Tapes 2 and 3. Also, both written and oral comments by the reviewers indicated that the individual in Tape 1 appeared to be uncomfortable in the role of trainer and relied almost exclusively on reading the EPA's guide as a means of conveying information. This individual's appearance of uneasiness may have been partly associated with knowing that the training session was being videotaped and would be evaluated, but the extent to which this affected the trainer's performance is unknown. In contrast, trainers in Tapes 2 and 3 were perceived as more enthusiastic, knowledgeable, prepared, approachable, and confident. These trainers' characteristics are important because they cannot only influence a trainee's retention of information, but also serve as an indication of a company's overall commitment to safety training and safety program management. For example, a trainer who appears to be unprepared or is not enthusiastic about the training subject may convey to trainees that a company is merely going through the motions of advocating workplace safety.

Concerning the training facilities, the location used for the hazard communication training (Tape 2) was clearly superior to the locations used for pesticide safety training. The location depicted in Tape 1 was particularly inappropriate. The trainer was interrupted five times by pages on the public address system, the lighting appeared to be poor, some of the trainees were seated at a table with their backs to the trainer so that they had to twist around to maintain visual contact, and the general environment posed a barrier to trainee and trainer interactions. In addition to making teaching more difficult for the trainer and learning more difficult for the trainees, presenting a training course under adverse conditions could also be perceived by trainees as merely a pro forma exercise on the part of the company rather than a sincere effort to encourage workplace safety.

Concerning presentation characteristics, the trainer in Tape 1 was again rated lower than the other two trainers. All three trainers did a good job of speaking in nontechnical terms such that the attendees could comprehend the material. All three trainers also used, in varying degrees, specific examples that connected the training material to actual work conditions in the facility. For example, the trainer in Tape 3 talked about situations when children of employees entered greenhouse sections potentially contaminated with pesticides at the end of a work day to meet a parent. The trainer warned trainees that for safety reasons their children were not allowed in greenhouse sections and that they should wait outside for their mother or father to meet them. The trainer also described greenhouse workers who rubbed their eyes with their fingers potentially contaminated with pesticides or soil rather than flushing their eyes at an eyewash station. Specific examples such as these help clarify important information and increase the relevance of the training material. The trainer in Tape 2 was successful in stimulating questions and comments from the two trainees undergoing hazard communication training by using personal anecdotes and greenhouse-specific examples. In part, this may have been due to the small size of the class which helped promote a relaxed, informal atmosphere. As indicated in the reviewers' ratings, the trainer's enthusiastic and approachable style undoubtedly contributed to this response.

Two areas that the reviewers identified as needing improvement were the use of visual aids and more frequent review and summary of the material previously covered. For example, the trainer in Tape 3 provided trainees with visual guides by showing them shower kits, disposable protective clothing, warning signs, and similar materials. The trainers in Tapes 1 and 2 used fewer props, and none

of the trainers used slides, videos, or other materials to embellish their lectures. These can be effective learning tools, by supplementing lecture material, adding additional stimulation to the presentation, and providing the trainees with multi-channel (i.e., oral and visual) presentations of redundant materials. For example, it is better to show a picture or slide of an eyewash station or emergency shower than to merely describe one, and better yet to take trainees to a specific location within a greenhouse where one is located and demonstrate its operation. All three training sessions would have benefited from better use of class room demonstrations and active participation by trainees in various exercises (e.g., looking up and reporting information from a material safety data sheet, operating an eyewash, properly removing protective gloves and washing their hands).

The ratings for the content specific items for the two pesticide safety training sessions (Tapes 1 and 3) are presented in Table 2. In both cases, the trainers read through the EPA's guide page by page to ensure that all the information in the guide was covered during the training session. Ostensibly then, one might not expect much difference between the ratings of these two training sessions. However, examination of Table 2 indicates that for every objective measured, the trainer of Tape 3 received a higher rating than the trainer of Tape 1. Thus, two trainers presenting basically the same material in the same order were perceived quite differently in terms of their ability to meet the training requirements of the EPA's worker protection standard. This finding is a reminder that, in reality, training is an interactive process. Merely presenting information to an intended target group does not guarantee that the information will be attended to, assimilated, and retained. Thus, given the noisy and disruptive training environment shown on Tape 1, it is quite possible that trainees were not able to follow, or even hear, the basic training information. It is also possible that the trainer's style may have caused boredom and disinterest in the trainees such that even though the material was presented, it was directed at unreceptive listeners.

Table 3 presents the reviewers' ratings for the content specific information for the trainer of Tape 2. The reviewers felt that this trainer generally did a good job of presenting the areas sampled in the rating scale. As was true for the trainers of Tapes 1 and 3, the trainer in Tape 2 also referred to the relevant standard during the presentation to ensure that all mandated topics were discussed. However, unlike the trainer in Tape 1, the trainer in Tape 2 did not just read the standard to trainees, but rather used it as a general organizational aid when going through the material. This seemed to result in a much smoother presentation and allowed more flexibility for questions and special emphasis on those topics meriting more discussion. However, it should be noted that these ratings merely tell us that the trainer was perceived as doing a fairly good job of presenting these topics. Whether the trainees actually retained the information presented to them was not evaluated as a part of this study but could have been determined by using some form of post-training evaluation.

Although the trainers were not specifically rated for their presentations of Green Circle Growers' mandatory policies associated with safety and health issues, observation of the tapes indicated that company policies were frequently presented in vague terms. For example, Green Circle Growers requires all greenhouse workers who handle plants or touch any other surfaces potentially contaminated with pesticide residues to wear disposable protective gloves. The company provided two types of disposable gloves and thin cotton glove liners at all six of its plants. While the company's glove policy should have been presented in a very direct manner by all three trainers, only the trainer of Tape 2 clearly stated that company policy required that greenhouse workers must wear gloves. The other trainers presented this company policy in terms that could have been interpreted as though the policy was optional rather than mandatory. The trainer of Tape 1 said that greenhouse workers were advised to wear gloves and twice said that workers were encouraged to wear gloves. The trainer of Tape 3 said during the training session, "We like to have employees wear gloves in the workplace," "We want

employees to wear the gloves," "Always have gloves on in the greenhouse," and "We stress the use of gloves."

RECOMMENDATIONS

"Effective training involves much more than passively exposing individuals to a set of scripted materials or prepackaged programs. Assessing training needs, specifying training objectives, developing a curriculum compatible with worker demographics, selecting a delivery technology, administering and delivering the training, evaluating the training, and assuring that the training transfers to the workforce on a sustaining basis are critical aspects of a successful training program."[6] The following recommendations are provided for improving the quality of training at Green Circle Growers. Acceptance of these recommendations should help strengthen the training program at Green Circle Growers and result in better informed employees. However, the recommendations will not guarantee greater worker adherence to the work practices advocated in training sessions; this is a function of the company's safety and health management program.

- Green Circle Growers should provide their trainers with public speaking and train-the-trainer type courses, develop an in-house mentoring program in which trainers critique each other's presentations and work collectively to improve their styles, and actively recruit and select those individuals within the company who are most suited to function as trainers.

- The current procedure for selecting and preparing trainers should be reviewed. Effectively conveying information to another person or a group of people is an important responsibility. If a training function is to be given more than cursory emphasis within a company, then trainers should be given the guidance and preparation necessary to do their jobs effectively. This involves setting time aside for trainers to critically review their current skills and to work collaboratively to sharpen each others presentations. Basically, this is the same approach that is taken to review any other managerial function within an organization.

- Training sessions should be given in rooms free of distractions, with adequate space for seating and work spaces that allow trainees to take notes and layout reading material. A trainer should also face the trainees so that demonstrations, audio visuals (e.g., flip charts and slides), and examples (e.g., protective gloves, respirators, and face shields) can be clearly and comfortably seen by the trainees.

- Trainers should clearly state the safety and health policies of Green Circle Growers in terms of expectations for each employee. "Employers can reduce their vulnerability to successful litigation if their organization's policy on the use of protection is at least as stringent as community standards, and is clearly stated in writing, effectively presented, and consistently enforced. Supervisors should notice and acknowledge safe behavior when they see it. Conversely, they should not be reluctant to criticize unsafe behavior and to provide meaningful sanctions for repeated or extremely hazardous behavior."[7]

- Trainers should consider new ways to present training material, remembering that adults learn best through active involvement and participation. The use of slides, pictures, actual products and materials, class room exercises, simulations, and practice presentations are all improvements over a pure lecture format. As new approaches are tried, trainees can be asked about their reaction to the different training strategies. This can be accomplished without adding to the length of a training session, and may in fact shorten the perceived burden on employees by making training more interesting and interactive.

- Although not required by either the EPA's worker protection standard or OSHA's hazard

communication standard, it is strongly recommended that some form of post-training evaluation be performed to ensure that trainees are in fact learning intended training information. An OSHA booklet on voluntary training guidelines is available and includes a section on the evaluation of a training program's effectiveness.[8]

The purpose of post-training evaluations is not to test the trainee, but rather to evaluate the efficacy of a training course in getting across the necessary information. For this reason, brief informational exams with pertinent questions (e.g., where are material safety data sheets kept?, what should you do if a co-worker becomes ill?) could be administered, returned anonymously, and scored. Test items should address those elements of a training program which are most important in terms of hazard severity or frequency, and the test duration should be between 5 and 10 minutes. Tests could be scored in class, and any items answered incorrectly could be reviewed in class and corrected with the appropriate information. Those items frequently (among classes) or consistently (within a class) answered incorrectly suggest a problem that may require special attention in future training sessions. By applying the same care in monitoring and evaluating training on a continuing basis that one does in any process control and quality assurance program, one can be reasonably assured that workers are learning the necessary information that they need to avoid workplace hazards.

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TABLE 1

Average rating (Standard Deviation) for instructor, facility, and presentation characteristics. [Response options ranged from 1 (very much disagree) to 5 (very much agree).]

Instructor Characteristics	Tape 1 (EPA WPS)	Tape 2 (OSHA HCS)	Tape 3 (EPA WPS)
Knowledgeable	2.4 (1.5)	4.2 (0.8)	4.4 (0.9)
Prepared	1.8 (1.8)	4.2 (1.1)	4.0 (1.4)
Enthusiastic	1.4 (0.9)	4.0 (1.0)	3.4 (0.9)
Approachable	2.0 (0.7)	4.4 (0.9)	4.6 (0.5)
Confident	2.2 (0.9)	4.6 (0.5)	4.2 (0.8)

Facility Characteristics	Tape 1 (EPA WPS)	Tape 2 (OSHA HCS)	Tape 3 (EPA WPS)
Quiet	1.0 (0.0)	4.6 (0.9)	2.8 (1.1)
Comfortable	1.4 (0.5)	4.0 (1.0)	3.4 (0.5)
Illuminated	2.6 (0.5)	4.4 (0.9)	3.2 (0.8)
Conducive to Learning	1.2 (0.4)	4.2 (0.8)	3.2 (0.8)

Presentation Characteristics	Tape 1 (EPA WPS)	Tape 2 (OSHA HCS)	Tape 3 (EPA WPS)
Organized	2.6 (1.3)	4.6 (0.9)	4.2 (1.3)
Effective Use of Visual Aids	1.2 (0.4)	3.2 (1.5)	3.6 (1.7)
Stimulated Discussion	1.2 (0.4)	4.4 (0.9)	3.0 (0.7)
Used Specific Examples	3.2 (1.3)	4.6 (0.9)	4.4 (0.9)
Non-Technical Terms	3.8 (0.9)	4.4 (0.9)	4.8 (0.4)
Reviewed Materials	1.8 (1.3)	3.2 (0.8)	3.6 (1.5)

WPS: worker protection standard
HCS: hazard communication standard

TABLE 2

Average rating (standard deviation) for content-specific area of videotapes 1 and 3 (pesticide safety).
[Response options ranged from 1 (very much disagree) to 5 (very much agree).]

Trainees adequately informed about:	Tape 1	Tape 3
Signs and Symptoms	2.8 (1.6)	4.4 (0.9)
Routes of Entry	2.8 (1.6)	3.6 (1.1)
Proper Clothing	2.8 (1.6)	4.2 (0.9)
Respirators	2.0 (1.7)	3.0 (1.1)
Obtaining Medical Help	2.2 (1.3)	4.2 (1.3)
First Aid	2.4 (1.5)	4.0 (1.2)
Washing before Eating	2.8 (1.3)	4.0 (0.8)
Washing before Drinking	2.8 (1.3)	4.0 (1.2)
Washing before Using Toilet	2.8 (1.3)	3.8 (1.2)
Identifying Hazardous Areas	2.8 (1.6)	4.2 (1.2)
Employee Rights	1.2 (0.4)	3.8 (1.1)

TABLE 3

Average rating (standard deviation) for content-specific area of videoape 2 (hazard communication).
[Response options ranged from 1 (very much disagree) to 5 (very much agree).]

Hazardous Chemicals	4.2 (0.9)
Interpretation of MSDS	3.4 (1.8)
Detection of Hazardous Chemicals	3.0 (1.4)
Protection Against Hazardous Chemicals	4.2 (1.1)
Locations of MSDS	4.6 (0.5)

MSDS: material safety data sheets

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