NEW SPRAY TECHNOLOGIES

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Several technological advancements in spray systems have occurred in recent years as the application industry searches for ways to apply crop protection products more efficiently and safely in the environment. Many of these technologies have been present for several years but adoption has been slow for different reasons. Much of the design emphasis in recent years has been to minimize drift potential. This paper will give a brief review of several of these technologies.

Drift Reducing Spray Nozzles

Several application equipment technologies for boom sprayers have been developed to assist in the minimization of spray drift. The most popular and least costly to the industry has been in the design of spray nozzles. Most all manufactures have designed new nozzles with the emphasis on improved droplet size control to enhance efficacy and minimize drift potential. Chamber- and venturi-style tips have been the most successful with this effort.

Air-Assisted Boom Sprayers

Air-assisted boom sprayers, uses a high-velocity air stream channeled along the boom to assist or shield the spray into the target. Research data will support improved deposition, but unless used in a canopied target the excess air velocity has potential to increase spray drift.

Electrostatic Sprayers

The second involves the use of system that will create and distribute electrically charged spray droplets into the target. The spray droplets are charged with an opposite polarity of the plant material and theoretically are attracted into the canopy. This is similar to the process used to spray paint new automobiles. Electrostatic spray systems are available for both ground and aerial sprayers. Electrostatic sprayers have moderate acceptance for increasing coverage in certain parts of the canopy, mostly in the upper portions. Electrostatic applications have also shown potential to increase droplet coverage on the underside of leaves. This feature is more critical when applying fungicides and insecticides rather than when applying herbicides. However, because of the need to develop fine spray droplets for the system to work effectively to achieve improved coverage potential, reducing the incidence of spray drift has not been as easily demonstrated.

Pulse Width Modulation

A third technology is available that is designed to alleviate drift problems associated with sprayers equipped with rate-controllers and capable of large spray speed fluctuations during the application process. The technology utilizing pulse width modulation (PWM) for controlling droplet size while varying application volume, speed, and pressure is available. By maintaining a constant application volume while adjusting spray pressure, operators are able to manipulate droplet size to meet changing wind and weather conditions or protect sensitive downwind areas. It is also possible to adjust application volumes without changing nozzles or adjusting pressure. This technology can also help maintain pattern uniformity when slowing in turns, for corners, and

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on hills preventing over-application at lower speeds and reducing under-application during acceleration. See additional abstract - Pulse Width Modulation to Control Spray Droplet Size for Increased Efficacy and Spray Drift Mitigation

Hoods and Shields

Spray hoods and shields have proven successful for reducing spray drift. Proper design is very critical for hoods to be beneficial. Hoods are typically designed to completely cover the boom while shields are usually placed in front or behind the boom and act strictly to shield the boom from wind. Other systems are designed to individually shield rows of sensitive crops from specific herbicides applied between the rows. Caution must still be used when highly active pesticides are used upwind of sensitive crops or around trees and gardens. Field conditions, size and added weight to modern agricultural spray systems has limited the adoption of this technology. The use of hoods or shields does not allow applicators to ignore label statements about drift. If the label states a wind speed limit, that limit must be followed.

Sensors

The use of optical sensors to actuate spray tips in combination with individual row hoods can be an effective tool in reducing spray drift. By design, the system only sprays a detected weed, and since it is not spraying all the time it is most effective for drift control because it is reducing the amount of pesticide being applied. However, in combination with improper tip selection and high pressures this technology would not be very effective.

Site-Specific Applications

Additional technologies are forthcoming that will utilize many of the above systems in combination with on-the-go site-specific application practices to help reduce drift. Sprayers utilizing prescription application maps for variable rate applications and others with sensors to identify targeted pests to apply crop protection products when and where needed are in development.

Each of the above technologies has seen limited adoption because of the additional cost added to the spray equipment. As future application guidelines regarding increased efficacy and spray drift minimization are established, more technologies will be developed and adopted. These developments will require sound research to support adoption. Additional information on each system discussed above is available by doing a basic web search. Use a key word describing the system of interest, i.e., hooded sprayers, electrostatic sprayers.