

Fertilizer and Pesticide Use by Tree Planters: Safety Bulletin Based on Research Summary

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A research project examining pesticide and fertilizer exposure among tree planters was conducted between May 2006 and April 2007. The study was a joint venture between researchers at the University of British Columbia (UBC) and FPInnovations, Feric Division. The project was funded by FPInnovations, Feric Division and supported by grants from Island Timberlands Limited Partnership, WorkSafeBC and the Western Silvicultural Contractors' Association (WSCA) in response to concerns voiced by workers regarding potential health effects of the substances they handle on a daily basis.

The research was headed by Dr. Hugh Davies (professor at the UBC School of Environmental Health) and Mr. Ernst Stjernberg (researcher and professional forester at FPInnovations, Feric Division). The research was subject to the Tri-Council Policy Statement on research ethics, and was externally reviewed before funding was approved. The research was coordinated by Ms. Melanie Gorman, and the outcomes of the research were made available in late 2008, with the completion of Ms. Gorman's thesis.

This summary has been prepared in order to assist workers and members of the industry in identifying the most salient findings and recommendations drawn from the research. Past research on pesticide exposure on Canadian tree planters has been very limited, and this research represented the largest and most reliable study done to date on the tree planting workforce.

The study focused on two issues:

1. Exposure to fertilizers (specifically the teabag variety commonly used in planting contracts)
2. Exposure to pesticides (those that are sprayed by nurseries on seedlings, prior to planting)

Exposure data was collected using skin swabs from planters' hands, blood samples and air samples using a filtering device carried by planters. Data were collected from 54 different planters at 5 different worksites, including a control site at which no fertilizer was being utilized. The research also included interviews with 223 treeplanters based in 13 different work crews.

The study had limitations associated with its scope and the limited workforce segment and operating conditions included in the research. However, some generalized findings and broad recommendations have been extracted from the research to provide the industry and its workers with a better understanding of their circumstances. These points have been provided based on a review of the material by an industry member, and the recommendations have been made based on the research findings and acknowledgement of the challenges inherent in the industry. Those interested in reviewing the specific recommendations and suggestions for sites of future study can view the thesis at the following web address:

https://dspace.library.ubc.ca/dspace/bitstream/2429/2493/1/ubc_2008_fall_gorman_melanie.pdf

Additional information on the research can be found at <http://www.cher.ubc.ca/treeplanter/>

Key findings regarding fertilizer

- Heavy metals are naturally occurring substances, and sampling found that trace amounts were detectable in the soils at the site, as well as the seedling root balls and fertilizers.
- There was no indication of heavy metal contamination in worker blood samples, and the highest level of metal exposure was found at a worksite where fertilizers were not being used.
- No heavy metals associated with fertilizers were found in the air samples.
- Small amounts of cadmium were found in three workers' blood samples, but two of them had not been handling fertilizer, and all three of them were smokers (smoking is a known source of cadmium exposure).
- In some instances, overall dust levels were a concern. However, the dust is likely from wind blown soil and road dust rather than from the fertilizer.
- Ammonia may be released from fertilizer when it becomes wet. Exposure to ammonia was not directly measured in this study, and it may warrant further examination in the future.
- Tree planters reported a higher than expected level of respiratory irritation symptoms, such as coughs and phlegm. It is not possible to determine the potential cause of these symptoms through this research, but those who self-reported longer duration of work with fertilizer tended to be more likely to report work-related health effects. Tree planters should monitor their own personal health, and take whatever reasonably practicable measures they can to reduce their exposure to irritants, including smoke, dust, and chemicals.

Key findings regarding pesticides

- Pesticide residues were found on some seedlings. Levels were higher on trees that have had more recent applications of the substances prior to being planted.
- Pesticide residues were found on the skin of some tree planters. The amount of pesticides found on planters' skin was determined to be far below what would be considered dangerous.
- Although exposure levels found in this study were extremely low, workers should be aware that exposure to pesticides can have harmful health effects, and workers should minimize exposure through whichever reasonably practicable means are available. One commonly used pesticide, chlorothalonil, has been classified by regulatory agencies as a probable human carcinogen.

- The research could not control for every possible factor associated with exposure, but estimates based on maximum levels of exposure still indicate that the level of pesticide exposure experienced by the planters in the study does not pose a serious and immediate risk to their health.
- Poor hygiene and use of improper gloves can increase the level of pesticide and fertilizer exposure, and workers should be informed of better ways of protecting themselves and provided with appropriate resources.
- Although the levels of exposure for both pesticides and fungicides were below levels considered harmful by several orders of magnitude, the substances applied to trees may have harmful health effects and workers can limit their exposure through the use of personal protective equipment and proper hygiene procedures.

Recommendations for minimizing exposure

These recommendations have been derived from the research, with additional content (photos and glove examples) added to help identify specific equipment and practices, and to place the research recommendations within the context of the work environment.

- Contractors should familiarize themselves with their responsibilities with respect to supervising work with potentially hazardous substances, particularly regarding provision of information, protective equipment, and opportunities for maintaining adequate personal hygiene.
- Tree planters work at an extremely high level of physical performance, and may be vulnerable to increased uptake of toxins. They should therefore exercise caution in regards to all potential toxins, not only those potentially associated with pesticides and fertilizers.
- Workers should exercise particular caution when working with trees treated with chlorothalonil. Although estimated exposure levels were far below acceptable limits, chlorothalonil can have harmful health effects after heavy or prolonged exposure. Chlorothalonil is listed under various trade names including Bombardier, Bravo, Echo, and Daconil.
- It is important for workers to handle fertilizers properly, prevent spills, and minimize absorption into their clothing in order to reduce exposure.
- Different bag materials are more effective at preventing leakage or transfer through the bags to the carrier. Butyl rubber, nitrile, and neoprene are some of the materials that would be effective for carrying fertilizer. Carrying teabags loose in canvas planting bags or silvacool bags does not offer effective containment.
- Contractors and workers should examine different methods and engineered receptacles for carrying fertilizer in a way that reduces the amount of water contacting the fertilizer teabags, and minimizing spillage. Two models currently used in the field include

manufactured fertilizer pouches (picture 1), and the modified milk jug (picture 2). Both of these containers are designed to be attached to the belt of the planting bags. The goal of these designs is to prevent the fertilizer teabags from becoming wet, and to separate them from the body and other work gear.

Picture 1



Image courtesy of Bushpro Supplies Inc.

Picture 2



- When the same clothes are worn on consecutive planting days, contaminants can build up on the clothing. This can result in higher levels of exposure. Planting clothes should be worn only once, and then washed. Clothes should be washed in hot water to maximize the cleaning effect, and work clothes should be washed separately from casual clothes.
- Planters should change their clothes as soon as they get home. An extra long sleeve shirt for changing into at the end of the day may be a useful piece of gear.
- Planters should wash their hands with soap and water as often as possible, especially before eating, drinking, or smoking. Washing with water alone is not nearly as effective. Sanitary wipes and alcohol-based cleaners are effective at preventing the spread of germs and disease, but are not designed to remove dirt and chemicals from the skin.
- The industry may want to experiment with different methods of enabling hand washing, such as 3.5-gallon mobile hand wash stations or Scrub 'n Go Scrub Jug Minis. While such options may not be practical in all tree planting work environments, other methods of hand washing in the tree planting environment warrant examination. For example, workers can be encouraged to take a small vial of biodegradable soap to work. This can be used in combination with an extra bottle of water that can be poured over the hands (see picture 3), or with a camping style water jug with a faucet that can provide a stream of water (see

picture 4). Local water sources such as streams and creeks may also offer opportunities for workers to wash their hands and reduce their exposure levels.

Picture 3



Picture 4



- Industry (contractors) should implement adequate personal protective equipment programs. These programs should address the following issues.
 - Contractors should train tree planters in the proper use and maintenance of their gloves. For example, gloves should be changed if they become damaged or contaminated on the inside and gloves should be washed prior to reuse.
 - Different glove materials work best for different chemicals. The contractor is required to tell tree planters what is required. Planters should use gloves that provide a chemically impervious barrier. Nitrile, butyl rubber, or neoprene gloves should be used when handling fertilizers and pesticides. Latex does not provide an effective chemical barrier. Examination of the ergonomic demands of gloves for tree planting and the types of gloves most frequently used in the industry indicates that nitrile is the most suitable material.

- Workers should avoid using gloves that have open fabric backs (see pictures 5 and 6), as they may trap chemicals and increase exposure levels by holding the contaminated fabric against the skin.

Picture 5



Picture 6



It has been noticed that many workers utilize open-backed gloves in combination with an inner nitrile liner that covers the entire hand (see picture 7). This would provide better protection, but the outer gloves should still be washed on a regular basis. There are also several types of nitrile gloves available for use that offer complete hand coverage along with suitable durability and ergonomic design (see pictures 8 and 9).

Picture 7



Picture 8



Picture 9



A pamphlet has been prepared by the WSCA to provide employers and employees with immediate recommendations for reducing worker exposure to pesticides and fertilizers. The pamphlet includes information on hygiene and laundering work clothes, as well as a detailed guide on the types of gloves used in the industry.

A note on responsibility

While many of the measures required to reduce exposure focus on the equipment used by individual workers and their actions in the workplace, employers are responsible for properly informing workers of all foreseeable hazards and providing them with the knowledge and the means to protect their health and safety. Employers must provide workers with the personal protective equipment required for their job, and instruct them in regard to the care and maintenance of that equipment. Employers are also responsible for ensuring that all worker

activities are in compliance with WorkSafeBC regulations and that workers are not engaging in practices that are hazardous to their immediate or long-term health. This includes inspecting workers to ensure they are using personal protective equipment such as proper gloves, and ensuring that hazardous substances are being handled in a safe manner. Employers are also required to implement WHMIS programs, and to provide the correct Material Safety Data Sheets (MSDS) for the substances being used at the worksite.

Employers must acknowledge these requirements as they shape their health and safety policies and programs. Maintaining a safe and healthy work environment is based on shared responsibility between the clear leadership of employers and the individual actions of their employees. This article has been provided to assist both employers and employees in fulfilling their roles in maintaining a safe and healthy workplace.

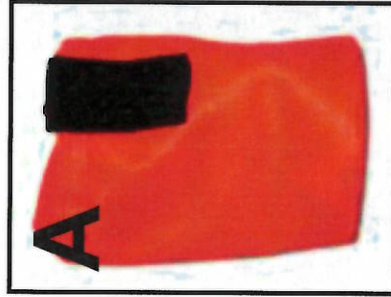
The following people contributed to this research summary:

- Dr. Hugh Davies (UBC School of Environmental Health)
- Mr. Ernst Stjernberg (Group Leader, Silvicultural Operations at FPInnovations, Feric Division)
- Ms. Melanie Gorman (research coordinator)
- Mr. Jordan Tesluk (BC Safe Silviculture Project)

Article source: Gorman, M.J. 2008. *Assessment of chemical exposure and self-reported health among tree planters in British Columbia*. University of British Columbia.

Handling Techniques and Equipment

- Open trees boxes of trees in well-ventilated areas and avoid inhaling vapours from newly opened boxes.
- Any spills must be immediately cleaned up, and planters should not leave loose fertilizer or broken teabags in planting bags. They will fall onto other people's gear during transport.
- Occasionally clean planting bags out with water to help remove any chemical build up.
- Carrying teabags loose in canvas planting bags or silvacool bags does not offer effective containment. Keep them in a special fertilizer pouch (picture A), plastic bag, or customized container.
- Many planters use a 4-litre milk jug with a hole just big enough to fit a closed hand through. Line the edges of the hole with duct tape, and hang the jug from the planting bag belt. (picture B).

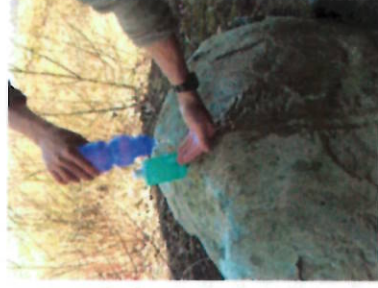


Remember: Research indicates chemical exposure from fertilizer and pesticide handling among tree planters is far below dangerous levels. However, planters can reduce exposure by using proper equipment and good techniques, and by maintaining good personal hygiene. (See rear panel for link to original research)

If you have concerns about pesticides or fertilizers, ask your company about their WHMIS program, and request the Material Safety Data Sheets (MSDS) for the substances you are handling. If you believe you are having an allergic response to any material, inform your first aid attendant immediately, and seek proper medical aid.

Hand washing and Hygiene

- Alcohol based cleaners and disposable hand wipes are designed for killing germs, and are not effective for removing chemicals. Soap and water should be used to wash hands after handling fertilizer or pesticides.
- Planters should wash their hands before eating, drinking, or smoking.
- Planters can take a small bottle of biodegradable soap to work each day, and use a small bottle of water or a camping water jug to wash their hands.



This pamphlet is informed by a joint research project by FP Innovations, Feric Division and the University of British Columbia School of Environmental Health.

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Ms. Gorman's Master thesis can be viewed on the Internet at the following address:
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Additional information regarding the research is available at www.cher.ubc.ca/treepanter

Fertilizer and Pesticide Exposure Reduction for Tree Planters



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- Helpful hints for minimizing exposure
- Guidelines for selecting gloves
- Tips on technique and gear selection
- Links to further information

Employers and employees share responsibility for a safe and healthy workplace. Both should be aware of their responsibilities under WorkSafeBC regulations, and should work together along with health and safety professionals, nurseries and forestry companies to ensure adequate chemical protection protocols and hygiene practices are in place at the worksite. This pamphlet provides information to help both employers and employees in that task.



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Glove Selection Guide

Gloves must provide both mechanical protection from scrapes and cuts, and chemical protection. Because fit and preference varies with individuals, and because there is no consensus on one perfect glove, this guide identifies several good and bad choices along with their respective pros and cons.



Planting gloves should be made of NITRILE. Butyl rubber and neoprene offer good chemical protection but are not usually flexible or thin enough for planting purposes. Latex rubber gloves are not suitable for planting because they do not provide an effective chemical barrier.

Whichever gloves workers utilize, they should ensure a good fit that does not compress the knuckles or hand tendons and provoke tendonitis.

1) Thin nitrile gloves (dishwashing style) with a cotton or polypropylene liner.

The washable liners wick moisture away from the hands, and provide warmth. Cotton liners (white) for warm weather, polypropylene (blue) for cold. These gloves provide an excellent chemical barrier, although the are slightly less durable than other gloves. The nitrile gloves are prone to failure if used without a liner because fingernails will work through the material. They are prone to punctures, but are relatively inexpensive, especially when purchased in bulk.

2) Full length nitrile-coated (gauntlet style).

These gloves possess a fabric backing that provides warmth and comfort, combined with a full nitrile barrier (coating). They provide excellent durability and protection from scrapes and cuts, but less flexibility. The gauntlet length also reduces the amount of debris that gets caught inside the glove.

3) Half-coated nitrile gloves combined with a full (surgical style) disposable nitrile inner liner.

The inner liner reinforces the partial outer coating, providing good chemical protection. Planters often utilize 2 to 4 inner liners each day, but they are cheap and available in large boxes. Latex inner liners are not recommended and may cause mild allergic reactions. Hands often get sweaty inside the liners, but they are easy to change throughout the day.

4) Vinyl-coated outer glove combined with a full (surgical style) disposable nitrile inner liner.

The outer glove provides excellent durability and cut protection, while the inner liner provides a good chemical barrier. The outer glove alone does not provide good protection, and the inner liner must be changed daily (or whenever it breaks).

5) Half-coated nitrile gloves (no liner).

These gloves are not recommended without the use of an inner nitrile liner, because the uncoated back of the glove can absorb chemicals and has the potential to increase exposure by holding chemicals close to the bare skin. A liner is strongly recommended (See #3).

6) Webbies.

These gloves are inexpensive and easy to find. However, they offer little to no chemical barrier, and allow dirt and rocks to become embedded under the fingernails. Not recommended

7) Duct Tape.

This does not provide an effective chemical barrier, and prevents the planter from properly washing their hands before eating or after using the bathroom. Tape manufacturers recommend avoiding prolonged or repeated skin contact. Duct tape "gloves" are not hygienic, not recommended, and not acceptable according to most Material Safety Data Sheets.

8) Bare Hands.

This provides no chemical protection and increases the probability of cuts and infection. Not recommended and not acceptable according to most Material Safety Data Sheets.

There may be other effective glove systems available, and planters may choose different gloves than the company provides. Planters should look for gloves with the same qualities as the recommended gloves in this pamphlet, including nitrile as the preferred material.

Laundry and Clothing

- Wash gloves as frequently as possible. Buy them in bulk, and keep spare pairs handy.
- Pesticides are absorbed by fabric, and can build up in clothing.
- Wear a fresh clean set of clothes each day of work. Planting clothes should be worn only once, and then washed. Use hot water to remove the most chemicals possible.
- Wash work clothes separately from casual clothes.
- Planters should change into fresh clean clothes immediately after work, or as soon as they return home from work.