

A Survey of Chemical Resistant Glove Use Practices and Preferences of Pesticide Applicators

Carol Black, Extension Specialist, Washington State University, Pullman, WA, ramsay@wsu.edu

Anugrah Shaw, Professor, University of Maryland Eastern Shore, Princess Anne, MD, ashaw@umes.edu

Courtney Harned, Lecturer, University of Maryland Eastern Shore, Princess Anne, MD, cpharned@umes.edu

Charlotte W. Coffman, Senior Extension Associate, Cornell University, Ithaca, NY, cwc4@cornell.edu

Abstract

During pesticide recertification training meetings in 2012 and 2013 in Washington, Michigan, Iowa, and New York, audience response systems (clickers) were used to gather pesticide applicators' input on their use of and preferences for chemical resistant gloves. Nitrile, reusable or disposable, was the most commonly selected glove material. Thirty-one percent of applicators selected a disposable glove variety when identifying the glove material they wear most (nitrile disposable, 28%; neoprene disposable, 3%). Many applicators indicated that they wear the same glove for multiple products (73%) or tasks (66%). Only 27% of respondents identified following label requirements as the primary reason for choosing gloves. The data indicate that outreach resources need to be developed for applicators and those who sell gloves to applicators.

Keywords: chemical resistant gloves, nitrile, pesticide applicators, label requirements

Introduction

Chemical resistant gloves are commonly used personal protective equipment (PPE) worn by pesticide applicators, mixers, and loaders. In the United States, the Environmental Protection Agency (EPA) Chemical Resistance Category Selection Chart for Gloves (EPA, 2013) is used to determine the type of gloves to be listed on pesticide labels and then worn by applicators, mixers, and loaders who handle the product. The chart was published to support the federal Worker Protection Standard (40 CFR Part 170) and pesticide labeling (EPA, 2013). The chart is a resistance matrix (high, moderate, slight, and none) based on eight glove materials and eight solvent classes: dry and water-based formulations (A) or other solvent types or percentages (B through H). The glove chart notes a minimum of 14 mils thickness for all gloves (butyl rubber, nitrile rubber, neoprene rubber, natural rubber, polyvinyl chloride [PVC], and Viton[®]) except barrier laminate and polyethylene. Agricultural product labels are required to reference the different glove materials on labels, either by specifying the glove type by name or solvent class by code (A through H). Most labels require a waterproof glove type (EPA, 2013; Shaw and Harned, 2013).

A collaborative project was initiated to determine licensed applicators' practices and preferences regarding gloves. This paper focuses on applicator input, which was obtained using an audience response system during pesticide applicator training sessions in four states.

Materials and Methods

A set of questions to use with an audience response system (TurningPoint[®], hereafter referred to as “clickers”) was developed to gather information on user practices and preferences as well as other issues related to gloves. The clickers were used during pesticide applicator training sessions. The set of questions was pretested by Washington State University and Michigan State University during training sessions in December 2012 and January 2013. The data collected were analyzed, and the final set of questions was revised based on pretesting.

The revised set of questions was administered using clickers as part of applicator training in Washington, Michigan, Iowa, and New York. Agricultural, urban, and other applicators participated. Collection sites were chosen for convenience and geographic location. A clicker system allows anonymous answers from applicators. Respondents were trained to use the system just before the set of questions was administered. The questions were integrated into the pesticide applicator training discussion on PPE, thus serving as both an education vehicle and a data collection method. For example, the lecturer/administrator showed photos of gloves made from different types of material before asking the question about glove materials. One of the limitations of the study was that the data could not be divided into subgroups for further analysis. The questionnaire was individualized for the four states. Therefore, not every question was asked of each group. In a few cases, the options were modified.

The questions focused on the following topics:

- Frequency with which applicators handle pesticides.
- Primary sectors of work.
- Use of gloves for pesticide application.
- Glove material worn most often.
- Glove use with different products.
- Glove use for different tasks.
- Most important factor in glove selection.
- Primary reason for selecting glove material.
- Primary place where gloves are purchased

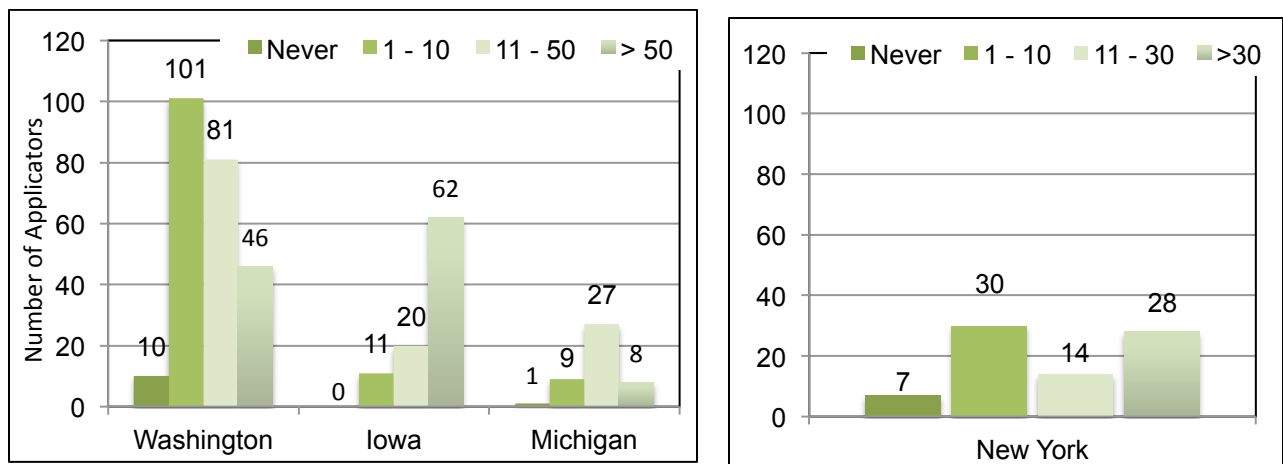
The data from the four states were analyzed, keeping in mind the differences in responses as a result of individualized surveys. The response rate for each question varied since not all respondents answered all questions, a result of maintaining the flow of the parent presentation that accompanied the questions. The data collected using the clicker system were sent to the University of Maryland Eastern Shore for compilation and analysis.

Results and Discussion

Frequency of Use

Initially, participants were asked how many times they handle pesticide products in a year. Figure 1 shows the differences in the number of handling activities that occur per year per respondent. New York participants answered the question using the range 11 to 30 instead of 11 to 50, the range used by Washington, Michigan, and Iowa applicators. Out of 455 participants from all states, 4% do not apply pesticides. Thirty-three percent stated they handle pesticides between one and 10 times per year. Among the 79 New York applicators, 18% handle pesticides between 11 and 30 times per year. Among the 376 Washington, Michigan, and Iowa respondents, 34% handle pesticides between 11 and 50 times per year. For those handling pesticides more than 30 or 50 times a year, responses were 35% for New York and 31% for the other states, respectively.

Figure 1. Number of times participants handle pesticides per year (n=455).



Primary Sectors of Work

New York, Michigan, and Washington applicators identified their primary sectors of work since they included more than the agricultural sector (n=222). Options varied as the set of questions was modified to accommodate the prevalent sectors in the respective state where the training was being delivered. For Washington and Michigan participants, the sectors included agriculture, ornamental and turf, residential and industrial, right-of-way, and other. Highest responses included agriculture (34%), residential/industrial/public health (26%), right-of-way (14%), forestry (14%), and ornamental and turf (10%). New York participants also had the options of forestry, greenhouse or nursery, aquatics, and stored commodities. Sixty-one percent of New York applicators worked in the agricultural sector, followed by ornamental and turf (10%). Iowa respondents did not answer this question (asking them to identify their primary sectors of work).

Use of Gloves

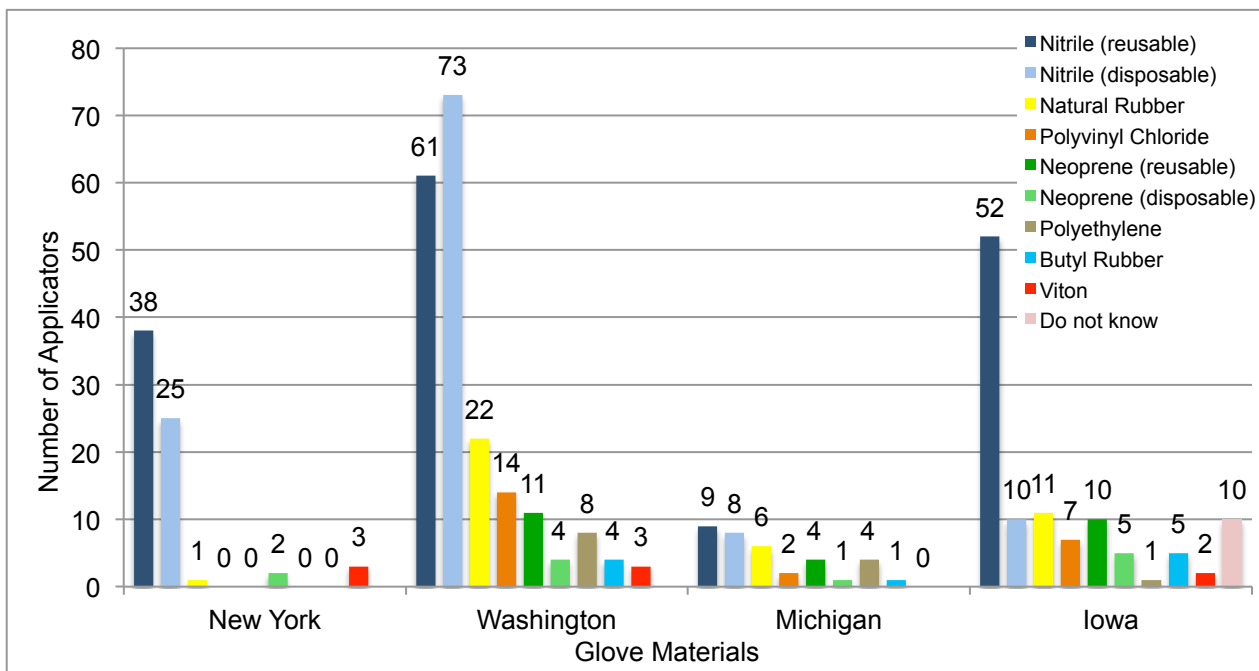
Most agricultural pesticide labels require gloves for handling or applying pesticides. However, some nonagricultural labels have no direct instructions for wearing gloves (Shaw and Harned, 2013). Therefore, applicators were asked whether they wear gloves when handling pesticide products. A large majority of participants (92%) said yes. Only 8% answered that they rarely, if ever, wear gloves when handling pesticides.

Glove Material

The participants who reported wearing gloves then identified the glove material they wear most often (Figure 2). A *reusable* nitrile glove (38%) was the most common type, followed closely by a *disposable* nitrile glove (28%). This meant 66% of respondents most often wear nitrile gloves. The next most often used material was natural rubber (9.5%), followed by reusable neoprene (6%) and polyvinyl chloride (5.5%). Polyethylene, often used for food handling, was chosen by 3% of the applicators and is listed as suitable in EPA’s Chemical Resistance Category Selection Chart for Gloves. A few participants also identified disposable neoprene (3%), butyl rubber (2.4%), and Viton® (1.9%) as the most often used glove. (Barrier laminate was not included as an option due to an author error.)

The survey was revised in Iowa to include the option “Do not know.” Interestingly, 10 of the 113 Iowa respondents (9%) selected “Do not know,” indicating a surprising level of uncertainty on the part of applicators. When the survey was designed, it was assumed that applicators know the type of glove they use most often. It is recommended that “Do not know” be included as an option in future surveys to better understand whether applicators recognize the glove material/s they are wearing.

Figure 2. Glove materials most often worn by applicators (n=417).



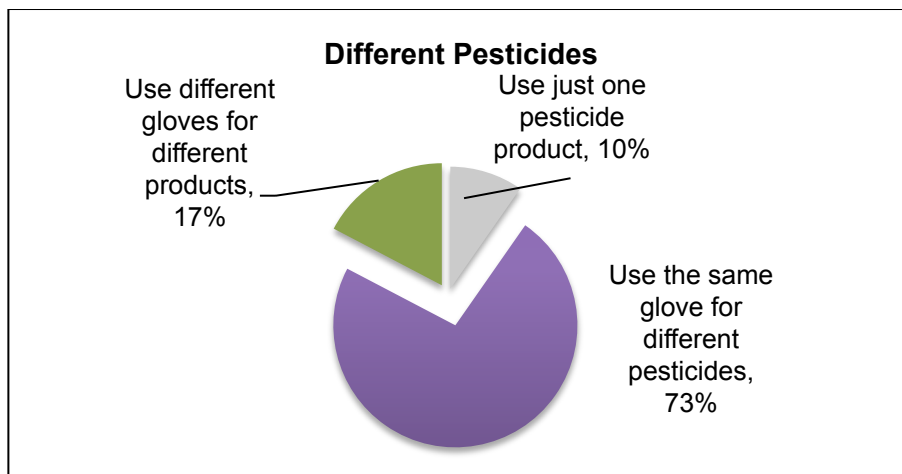
Glove Use with Different Products

Applicators were asked whether they wear the same glove materials when using different pesticide products (Figure 3). Seventeen percent of respondents use different gloves for different products. A few applicators (10%) apply just one pesticide product, so one glove type would be suitable. However, 73% of the applicators indicated that they wear the same glove for multiple products. This may be appropriate if the same glove meets the requirements for the different pesticide products used. On the other hand, it could suggest a concern if these applicators use the same glove for convenience without meeting the label requirement. It is important to keep in mind that the glove type is based on solvent category, not type of pesticide.

The possibility of inappropriate glove use is supported by an incident during a recent training event in Washington (C. Black, personal communication, April 2013). During the discussion of an herbicide label, the educator pointed out that this particular formulation contained a solvent that required either barrier laminate or Viton[®] gloves. The group of nearly 70 highway department employees was surprised – they occasionally used the product and had not noted (or presumably followed) this glove requirement. Based on an analysis of 1,552 pesticide product labels, there are 193 different pesticide products where nitrile is not acceptable (Shaw and Harned, 2013). In fact, there are several herbicides that require either barrier laminate or Viton[®] gloves.

If applicators are accustomed to seeing the same glove statement on most labels, they might not pay close attention to the requirements on all labels. This applicator survey did not answer the question about whether a single glove type was the correct type. These data may alert PPE educators to the need to have applicators review their product labels for glove statements. The solvents in formulations vary and may change in a particular product over time.

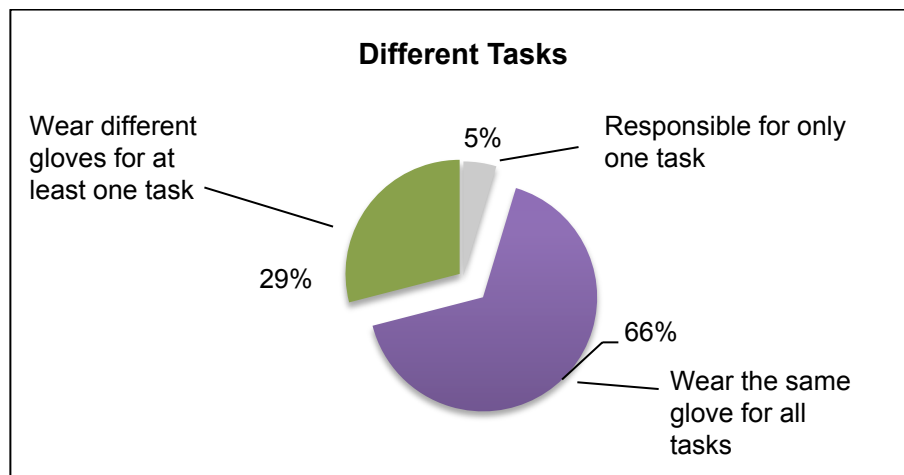
Figure 3. Applicator response to wearing the same glove for different pesticide products (n=433).



Glove Use for Different Tasks

Regarding glove choice related to tasks (Figure 4), 5% of respondents answered that they have only one task. Twenty-nine percent stated that they wear different gloves for different tasks, and 66% reported that they wear the same glove for all tasks. Because glove requirements are based on pesticide solvent, the glove material requirement for any given product is typically the same for all tasks. It should be noted that for some products, gloves may be required only for tasks such as mixing and loading. The data suggest that most participants are comfortable with one glove type for all tasks. **Note:** Michigan respondents did not answer the question regarding tasks.

Figure 4. Applicator response to wearing the same glove for different tasks (n=386).



Factors in Glove Selection

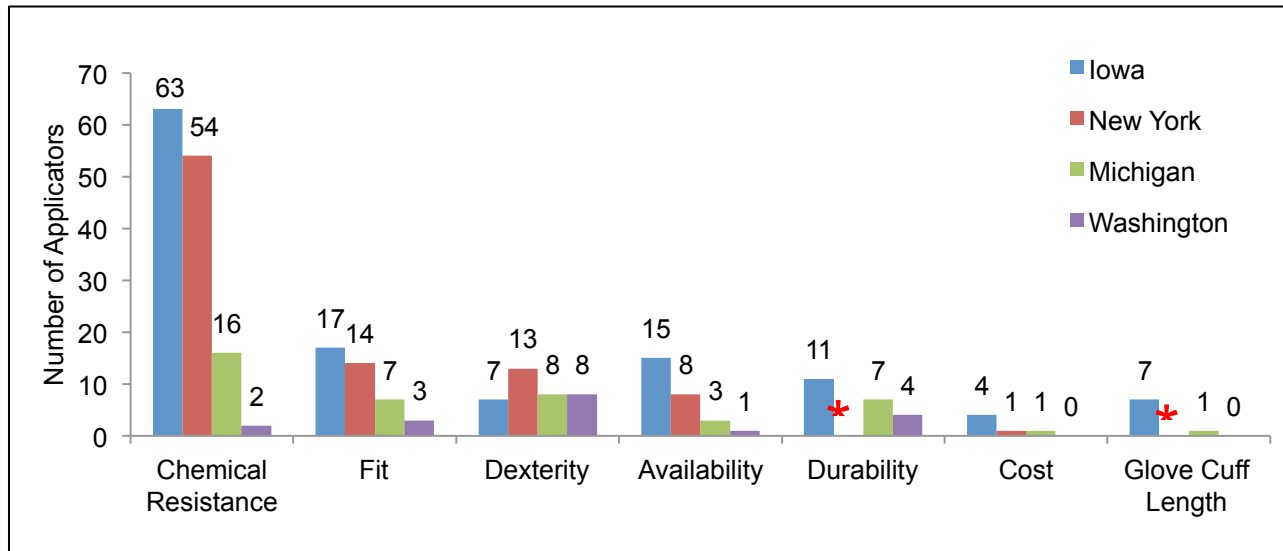
Applicators were asked to identify the most important factor in glove selection. The number of respondents who answered this question was relatively low (N = 275) since participants in two Washington workshops were not asked the question. The most important factor in choosing gloves was chemical resistance (49%; Figure 5). Since many labels do not stipulate thickness, the thin, disposable nitrile or disposable neoprene gloves worn by 128 respondents may be label compliant but not sufficiently protective.

The next most important factor was fit (15%), followed by dexterity (13%). Fit and dexterity factors are supported by the frequency of applicators wearing disposable gloves. Participants in Iowa were most concerned with availability. Glove cuff length was a concern in Iowa, but respondents overall were less concerned with glove cuff length and cost. The survey was differentiated for Washington, Michigan, and Iowa to include options for durability and glove cuff length.

Applicator response indicates that although chemical resistance was most important to almost half the respondents, other factors (such as fit and dexterity) were very important to 28% of participants. These factors are currently not considered in determining label glove requirements. The question is, would the numbers for other factors be higher if many were not wearing disposable gloves? It also raises the question of what applicators consider

protective. Some use disposable gloves that do not meet the minimum thickness requirements for elastomeric materials.

Figure 5. Most important factor in glove selection (n=275).



Not an option *

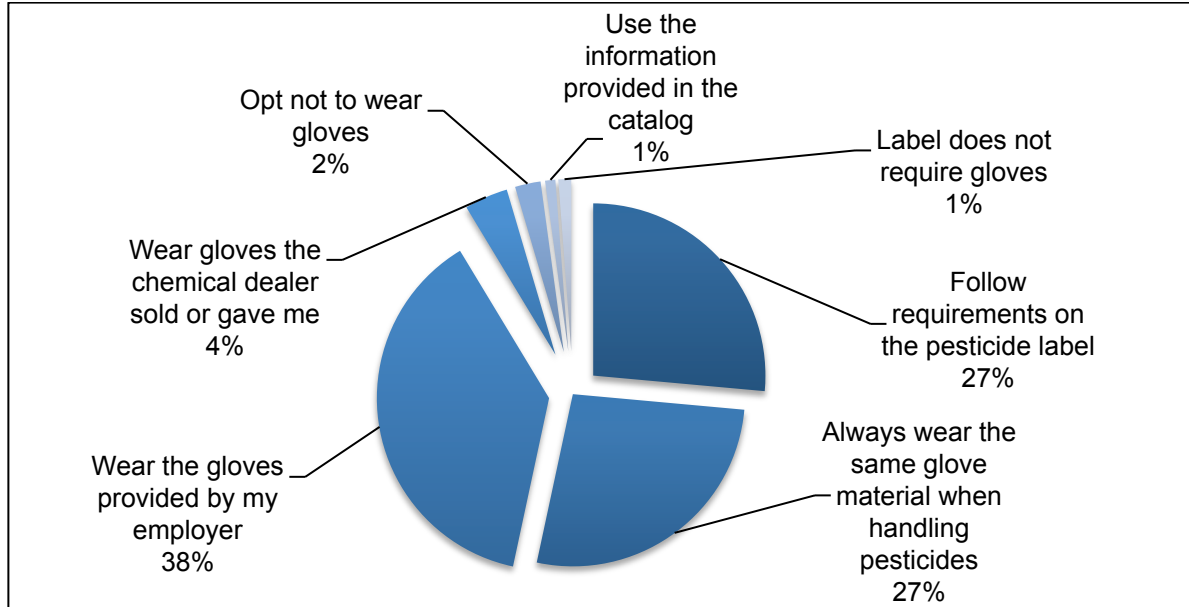
Primary Reason for Glove Selection

According to the survey, only 27% of respondents select gloves to follow label requirements (Figure 6). Thirty-eight percent indicated that they wear the gloves provided by their employer. This underscores the fact that many applicators rely on their employer to make the right choice. Nonetheless, certified applicators are legally accountable for complying with label directions. A sizable number (27%) also said that they always wear the same glove when handling pesticide products, although only 10% of respondents used a single product (see Figure 3). Two percent indicated that they opt not to wear gloves. Again, the survey was differentiated. Washington, Michigan, and Iowa had two additional choices:

- 1) I use the information provided in the catalog.
- 2) The label does not require gloves, and I do not wear them.

Responses were low for these selections. It would be useful to find out if the applicators read the label before using the gloves. Also, if there are several options, how do they decide which glove type to wear?

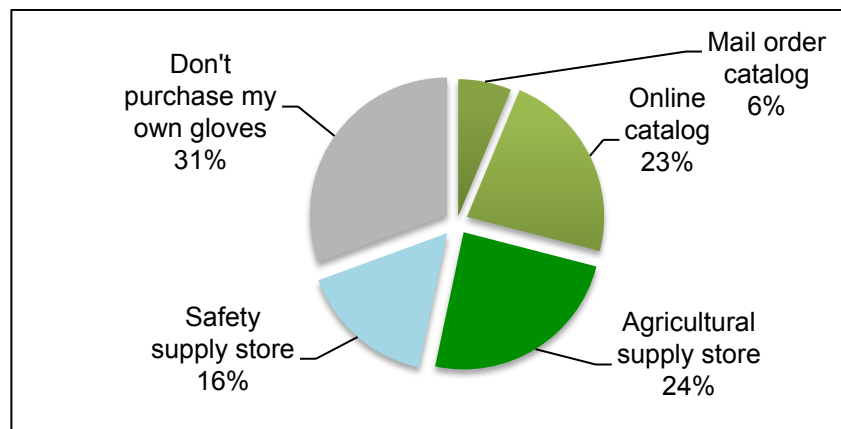
Figure 6. Primary reason for the selection of glove material (n=416).



Primary Places to Purchase Gloves

Applicators in New York, Washington, and Michigan purchase their gloves in a variety of places (Figure 7). Thirty-one percent of participants do not purchase their own gloves, while 24% purchase from an agricultural supply store, 23% from an online catalog, 16% from a safety supply store, and 6% by mail order catalog. Since nitrile gloves (especially the disposable type) are so common, PPE distributors may not be stocking a sufficient variety of label-required glove types, including barrier laminate and reusable butyl rubber and nitrile gloves. This question was not asked of Iowa participants.

Figure 7. Primary location where gloves are purchased (n=255).



Conclusion and Recommendations

The results of the survey show that the most popular glove material worn by pesticide applicators was nitrile, either reusable or disposable. Protection by gloves depends on task duration and the material, material thickness, and, in some cases, age or condition of the glove. Except for polyethylene, disposable gloves do not meet the minimum 14 mils thickness as required in the EPA Chemical Resistance Category Selection Chart for Gloves (EPA, 2013). Common disposable varieties include nitrile, latex, PVC, and neoprene. Since many labels do not stipulate thickness, the disposable nitrile or neoprene gloves worn by 128 respondents may not be protective although they comply with many label directions. Additional research is required to determine the level of protection provided by thinner nitrile and other disposable gloves using representative pesticide formulations. Also, the revised *Label Review Manual* (EPA, 2013) notes that for Category A (dry and water-based) formulations, a waterproof glove is needed. The manual specifically instructs label writers not to list the glove types. Presumably, disposable latex, nitrile, or neoprene would be suitable. However, an EPA determination is needed in order to permit use of the thinner glove materials for Category A products.

The data indicate that 92% of applicators surveyed wear gloves when handling pesticide products. The concern today, therefore, is not whether applicators wear gloves but whether they choose the correct glove material and thickness. The responses to several questions revealed some confusion about glove requirements and selection. Since many applicators indicated that they wear the same glove for different products (73%) or different tasks (66%), they need to select gloves based on the labels of the products they are using. This may require using multiple glove types. Educational materials should focus on the need for different glove types based on different formulation solvents, as specified on the product label. The investigators also noted dissatisfaction among pesticide applicators regarding comfort, functionality, cost, and availability.

Although most certified applicators wear some type of glove during pesticide use, this survey identifies areas for additional education or refocused discussions. Four key topics are:

- 1) Reading and interpreting glove statements on the pesticide label (particularly regarding the glove requirement for different formulations of the same active ingredient) to increase applicators' knowledge of the type(s) of gloves they currently use and those that should be used.
- 2) Developing outreach information about material performance and thickness, especially directed toward those who wear the recommended glove material for nonwater-based solvents.
- 3) Building awareness that certain glove types may be required for specific tasks, such as mixing and loading.
- 4) Initiating an outreach program targeting employers and glove suppliers since more than one-third of pesticide applicators do not select their own gloves.

Acknowledgments

The authors appreciate the willingness of John Stone (Michigan State University) and Betsy Buffington (Iowa State University) to include the set of questions in their training sessions and then share the data with the authors.

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