DRIFT REDUCTION ADJUVANTS: UNDERSTANDING WHAT'S IN YOUR TANK

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In a world where we can splice genes, split atoms and transplant organs it is hard to believe that we still have not figured out a way to spray agricultural pesticides with zero spray drift. Although newer developments in application technologies have helped to contain spray drift; nearly all focus on increasing or stabilizing droplet size as their primary goal. Nozzles, pulse width modulation, boom add-ons, and even drift reduction adjuvants can all be placed in this category. As an applicator, it is critical to understand the technologies you are utilizing for proper sprayer management in drift prone conditions.

Understanding Drift

Pesticide application through spray nozzles results in droplets that as a result of surface tension are roughly spherical in shape. Droplet size is measured in microns with 1 micron = 1/1,000,000th of a meter. Small droplets, those less than 150 microns, are highly susceptible to off-site movement.

As the spray solution exits the elliptical orifice of a fan nozzle (most commonly used type today) it does so as a thin sheet of fluid moving at speeds up to 60 feet per second (49 mph). Droplets are formed at the edge of this sheet of fluid. Unless the spray particles are electro-statically charged or propelled with an air assist boom, the forces of gravity and air resistance take over quickly on the emerging droplets. Small droplets, which have less mass and greater surface area will fall much slower than larger droplets due to more friction with the surrounding air. Larger droplets which are capable of maintaining a downward velocity longer are more likely to be deposited on the intended target. How far can you "push" a droplet before gravity and air resistance completely take over? A 100-micron droplet moving at an initial velocity of 33 feet per second can only be "pushed" approximately 5 inches. A 500-micron droplet moving at the same initial velocity can be "pushed" roughly five times as far.

Managing Droplet Size

From the previous discussion it is apparent that larger spray droplets maintain velocity longer, and are less prone to drift. If that is the case, why not simply choose a nozzle which produces droplets so large that drift becomes nearly impossible? At some point a droplet becomes so large that too few are being deposited for effective pest control. In fact, pesticide performance can vary greatly due to droplet size and will require the applicator to adjust their target size droplet accordingly.

Nozzle selection is one of the most critical aspects in determining spray droplet size. Today we have many nozzle manufacturers producing quality products to meet application needs. Much verifiable data exists on nozzles and droplets produced, so that with a bit of research, the applicator can make very informed decisions on nozzle selection.

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Role of Adjuvants

Pesticide labels may dictate the addition of either activator adjuvants (those which enhance a pesticides performance) or special purpose adjuvants (which includes compatibility agents, drift control agents, etc.). Activator adjuvants like surfactants, crop oil concentrates and seed oil concentrate all function a bit differently, but also all reduce the surface tension of the spray solution. Reducing the surface tension is often referenced in helping the spray droplets to spread out over a greater surface area on the target. Reduced surface tension however also causes the sheet of water released from the nozzle to break into smaller droplets. Most nozzle testing is done with water only, so realize that your experience of droplet size produced may differ somewhat from nozzle manufacturer charts based on the composition of the spray solution.

Special purpose adjuvants include products like drift control additives. According to the Compendium of herbicide adjuvants, there are over 150 different drift control products available to choose from that fall roughly into three classes:

Thickeners – these tend to be polyacrylamide or polyvinyl polymers which thicken the spray solution and increase droplet size.

Encapsulators – these products do not affect overall droplet size, but encapsulate the pesticide into droplets to help minimize evaporation losses during product delivery.

Spray Modifiers – these products tend to be vegetable oil based and intend to reduce the amount of fine driftable droplets without increasing the size of the larger droplets.

The addition of a drift reduction adjuvant will never eliminate the potential for drift. As with all other tools in the drift reduction toolbox, these adjuvants are intended to improve your ability to reduce drift. Which product to use? Unfortunately, there is not enough time or resources to test all adjuvants in combination with all pesticides, so personal experience and testing on your rig will play an important role – remembering that no tank additive will make it completely safe to spray on that next marginal day.