

INSIGHTS

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CROP PROTECTION

Crop producers can maximize their yield potential by understanding and addressing eight key agronomic needs: timeliness, crop residue management, soil tilth, seed bed conditions, seed placement accuracy, plant food availability, **crop protection** and harvest quality. Once the seed is in the ground with adequate available nutrients, the grower must protect it from weeds, pests and other factors that may limit yield.

Protecting yield potential requires getting the right amount of product applied at the right time, despite the weather. Application equipment technology should be designed to get you into fields earlier and deliver a quality application on time, every time. Yield loss can also occur when applications of crop nutrients, herbicides, insecticides and fungicides are delayed or prevented. Operator skill, droplet size and equipment design all influence application quality and timeliness. This report reviews some good practices, new research and agronomic equipment designs that can improve application quality, protect yields and give you “picture perfect” fields.

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NEW DATA ON DROPLET SIZE

By Mark Burns, Case IH Application Equipment Marketing Manager

Size matters when it comes to spray droplets. Understanding the right droplet size for the product is not only important for spray drift management, but also for the best product efficacy.

A university team, led by Dr. Greg Kruger, University of Nebraska Extension Cropping Systems Specialist and private-company representatives are doing field research to evaluate what droplet size provides the best efficacy for pesticides currently on the market. The research is conducted at the University of Nebraska-Lincoln (UNL) West Central Research Extension Center in North Platte.

The facility is using new wind tunnel technology to measure the drift potential of multiple droplet sizes at various wind speeds. This data provides insights into spray efficiency, penetration of the pesticide



Agronomic Needs for Successful Stands



DROPLET SIZE [cont'd]

into the plant canopy and pesticide efficacy comparisons. The purpose is to see what droplet size looks like under various application conditions—using different nozzles, different orifice sizes and varied applicator pressures—and how that translates into off-target movement and product efficacy.

Since Roundup Ready systems have been widely adopted, applying products with multiple modes of action has become the best practice to manage glyphosate weed resistance. Often, the products in these tank mixes have different droplet size recommendations. This data will be

especially important to help applicators fine-tune how to best apply tank mixes of products requiring different droplet size to achieve the most efficacy and least spray drift.

The research is also assisting the U.S. Environmental Protection Agency's new Drift Reduction Technology policy that will allow manufacturers to label products based on their ability to reduce drift. The wind tunnels are helping to determine each pesticide's potential to drift by taking into account application speed, pressure, nozzle selection, tank mixtures and wind speed. ■

Droplet Guide*

ASABE Standard S-572.1 Droplet Spectrum Categories ^{1,2}	Contact Insecticide and Fungicide	Systemic Insecticide and Fungicide	Contact Foliar Herbicide	Systemic Foliar Herbicide	Soil-Applied Herbicide	Incorporated Soil-Applied Herbicide	Relative Size	Comparative Size	Atomization
Very Fine (VF) Red								Point of Needle (25 microns)	Fog
Fine (F) Orange	✓							Human Hair (100 microns)	Fine Mist
Medium (M) Yellow	✓	✓	✓	✓				Sewing Thread (150 microns)	Fine Drizzle
Coarse (C) Blue		✓		✓	✓	✓		Staple (420 microns)	Light Rain
Very Coarse (VC) Green				✓	✓	✓			
Extremely Coarse (XC) White						✓		#2 Pencil Lead (2,000 microns)	Thunderstorm

*Droplet sizes are suggestions for each pesticide. ¹Based on VDO.5, the Volume Master Diameter (VMD) designation. Source: Kansas City University. ²Revision of Standard S-572.1 also includes extra-fine and ultra-coarse categories for nonagricultural users.

This droplet guide summarizes suggested droplet sizes for a variety of chemicals, based on the ASABE standard droplet spectrum categories.

UNCONTROLLED WEEDS IMPACT YIELD

By Ken Lehmann, Case IH Application Equipment Sales and Marketing Manager

When do weeds become a problem? Research at Colorado State University indicates weeds have the potential to compete with corn as early as the one-leaf stage. Very early competition causes the corn plant to make adjustments in growth that could lead to reduced yield potential.

Numerous university and company research studies show that **if weeds are allowed to emerge with corn and are left uncontrolled while corn is growing from the V2 to V4 stage, the yield loss is usually more than one bushel per acre per day.**

In soybeans, once weeds begin to impact yield, each additional day they are allowed to compete can result in yield losses of up to 1 percent per day.

Getting the right product applied at the right time can be challenging, especially with pre-emergence products in corn. Weather conditions sometimes result in wet fields that can't be sprayed before the corn emerges and weeds germinate.

This sets up early season weed competition that can be costly, especially when a post-emergence application is also delayed. A University of Minnesota study showed that when no pre-emergence herbicide was applied, an application delay of four to seven days after weeds exceeded 4 to 5 inches in height resulted in a yield loss of 12 bushels per acre. Delaying glyphosate application



NEW APP ESTIMATES DROPLET SIZE

Information generated in the wind tunnels at the West Central Research Extension Center in North Platte, Neb., is powering a new app developed by UNL to assist pesticide applicators in making ground applications with decisions relating to droplet size and potential for off-target movement of pesticides. According to a UNL *CropWatch* bulletin, the app calculates the size of spray droplets generated from various spray nozzles at various pressures using different spray solutions. Applicators can plug in application parameters for their pesticide applications and get the droplet size range that would be produced. Once they have the droplet size information, they can estimate the potential for drift and adjust their application parameters appropriately.

To Download

iTunes: <https://itunes.apple.com/us/app/ground-spray/id528759748?mt=8>

Android: <https://play.google.com/store/apps/details?id=com.kxs.groundspray&hl=en>

Requirements: Compatible with iPhone 3GS, iPhone 4, iPhone 4S, iPhone 5, iPod touch (3rd generation), iPod touch (4th generation), iPod touch (5th generation) and iPad. Requires iOS 5.0 or later.

another seven days, when weeds were 8 to 9 inches tall, resulted in an average yield loss of 27 bushels per acre.

Crop safety becomes another challenge when the application window narrows, especially in wheat. There are various weed control products for wheat, but 2,4-D is inexpensive and widely used. If 2,4-D is applied too early or too late, it can cause plant damage, and significant yield loss. Multiple years of research show that 2,4-D sprayed too early (only 2-3 tillers) can cause up to 35 percent plant damage and sprayed too late (at or after jointing) can cause 70 to 90 percent damage.

Timeliness of application is critical to protect yield potential. Sprayer design can make the difference in being ready to take advantage of the perfect agronomic window to get into a field. ■

SIX APPLICATION QUALITY DRIVERS

By Mark Burns, Case IH Application Equipment Marketing Manager

Weather, field conditions and pests may change from year to year, but there are consistent challenges applicators must overcome to ensure a quality application and help maximize a crop's yield potential. The three biggest are timeliness, consistency and conditions.

An applicator's goal is always to be in a field at the right agronomic moment to minimize competition from the weeds and other pests that are prevalent. Consistency of the application is equally important to ensure that the right rate and recommended droplet size is uniformly applied over every acre of the field. Finally, the application equipment must be designed to handle rough terrain or tough field conditions without compromising application consistency. Growers and operators can address each of these challenges by managing the six drivers that influence application quality:

1. Accurate rate for the application
2. Right droplet size for the product
3. Consistent crop coverage
4. Reducing overlaps and skips
5. Timeliness
6. Drift control

It takes a skilled applicator and equipment designed around these six drivers of application quality to protect yields and get "picture perfect" fields.

Accurate Rate for the Application

Quality application begins with understanding and using the recommended rate and droplet size for the product being applied. Over-application can lead to crop damage, and under-application may fail to provide adequate control. In the end, successful application must begin with identifying the accurate product rate for the job and successful application of that rate.

Right Droplet Size for the Product

Selecting the recommended droplet size for the product and ensuring that same droplet size is delivered to the plant is critical to application quality.

Former Kansas State University professor, Dr. Robert Wolf who now operates Wolf Consulting & Research LLC, says the droplet size created by a nozzle becomes very

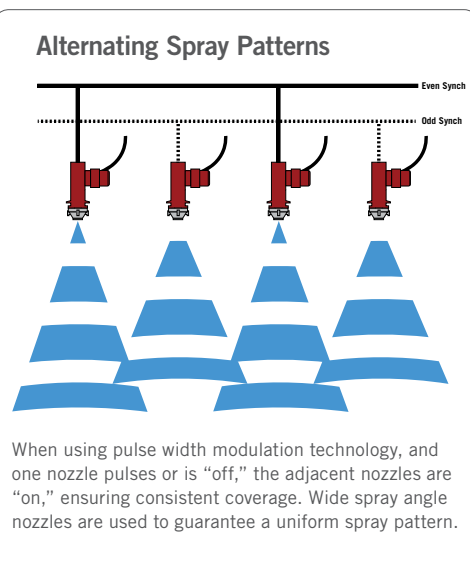
important when the efficacy of a particular plant protection product is dependent on coverage or when the minimization of material leaving the target area is a priority.

Pulse Width Modulation (PWM) technology allows for constant rate and constant pressure even when the speed of the sprayer changes. By maintaining a constant application volume while adjusting spray pressure, operators are able to manipulate droplet size to meet changing product and condition needs. It's also possible to adjust application volumes without changing nozzles or adjusting pressure.

Consistent Coverage

Not only must self-propelled sprayers deliver the right rate and the right droplet size, they must do so equally across the boom and across the entire field. Tough terrain can cause boom bounce and interfere with delivery.

Consistent coverage starts with a stable spray platform, robust enough to deliver consistently over the sprayer's speed range to maximize performance and minimize drift. Automatic boom height control, automatic boom section control, robust boom suspension and trailing-link chassis suspension all contribute to consistent coverage. PWM can also contribute with a constant and consistent spray pattern.



Reducing Overlaps and Skips

Skips and overlaps in application coverage can be difficult to avoid, especially in irregular shaped fields or around pivots, and they can be very costly. Missed areas

can contribute to pest pressure and yield loss. Similarly, overlaps waste valuable crop protectant chemicals and can lead to crop damage.

Sprayers equipped with automatic boom section control and a guidance system can improve accuracy and minimize skips and overlaps. PWM technology also helps maintain pattern uniformity when slowing in turns, for corners and on hills preventing over-application at lower speeds and reducing under-application during acceleration.

Timeliness

Getting product applied at the right time can be challenging. This is one of the key contributors to the growing incidence of growers choosing to purchase their own sprayer and handle their own applications.

When fields are soggy, the stakes are raised even further. Sprayers with even weight distribution have an advantage because they'll leave a lighter footprint—less rutting and soil compaction—without compromising power and performance.

Drift Control

Off-target product movement can happen for many reasons. But even when the right droplet size is delivered at the right pressure in the field, weather conditions can change quickly, raising the risk of drift and the potential for inconsistent coverage and incomplete weed control.

Typical strategies for minimizing drift and maintaining a consistent spray pattern include increasing droplet size, increasing flow rates for higher application volumes, using lower pressures, using the lowest spray boom height practical, and avoiding high speeds and rapid speed change.

New spray technologies can also help minimize off-target drift. PWM technology allows operators to easily toggle between pre-set spray pressures to provide on-the-go drift control when weather and wind make spray patterns difficult to control. ■

WHAT TO LOOK FOR IN A SPRAYER

When it comes to protecting yield potential and improving ROI, producers and applicators should consider each of the six Drivers of Application Quality. Here are some Agronomic Design considerations when evaluating a sprayer:

Consistent Coverage. The sprayer should deliver a uniform droplet size from the nozzle to the plant over a wide speed range, allow multiple applications from a single tip and automatically adjust boom height as changes in terrain are detected.

Boom Design. Booms should be designed to respond to tough field stress loads while maintaining the range of motion needed for pre-plant, post-tassel or anytime in between.

Boom Shut-Off Control. Boom sections should automatically turn off when the sprayer enters an area that has already been sprayed and then turn on when leaving the applied area.

Spray Drift Control. Operators should be able to switch between pre-set spray pressures in the field when changing weather conditions and wind make spray patterns difficult to control.

Even Weight Distribution. Sprayers should be designed for equal weight distribution, providing a light footprint to get applicators into wet fields sooner.

Superior Suspension. The sprayer's suspension system should absorb any shock load in rough terrain without compromising application quality. ■



The cab-forward, rear-engine design of a Case IH Patriot® sprayer provides equal weight distribution across the machine to get operators into fields earlier for more timely application with less rutting and soil compaction. Aircraft-style, trailing-link suspension absorbs both vertical and lateral shock loads for smooth spraying.



The Case IH Patriot sprayer may be equipped with optional AccuBoom automatic boom section control and AutoBoom automatic boom height control to maintain consistent, accurate crop coverage. The parallel-link boom design delivers all the range-of-motion versatility operators need.



The AIM Command® spray system automatically ensures a constant droplet size and application rate at a specific, constant pressure, even as sprayer speed and field conditions change. AIM Command also provides on-the-go drift control and allows multiple applications from a single tip. Add AFS AccuGuide™ autoguidance to improve spray accuracy and reduce skips and overlaps.

FIND OUT MORE: Visit [www.CaseIH.com/Agronomic Design](http://www.CaseIH.com/AgronomicDesign) to learn more about agronomic considerations when spraying.

