Understanding Adjuvants

Andy Hulting
Extension Weed Management Specialist
Department of Crop and Soil Science
Oregon State University
541-737-5098
andrew.hulting@oregonstate.edu

Afternoon Overview

- Definitions
  - Types of adjuvants
  - Why and how they are used
- Examples in cranberry

  Herbicide adjuvants

Oregon State
UNIVERSITY

Effective Chemical Weed Management

Herbicide application and placement

Herbicide uptake

Herbicide translocation

movement within the plant through xylem and phloem tissue

Herbicide toxicity and activity

Herbicide metabolism and degradation

Oregon State UNIVERSITY

Adjuvant

- An ingredient in a pesticide formulation or added to the spray tank that aids or modifies the action of the principle active ingredient

- Activator adjuvants
- Special purpose adjuvants

- Blended adjuvants becoming more popular
- Hundreds of products available

Oregon State UNIVERSITY

Activator Adjuvants

- Can alter the physical characteristics of spray solution
- Commonly used to enhance postemergence pesticide performance
- Can increase activity, absorption into plant tissue and rainfastness or decrease photodegradation
- Include surfactants, crop oil concentrates, nitrogen fertilizer, spreader-stickers, wetting agents and penetrants

Special Purpose Adjuvants

- May also alter the physical characteristics of the spray solution
- Widen the range of environmental conditions under which a given pesticide formulation is useful
- Include compatibility agents, buffering agents, antifoam agents and drift control agents

Activator Adjuvants

- Primary use with postemergence, foliar-applied pesticides
- Transfer from leaf surface into plant tissue-waxy cuticle is a water repellent barrier
- Surfactants-reduce the surface tension of the spray droplet to allow more contact with plant surface which increases absorption
- Surfactant molecules are highly synthesized to achieve specific goals, non-ionic surfactants (NIS) widely used

Oregon State UNIVERSITY

Activator Adjuvants

- Oils are probably the oldest group in this category
- Increase penetration through cuticles of plants and outer layers of insects
- Crop oils (which are actually petroleum based), vegetable oil concentrates, methylated seed oils
- Organosilicone-based methylated vegetable oil concentrates

Activator Adjuvants

- Nitrogen fertilizer is frequently added to the spray tank to increase activity
- Often used in addition to surfactants or oils
- Ammonium salts in the fertilizer appear to be the active component
- 28, 30 or 32% UAN solutions
- Ammonium sulfate (AMS) can reduce antagonism between pesticides and the effects of “hard water”

Oregon State UNIVERSITY

Special Purpose Adjuvants

- Compatibility agents allow tank mixing of two or more active ingredients
- Buffering agents (salts) or acidifying agents (citric acid) may be used to adjust the pH of the final spray solution
- Antifoam agents and defoamers can be used to minimize pump and application problems
- Drift control agents reduce potential for drift by minimizing small spray droplet formation

Adjuvant Selection

- Should be primarily based on recommendations given on the pesticide label
- Manufacturers have invested time and money in adjuvant research
- The wrong adjuvant may increase risk of poor performance and/or crop injury
- Consider percent active ingredient of adjuvant (just like you would for various formulations of pesticides) as well as cost

Oregon State
UNIVERSITY

Some Rules of Thumb…

- If both oils and NIS are listed on a label, use the NIS under normal conditions to maximize efficacy and reduce risk of crop injury
- Use oils under tougher environmental (drought or cold stress)applications and with postemergence grass herbicides
- To improve crop safety, do not use oils with plant growth regulator herbicides (dicamba, 2,4-D, MCPA)

Oregon State UNIVERSITY

Weed Management Handbook

This handbook is designed as a quick and ready reference for weed control practices and herbicides used in various cropping systems or sites in Idaho, Oregon, and Washington.

This handbook will be useful to Extension agents, company field representatives, commercial spray applicators and consultants, herbicide dealers, teachers, and producers. More about the PNW Weed Management Handbook

Cranberries

Kim Patten
Revised: March 2016

Preplant weed control All major weed problems can be prevented by starting with a clean field and avoiding reinfestation. For proper preplant management, growers should consider spraying perennial weeds with several applications of an appropriate systemic herbicide, using sand free from weed seeds, fumigating soil, planting weed-free vines, cleaning equipment when moving between beds, and seeding dikes with cover crops effective in preventing weed infestation (e.g., dwarf perennial ryegrasses and some creeping fescues).

Year-round weed management in bogs Successful weed management in cranberries requires a comprehensive, year-round approach that alternates a combination of weed control practices over several years. Developing these strategies requires knowledge of

Adjuvant Selection Examples

- Mesotrione (Callisto) NIS or COC
- Clethodim (Select Max and others) COC or NIS
- Sethoxydim (Poast) COC
- Clopyralid (Stinger) Do not apply with an adjuvant

Oregon State UNIVERSITY

Summary

- The type of adjuvant added to the spray tank can enhance or reduce performance of the pesticide
- Many kinds of activator adjuvants-primary purpose is to reduce surface tension, improve wetting action and increase penetration of the pesticide
- Follow the pesticide label for selection of the correct product to maximize efficacy and crop safety

Oregon State UNIVERSITY