Australia Field Trials

FACT SHEET

To effectively manage weeds, farmers need access to a variety of crop protection tools. XtendiMax® with VaporGrip® Technology (XtendiMax) is Monsanto's latest offering to help soybean and cotton farmers control weeds, including the infamous Palmer Amaranth, which can lead to 79% yield loss in soybeans if left uncontrolled. Growers using XtendiMax® reported 97% weed control satisfaction in 2017.

Dicamba, the active ingredient in XtendiMax®, was first approved by the Environmental Protection Agency (EPA) in 1967 and has been used to control weeds for decades. XtendiMax® was approved by the EPA in 2016 after comprehensive testing to ensure the product can be used safety and effectively.

UNDERSTANDING OFF-TARGET MOVEMENT

Making on-target herbicide applications is critical for effective weed control and avoiding damage to non-target plants. Product labels issued by the EPA provide instructions to help farmers avoid the two most common causes of off-target movement: 1) particle drift during application due to wind or other factors and 2) sprayer tank contamination due to insufficient cleaning.

Another type of off-target movement is volatility, which is the movement of an herbicide as a gas after spray application. While older dicamba products are known to volatize, Monsanto discovered a mechanism to reduce volatility potential by 90%. Extensive pre-launch testing of XtendiMax® confirmed the significant reduction in volatility compared to previous generations of dicamba products.

CONTINUED TESTING: LARGE-SCALE AUSTRALIA TRIALS DIFFERENTIATE DRIFT VS. VOLATILITY

During the 2017 growing season, there were some reports of dicamba moving off-target and questions about the causes. Monsanto data clearly shows volatility was not the issue. Based on the science behind XtendiMax® and learnings from the 2017 season, Monsanto is confident the new training requirement for all applicators can address the main causes of off-target movement.

METHODOLOGY: PLANT EFFECTS IN COVERED VERSUS UNCOVERED

To further build confidence in the volatility control of XtendiMax®, Monsanto continues to conduct tests to demonstrate the low volatility from labeled applications. Monsanto developed methodology to differentiate drift from volatility. Researchers use tarps to cover sections of non-dicamba tolerant plants around a central treated area of dicamba tolerant crops during, and for 30-minutes after, an application of XtendiMax®. Research then note differences in plant effects in the covered versus uncovered areas for the next several weeks.

CONDITIONS: HOT (↑105°F) WITH DAILY INVERSIONS

After the 2017 season, alongside researchers from the University of Nebraska and based on input from weed scientists from Mississippi State University and Purdue University, Monsanto researchers used the aforementioned methodology to conduct a large-scale field trial (nearly 40-acres of soybeans) in Australia. Conducting the trial in Australia, where the temperatures exceeded 105°F all three days, allowed researchers to pressure test XtendiMax® in extreme conditions. The team also detected temperature inversions, which can increase risk of off-target movement, every evening during the trial.

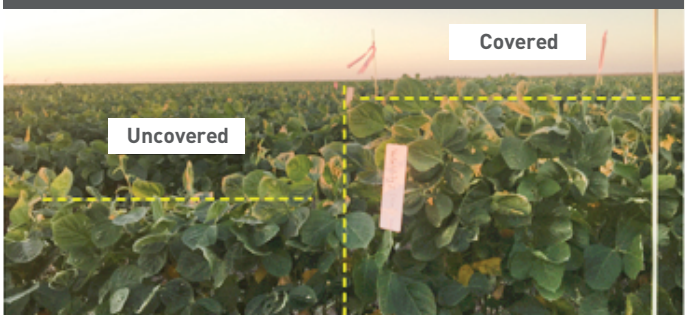
SPECIFICATIONS: FROM NOZZLE TYPE TO TARP PLACEMENT

- Location: Rowena, NSW, Australia
- Nozzles: TeeJet TTI 11004
- Tank Mix: Roundup Powermax (32 oz/ac), XtendiMax (22 oz/ac), and Intact (0.5% v/v)
- Plot Size: 384M x 390M
- Spray Volume: 15 gal/ac
- Boom Height: 24 inches above canopy
- Wind Direction and Speed: From the north at approx. 6 to 8 mph
- Tarp Placement: 5M, 20M, and 35M from treated area

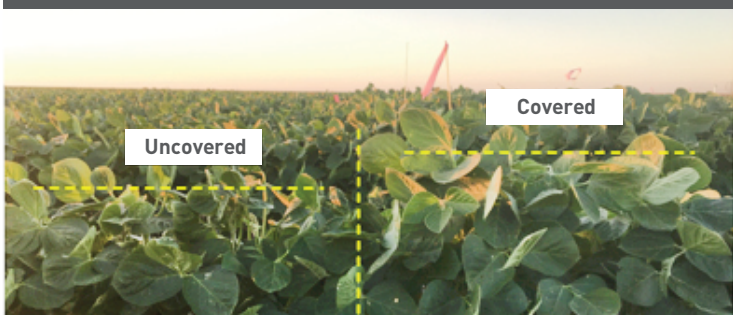
RESULTS: REAFFIRMED VOLATILITY NOT A SIGNIFICANT CONTRIBUTOR TO OFF-TARGET MOVEMENT AND SPRAY DRIFT IS MANAGED WITH APPLICATION REQUIREMENTS

RESEARCHERS REMOVED THE TARPS 30 MINUTES AFTER APPLICATION AND THEN DOCUMENTED SYMPTOMS FOR 27 DAYS AFTER THE APPLICATION. AFTER 27 DAYS, THE PLANTS THAT WERE UNDER TARPS AT 5M SHOWED ONLY MINIMAL SYMPTOMS AND BY 20M THE SYMPTOMS DIMINISHED. THE VERY LIMITED SYMPTOMS OBSERVED IN THE PLANTS THAT WERE COVERED DURING APPLICATION CLEARLY SHOW VOLATILITY IS NOT A SIGNIFICANT CONTRIBUTOR TO OFF-TARGET MOVEMENT WHEN THE PRODUCT LABEL INSTRUCTIONS ARE FOLLOWED.

At 5M downwind. Minimal symptoms in covered plants. Confirms drift is primary cause of off-target movement.



At 20M downwind. No symptoms due to volatility and drift effects lessened



Note: Just prior to the trials, some 2,4-D herbicide drifted from a nearby farm onto the soybean test plot. The impact was minimal but the drift event must be noted. Researchers adjusted plans and placed tarps in a way to minimize the impact of the drift event on the reliability of the field trial results.

FLUX DATA: AIR SAMPLING TO MEASURE RATE OF DICAMBA VOLATILITY

Consistent with studies previously submitted to the Environmental Protection Agency (EPA), the researchers also captured air samples in the center of the treated area to calculate FLUX, which is the rate of dicamba volatility. Air samplers were placed at different heights to determine the changes in dicamba concentration and account for wind effects. The results reaffirmed previous learnings that most dicamba is detected in the first six hours and by 72 hours are very low. Indeed, dicamba is either readily absorbed by plant tissue or degraded by soil microbes and oxygen. FLUX measurements, coupled with the covered versus uncovered plant effect observations, provide a conclusive method for differentiating between effects from drift and volatility.

Consistent with previous testing, the Australia field trials conclusively show – even under extreme environmental conditions – that volatility is not a significant contributor to off-target movement when XtendiMax is used according to the label requirements.