The Western Producer

Spraying: night may not be ideal time

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Research has shown that time of day can make a big difference to the effectiveness of a spray application. | File photo

> In pre-seed burndown, day applications were more effective than night and morning sprays 78 percent of the time

EDMONTON — Herbicide companies complete many trials to prove a product's worth before it's registered for use, but none of the trials include night spraying .

"The scientists wouldn't even dream of doing that," said Ken Coles, Farming Smarter general manager.

But as guidance systems improve and fewer farmers cover more acres in a tight timeframe, many producers do spray under moonlight.

To see if night spraying hampers the efficacy of commonly used herbicides Farming Smarter, based in southern Alberta, ran night spraying trials.

"We wanted to get a better handle on whether all of these crazy farmers that don't want to go home to their wives and spray all night long are sacrificing efficacy," Coles said during Science O-Rama in Edmonton.

In the trials, daytime applications were more effective 75 percent of the time than night and morning spraying.

In pre-seed burndown trials, day trials were the most effective 78 percent of the time, and on trials that looked into average controlled weeds, daytime spraying was more effective 10 percent of the time compared to morning and night spraying.

“The biggest difference in efficacy we saw (in the burndown trials) was 18 percent. So that is the difference between 80 percent control and 98 percent. When you think about weed seed bank, especially when you’re dealing with herbicide tolerance, that’s pretty significant,” Coles said.

The broadleaf in-crop studies showed broadleaf weeds are the most sensitive to the time of day they are sprayed. In those cases, daytime spraying was better than morning and night spraying 100 percent of the time with an average efficacy difference of 12 percent.

The results of the in-crop grass seed trials didn’t follow the same trend — day and night spraying each produced the best results half of the time.

“On the grass seed side of things that was a little bit different. I think it has to do with dose response,” Coles said.

He said some herbicides applied in the daylight are subject to photodegradation, and that there might be an opportunity to improve grass seed herbicides with a nighttime application.

“Some people think that the surfactants have been developed in a way that can deal with that photodegradation. I think that’s true but under tight environments we did see statistical improvements with grass seed herbicides… in a night time application.”

In the canola trial at the Lethbridge location, Coles found early morning spraying with Liberty was the worst time to spray the chemical.

“So sometimes you want to cheat and get up and start a little early with the Liberty, but that is one of the last things that I’d recommend going off the data that we’ve seen. Especially on the broadleaf weeds, we went from a 86 percent control down to a 34 percent in early morning application,” Coles said.

Most herbicides do work well in a range of conditions, but Coles said there are some different results based on environmental conditions that producers should consider.

For instance, they should know whether herbicides are contact or systemic.

Because glyphosate and Liberty were more sensitive to environmental conditions than wheat herbicides, it makes sense for producers forced to spray in the morning to spray their wheat in the morning, glyphosate and Liberty in the afternoon, and peas in the evening, Coles said.

He said there are two main reasons why spray effectiveness might change depending on the time of day — environmental conditions that hamper spray from reaching the target and environmental conditions that affect plant uptake of the applied chemicals.

To better understand why time of day influences the target acquisition of an applied product Coles discussed inversions, which he said is a known problem of night and morning spraying.

“The cool air is densest so your fine droplets are going down, but they are going down much slower than the big droplets. A heavier object is going to hit the ground harder, so the big droplets are making it through that inversion but your fine droplets aren’t. So you are actually literally missing the target. Especially with Roundup, the fine droplets are quite often the ones that are doing most of the killing,” Coles said.

He said the amount of dew is important when spraying because spray can hit the leaves and bounce off and because dew is an indicator of an inversion.

“Some people say it’s good to spray on a dew, my experience now after these studies, I don’t think I’d like to spray in dew.”

Producers can measure to see if there is an inversion by taking the temperature at the surface level, and at eight to 10 feet higher.

“Basically if at 10 feet high the temperature is higher than at 8 to 12 inches around the canopy level, than you’ve got an inversion and you will risk not getting all of your spray droplets to the target.”

As temperature goes up, relative humidity goes down, and the early morning tends to be the coldest time of the day with the highest relative humidity.

“Lots of times we think that maybe humidity is a good thing and we think that maybe the droplets aren’t going to dry as fast and the plant will have more time to absorb it. But if the droplet does not make it to the leaf then it’s definitely not going to absorb it,” Coles said.

Environmental conditions can also affect plant uptake.

For instance, in hot weather, spray can evaporate before it hits plant, and the high temperatures will also affect how the plant responds to the chemical.

“If you’re really hot the plant tends to shut down,” Coles said.

Dew can affect uptake in a positive way, because if the spray does hit the target, it can sit on the leaf for a longer time and potentially have better uptake.

However, if there is wind, dew can also negatively affect plant uptake.

“Just like when you’re wet and get out of the shower and stand in front of a fan, it’s cold. That same thing happens to the plants, which is another reason why I’m a little concerned with dew on the plant,” Coles said.

If a plant is soaking wet and there is a breeze it will likely affect plant uptake of the herbicide, he said, and that producers can use a Delta T measurement to indentify when such conditions will negatively affect their spraying.

Delta T is a measurement that helps indicate if spraying conditions are acceptable because it indicates the evaporation rate and droplet lifetime.

“Its definition is a wet bulb temperature minus the dry bulb temperature. And all that really means is they take a thermometer and wrap it in wet cloth, and what it does is it takes into account the evaporative cooling effect,” Coles said.

He said the delta T measurements produces psychrometric charts, which basically plots relative humidity on one axis and dry bulb temperature on the other.

“As the temperature goes up we get into these zones where it’s not good for spraying. When it’s really hot and dry it just isn’t making it to the target. When it’s cool with high humidity it’s also an area that’s not recommended for spraying,” Coles said.

When Coles analyzed the data from the early morning and night applications they ended up in a zone of less than 2 Delta T, which indicate spraying is not recommended.

The daytime applications ended up in a Delta T zone that is an optimum zone for spraying, according to the psychrometric chart.

Coles said producers could be more effective when spraying by checking for inversions, and using Delta T measurement.

“We’ve always focused on drift because we don’t want to hurt the neighbors crop or other sensitive crops. But I think this inversion thing is impacting efficacy,” Coles said.

Farming Smarter plans further study into using Delta T measurements to help understand the best and worst environmental conditions in which to spray .