The Impact of 2,4-D on Breast Cancer

Current Use

During the early 1990s, 42 million pounds of 2,4-D were used per year on U.S. croplands making it the fourth most used herbicide in U.S. agriculture. At the same time, the annual use of 2,4-D in New York State was estimated to be 141,665 pounds, making it the seventh most used herbicide in this state. 2,4-D’s primary use in agriculture is to control weeds in wheat and corn fields. It is used, but much less so, in orchards to prevent fruits from dropping prematurely. 2,4-D has many nonagricultural uses. It is used to control weeds in forests, rangelands, pastures, parks, athletic fields, golf courses, ponds, and lakes, and to clear land for roadways and rail tracks. In addition, it is used in home lawns and gardens to control broadleaf weeds like dandelions. The EPA has estimated that 12 to 28 million pounds of 2,4-D are used each year in nonagricultural settings.

Animal Cancer Risk

2,4-D fed to laboratory mice over long periods of time did not cause tumors. One study observed an increased incidence of a type of brain tumor called “brain astrocytoma” in male rats fed 2,4-D for two years. However, these results could not be repeated in a second study on rats that were fed higher doses of 2,4-D.

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History

2,4-D was originally developed in 1941 to increase plant growth. Soon, it was discovered to have an even more useful role in agriculture as an herbicide to control weed growth. A mixture of 2,4-D and a related chemical called 2,4,5-T was found to be a more effective herbicide than 2,4-D alone. This mixture was called Agent Orange and was used by the U.S. during the Vietnam War to increase the visibility for war planes by destroying plant undergrowth and crops. The usage of 2,4-D and 2,4,5-T increased through the next 15 years. In response to its potential to cause cancer and other health concerns, use of 2,4,5-T was banned by the U.S. Environmental Protection Agency (EPA) in 1983.

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Rip Van Winkle and Turfgrass Fertility

I feel like Rip Van Winkle, the Dutchman in the Washington Irving tale who fell asleep atop a Catskill knoll and awoke 20 years later only to realize how much the world had passed him by. Before I “fell asleep,” potassium was a regular macronutrient, required in roughly equal amounts to nitrogen. By the time I “woke up,” many turfgrass managers deemed potassium the most important nutrient, required at levels as much as six times that of nitrogen.

I suspect a few things happened during the period of my slumber that could lead one to think they need more potassium. First, there is more soil with high salinity content today than in past years, and additional potassium can help adjust those sodium problems. Second, treatment methods embraced by soil-consulting firms require more potassium. And third, although evidence suggests that potassium can enhance drought and wear tolerance, there is no evidence that most golf courses lack the required amount of potassium.

Now that I am awake again, it is clear to me that no one is reading the research material available on potassium. Gratifying potassium applications have become the norm regardless of the real need.

Leaching, Leaching, Leaching

Sodium is detrimental to plant and soil health. Increased use of poor quality irrigation water, especially water that is high in sodium, has led to a perceived need to increase the amount of potassium. In addition, areas with low rainfall exacerbate sodium accumulation problems by limiting leaching.

Bob Carrow, a professor at the University of Georgia, writes that at most potassium is required in equal amounts to nitrogen. His findings are obvious to other plant researchers. It’s a mystery how his findings, and those of other researchers, have been misinterpreted to the point that some turf managers use up to six times as much potassium as they do nitrogen.

Carrow has a mantra to help turfgrass managers understand the most effective means of solving sodium problems: “Leaching, leaching, leaching” he said during a seminar after seminar and in almost every article he has written on the subject. Consequently, the leaching of harmful cations, or positively charged ions, such as sodium, will also leach important cations, such as potassium. Therefore, more potassium must be applied but in equal proportion to nitrogen.

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Potassium is viewed by some as more important than nitrogen because potassium can “be out of balance” and can be leached out of the soil. Therefore, consultants believe potassium is required in significantly higher amounts regardless of plant response. I’m feeling like Rip again.

A recent study at Cornell University showed that turf treated with high rates of potassium (not in a 1-to-1 ratio with nitrogen) was significantly more susceptible to snow mold and slower to recover than turf that did not receive potassium. A subsequent study at the University of Massachusetts supported these findings.

Science vs. Theory

Most turfgrass managers attended a Soils 101 class during formal turfgrass education. One of the basic tenets of soil nutrient management is testing for nutrients in the soil that might be available to the plant and applying those nutrients to elicit a response. This fundamental principle of soil nutrient management that nutrients are applied to elicit a response makes sense. However, nutrient applications based on some cation balance theory rather than scientific research, which is promoted by many soil consultants, is irresponsible.

If you are concerned about cation balances such as potassium, testing for pH levels is a simple method for evaluating how cation balance can be adjusted. The current trend to interpret soil tests based on cation balance was adapted from production agriculture and has never been proven to be significant for turf nutrient management. In fact, a few recent studies have refuted its application to turf.

Cation balance interpretations typically lead to application rates of nutrients such as calcium and potassium that are higher than necessary when compared with interpreting based on plant response. Potassium is viewed by some as more important than nitrogen because potassium can “be out of balance” and can be leached out of the soil. Therefore, consultants believe potassium is required in significantly higher amounts regardless of plant response. I’m feeling like Rip again.

Diminished Stress Tolerance

Potassium is an important ion for managing water. It is involved in cellular hydraulic as well as regulating stomatal conductance that governs water movement throughout the plant. A significant amount of research was conducted about 15 years ago on the subject of potassium’s role in water management throughout the plant. Research showed that adequate levels of potassium must be maintained in the soil to enhance a plant’s stress tolerance. The 6-to-1 potassium-to-nitrogen ratio that some turf managers have adopted since I fell asleep could be adversely affecting stress tolerance.

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Simplify

We can all learn something from Rip Van Winkle. When he awoke, there was much disbelief about his story and from him about how the world had changed. No one believed he had slept for 20 years, and he could not comprehend that he no longer was a subject of King George—and his nagging wife. He always had appreciated the simplicity in life and was more accepted by the younger members of society who could learn from his simple wisdom.

I find that I anger some people in the turf industry when I talk about how detrimental high rates of potassium can be to plant health. I can tell by looking into the eyes of those in the audience the turf managers who have embraced the practice of high application rates of potassium and those who never have understood why so much potassium was needed.

I am for our industry to take a step back to simpler times when potassium applications were not made gratuitously, but were based on science and expectations of performance. Maybe it’s time we all woke up.

Frank S. Rossi

Rip Van Winkle continued from page 1

Dean Henry’s Response to Cornell Guidelines Language

Editor’s note: The following letter is from Susan A. Henry, Ph.D., the Ronald P. Lynch Dean of Cornell’s College of Agriculture and Life Sciences, to Mr. James Diermeier, CGM/CNP, President of New York State Turfgrass Association, Inc. Dean Henry was responding to the publication of erroneous information in an official Cornell publication. It was written in July 2005.

Dear Mr. Diermeier:

Thank you for your letter of May 25 outlining the turfgrass industry’s issues with the most recent edition of Cornell’s 2005 Pest Management Guidelines for Commercial Turfgrass.

As Dean of the College of Agriculture and Life Sciences, I want you to know I share your frustration, and, indeed, anger regarding the inappropriateness of the language contained on pages 21-25. I am embarrassed that such egregious opinions were published and distributed in a publication from Cornell.

As was explained to me, approximately 50 pages of new information were added to the turfgrass guidelines this year. Some of this information originated in a series of articles published over ten years ago in a turfgrass trade journal. With the best of intentions, the Cornell turfgrass team felt that this information would be helpful to the professional turfgrass managers who use the guidelines. It was unfortunate and inexusable that they did not proof the information more carefully nor remove the offensive language in the section on fungicide use before publication.

To address the issue, let me assure you we are taking appropriate steps to rectify the situation and to make sure that this type of mistake does not happen again. Here are the actions that I and others have undertaken:

• I am conducting a personal investigation to determine how this language came to be published in the publication and who is responsible, and am taking appropriate actions to correct this type of error that does not occur again. Furthermore, I have spoken personally to the individuals responsible to ensure that they do not promote such opinions in the future nor allow such opinions to affect work associated with Cornell. I am taking administrative action commensurate with Cornell rules to hold these individuals responsible.

• Let me assure you that Frank Rossi, who is the leader of Cornell’s turfgrass team, was not responsible for the situation. He feels even worse than I do and is working with me to ensure that this will never happen again. Immediately after the incident occurred, but prior to my being informed, Frank spoke directly with many individuals in the turfgrass and related industries who brought these concerns forward. He also published an acknowledgment of the concern and a retraction in Cornell’s ShortCUT newsletter on May 23, 2005, which went to all NYSTA members and additional subscribers in the turfgrass industry.

• The online version of the guidelines was edited, and the inappropriate language removed as soon as the concerns were raised.

• The remaining copies of the 2005 turfgrass guidelines have been pulled from distribution. People interested in procuring them are being directed to the online version.

• Frank Rossi is preparing a letter to all members of the turfgrass industry who received a copy of the guidelines that addresses the mistake. He will offer his expertise and the expertise of our director of communications, Linda McCandless, should someone be contacted by the media or an advocacy group.

• Frank Rossi and the Cornell turfgrass team have developed a more rigorous editorial process to insure this type of mistake will not be repeated in the turfgrass guidelines.

• The editorial process by which the entire Cornell guideline series is produced is undergoing a review to prevent this type of error in the future. I will insist that a single editor be identified for each guideline who will take responsibility for content.

I would also like to extend my personal apology to you and members of your industry for the negative perceptions of the industry that were promulgated in this publication, for which we accept full responsibility. Furthermore, I am offering to personally meet with you and members of your industry to address the concerns you voiced in your letter.