NCASI Fact Sheet

IMPACT. SCIENCE. SOLUTIONS.

Herbicide Tank Mixtures – Inert Ingredients and Adjuvants

May 2021

Introduction

Pesticide formulations (the commercial product that users purchase, e.g., Chopper®, Accord® XRT II) contain both active and inert ingredients. Active ingredients directly control pests. For example, the forestry herbicide formulations Chopper® and Arsenal® contain the active ingredient imazapyr, which inhibits plants' ability to synthesize some amino acids essential for growth.

Inert ingredients do not have direct herbicidal effects on plants, but they enhance the effectiveness of active ingredients and improve the product's performance. The term "inert" does not mean that a substance is non-toxic, it simply means that it does not have any direct pesticidal effect. Another term used for inert ingredients is "adjuvant," although in practice, "inert ingredient" seems to be used mostly for substances that are premixed in the formulation (i.e., added by the manufacturer during the manufacturing process). The term "adjuvant" is more commonly used to describe substances that are added directly to the spray tank mixture by applicators.

Commonly used types of inert ingredients/adjuvants include surfactants, oils, suspension agents, deposition agents, conditioning agents, compatibility agents, acidifiers and buffering agents, antifoaming agents, markers, drift control agents, and solvents.

Regulation

Under US federal law, active ingredients in a pesticide formulation must be identified by name on the pesticide product's label along with percentage by weight. The identity of inert ingredients, on the other hand, is considered confidential business information and the law does not require manufacturers to identify these substances by name or percentage on product labels. In general, only the total percentage of all inert ingredients is required to be on the pesticide product label.

Active Ingredient: isopropylamine salt of imazapyr: (2-[4,5-dihydro-4-methyl-4-(1-methylethyl)-5-oxo-1*H*-imidazol-2-yl]-3-pyridinecarboxylic acid)*	**27.8%**
Other Ingredients:	**72.2%**
Total:	**100%**

This does not mean that EPA does not know which inert ingredients are used. The fact that inert ingredients are not identified on the label has led to concerns about potential environmental effects of these ingredients and that inert ingredients are not tested for toxicity. In reality, under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), EPA mustensure that pesticide formulations, including the inert ingredients, meet the registration standard under FIFRA Section 3, including the lack of unreasonable adverse effects on the environment.[1] In addition, where a product label directs the user to add a particular adjuvant before use, EPA must treat that adjuvant as if it were an "other ingredient" in making the registration decision.[2] EPA also notes that it is within the Agency's authority to treat any tank-mixed substance as part of the pesticide because it meets the FIFRA definition of pesticide (i.e., a "mixture" of substances intended to kill a pest).[1] In practice, EPA does not typically use that authority to regulate adjuvants added to tank mixes, but even if a particular adjuvant is not subject to pesticide-related

[1] https://www.epa.gov/pesticide-registration/pesticide-registration-manual-chapter-8-inert-ingredients
[2] https://www.epa.gov/pesticide-registration/pesticide-registration-manual-chapter-1-overview-requirements-pesticide

regulations, it is still subject to regulation under the Toxic Substances Control Act, under which EPA evaluates new and existing chemicals and their risks.

Toxicity

Public concerns about potential adverse environmental effects of inert ingredients/adjuvants generally focus on surfactants. There are publications that address toxicity of surfactants used in pesticide formulations or as adjuvants in spray tank mixtures. However, interpreting these studies requires caution.

One important factor is understanding the difference between "hazard identification" and "risk assessment." Hazard identification asks only if something *can* be hazardous under some condition. Risk assessment asks a more appropriate and nuanced question: Is this substance likely to be hazardous when used according to label directions and under actual conditions of use? Most of the published studies are hazard assessments, not risk assessments, and use unrealistic exposure concentrations and methods. For example, when describing their methods for assessing the toxicity of Roundup® formulations to bees in a recent publication, Straw et al. (2021) stated that:

> *This methodology is not designed to replicate field realistic exposure (spraying conditions or label recommended application rates), it is instead designed to assess the lethality (hazard) the herbicide products pose to bumble bees.*

A study by Haller and Stoker (2003) is a good illustration of the disconnect between hazard identification and risk assessment. They studied the toxicities of 19 adjuvants, primarily nonionic surfactants used in aquatic weed management, to juvenile bluegill sunfish (*Lepomis macrochirus*) and found that all the adjuvants caused mortality at sufficiently high exposure concentrations. However, when they compared expected concentrations in water following applications made at maximum label rates, they found safety factors of at least five times for 18 of the adjuvants (the 19th was an experimental product with no established application rate, so no safety factor could be calculated). The safety factor for Entry II®, a polyethoxylated tallow amine surfactant (the type of surfactant used in original formulations of Roundup®), was 12.6.

Figure 1 Bluegill Sunfish (Lepomis macrochirus)

Summary

Inert ingredients/adjuvants are essential components of herbicide formulations and spray tank mixtures. Without adjuvants, active ingredients would have to be applied at higher rates to achieve the same level of effectiveness. Protecting water quality and minimizing effects on non-target organisms from adjuvants requires the same actions employed to protect water quality and minimize adverse effects from active ingredients: following label directions and using forestry best management practices.

References

Haller, W.T., and Stocker, R.K. 2003. Toxicity of 19 adjuvants to juvenile *Lepomis macrochirus* (bluegill sunfish). *Environmental Toxicology and Chemistry* 22:615-619. https://doi.org/10.1002/etc.5620220321.

Straw, E.A., Carpentier, E.N., and Brown, M.J.F. 2021. Roundup causes high levels of mortality following contact exposure in bumble bees. *Journal of Applied Ecology*. https://doi.org/10.1111/1365-2664.13867.

For More Information

Contact info@ncasi.org