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What Can You Expect for 2018

Updated Label Highlights

Volatility Research

Key Learnings from 2017 Season

Agenda

Roundup Ready® Xtend Crop System

Pitts-0197.0003
In the 2018 season, Roundup Ready® Xtend® soybeans to have supply for 40+M acres of Monsanto + Licensee partners expected.

- 6+M acres of cotton with Xtend® Flex® technology.
- 20+M acres of Roundup Ready® Xtend® soypeans.

Strong demand in 2017 season.

Roundup Ready® Xtend Crop System.
All growers surveyed were required to have 50+ acres of Roundup Ready 2 Xtend® soybeans or cotton with Xtendflex® Technology and treat at least some acres with Xtendimax® with VaporGrip® Technology to qualify.

Summary of Inquiries (as of 10-26-17)

Learnings from 2017 Season
Spraying weeds less than 4".

Reduce ground speed in areas with excessive weed populations.

Apply utilizing upper end of specified pressure range at boom. When DRA required DO NOT combine with other DRA containing products.

Apply in a minimum of 15 GPA or spray solution (label updated to require).

Best Management Practices:

- Timings of activity similar to glyphosate (up to 2 weeks).
- Cooler temperatures can delay response (early season).
- Expectations of dicamba activity.
- Inconsistent mixing order & lack of agitation in spray tank.
- Spray volume > 15 GPA when utilizing required DRA in tank mix.
- Use of multiple drift reducing adjuvants (DRA) in tank mix.
- Inadequate coverage caused by:
  - Applications to areas with excessive weed populations.
  - Applications from 2017 season.

XtendMax® Weed Performance Inquiries - Summary.
Inquiries OTM Application - Temperature Frequency (No Correlation)

Learning from 2017 Season
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MAP

- Total Monsanto Inquiries: 26
  - Wayne County, IL
  - Total Monsanto Inquiries: 282
- Central Region
  - Total Monsanto Inquiries: 20
    - Cottonwood County, MN
    - Total Monsanto Inquiries: 265
- North Region

XtendiMax® Applications from May 1 – August 24 Reported by applicator

Applicator OTM Inquiries & Regional Maps

Learnings from 2017 Season
Climate Corporation

Validating environmental conditions and analyzing publicly available weather data to support the

- No Sensitive Crops Downwind
- Nozzle Pressure
- Approved Tank Mixes & Use of DRAS
- Wind Speed
- Boom Height
- Ground Speed
- Application Volume
- Application Rate
- Approved Nozzle
- Required Buffer

Evaluating compliance with 10 Key label requirements based on applicator self-reported data including:

- Inquiries by applicators of XtendiMax® with VaporGrip® Technology regarding possible off-target movement

Applicator OTM Inquiries – National (as of 10-26-17)

Learning from 2017 Season
CHECRED THAT COULD HAVE CONTRIBUTED TO O/TM

SELF-REPORTED ERRORS FROM ONE OR MORE LABEL REQUIREMENTS
INFORMATION WAS AVAILABLE (1, 1.14 OF 1, 222), APPLICATORS HAVE
COMPLETE

- 1.9% of the cases evaluated to date in which complete
- Climatological evaluation
- 1,222 applicators supplied sufficient data for review and
- 1,448 site visits thus far
- 1,467 applicator inquiries to date
- Possible off-target movement

Inquiries by applicators of XtendiMax® with regard

Applicator O/TM Inquiries - National (as of 10-26-17)

Learnings from 2017 Season
Through testing, supporting applicators concerned about possible contamination.

- Direction and inversion potential
- Climate Corp's environmental & weather data on wind speed,
- Details for downwind susceptible crops
- Application delivery check (nozzle, pressure, speed & GPA)

Continuing to Evaluate Following Aspects:

- Some applicators self-reported multiple application errors
- In 76% of cases (995 out of 1,222)
- Most commonly self-reported cases was inadequate buffer
- Inadequate buffer was reported on more than 90% of the time

| Application Volume | 9 |
| Ground Speed | 10 |
| Wind Speed | 39 |
| Application Rate | 64 |
| Nozzle Pressure*** | 66 |
| Nozzle Selection | 104 |
| Boom Height | 157 |
| Tank Mix | 269 |

**Required Buffer/Do Not**

- Downwind Crop
- Spray Susceptible

**Application**

- Buffer/Do Not
- Application

Applicator OTM Inquiries - National (as of 10-26-17)

Learning from 2017 Season

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XtendiMax® during soybean applications in 2017

Grower Survey: Most common products tank mixed with XtendiMax® with Vapogrip® Technology Grower Survey - August 2017
Factors in some cases

Proximity to fields where unapproved products may have been utilized may also be

- When 3 mph
  application window either exceeded 1.5 mph (or 1.0 mph in states with a 1.0 mph restriction) or was less
  application window was exceeded. 4% of the time of 279 cases, NOAA weather data suggests that the wind speed during the reported
- 24% of the time of the time of the 279 cases, NOAA weather data suggests that the wind speed during the reported

- Time applications:
  inversion based on HRRR modeling of NOAA weather information, A large majority of these were night
  Okeham weather data in the 279 cases, weather data suggests that inversion conditions were conducive to an
  16% of the time of the 190 cases, weather data suggests that inversion conditions were conducive to an

- Reliability weather data from NOAA, to see how it compared with what the applicator reported
  also modeled in-field conditions at the time of application, based on the historical

- Could have contributed to OTM
  applicators self-reported errors from one or more label requirements checked that
  In 91% of the cases evaluated to date in which complete information was available

Summary - Applicator OTM Inquiries (as of 10-26-17)
- Conditions to understand application
- Related insights for specific field
- Using additional weather
- Past season applications that were visited this in process of following up with
- Field Engagement Specialists

OTM Applicator Inquiries - Follow-up Efforts
Gravels to identify an inversion
- Exploring additional tools that may be available for
  dirt potential can be high
  specifically states not to apply during an inversion as
  Important to highlight that the label for XenidMax®
  Instances in 2017
  Inversions did play a role in some
  Initial assessment suggests that

OTM - Temperature Inversions (form of physical drift)

Learnings from 2017 season
Stability Class-Frequency for a Given Hour in June, 2017

Temperature Inversions - Consistent & Predicable
### Physical Drift Can Cause Broad Uniform Symptomology

Importance of Nozzle Selection & Boom Height

<table>
<thead>
<tr>
<th>Condition</th>
<th>Distance</th>
<th>Not Approved</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.5-3.3%</td>
<td>42-82</td>
<td></td>
</tr>
<tr>
<td>&gt; 3.5%</td>
<td>69-138</td>
<td></td>
</tr>
<tr>
<td>3.4-5.6%</td>
<td>201-358</td>
<td></td>
</tr>
<tr>
<td>11.7-22.3%</td>
<td>54-174</td>
<td></td>
</tr>
<tr>
<td>17.7-18</td>
<td>349-422</td>
<td></td>
</tr>
<tr>
<td>High Viscosity</td>
<td>VC</td>
<td></td>
</tr>
<tr>
<td>Variable Capacity</td>
<td>VC</td>
<td></td>
</tr>
<tr>
<td>Extreme Capacity</td>
<td>XC</td>
<td></td>
</tr>
<tr>
<td>Medium Capacity</td>
<td>M</td>
<td></td>
</tr>
</tbody>
</table>

Rows on wind, flow, MPH
Impact of Hedge
Greater 15 mph, MPH
Temp inversion, MPH
Less 10 mph, MPH

Smoke Test (Nebraska)

**Driftable Finishes**

**Nozzles**

**Distance**

**Droplets**
Other Potential Causes That Must Be Considered

- Product contamination
- Misdiagnoses of symptomology
- Bulk handling and mixing
- Application equipment hygiene
- Applications of other products to fields in proximity to field with reported symptomology (E.g. corn)

Learnings from 2017 Season
Successful application of Xtendimax ® with Vapogrip ® technology
addressed through education, training and following the product label for
identifiable factors that contribute to drift are controllable and can be readily

Majority of the cases drift (not volatility) appears to be the cause of off-target movement.

- In our evaluation, products and possible contamination of other products are important factors that were not reflected.

Because our evaluation was with Xtendimax ® users, illegal use of non-approved dicamba

- Factors that are leading to off-target movement are readily identifiable

Based on our evaluation in the vast majority of cases where Xtendimax ® was used the

**Summary**

Learning from 2017 Season
What Have We Learned from Volatility Research
When applying XtendiMax® and following all label requirements — Conﬁdent the symposiumology in the ﬁelds is not attributable to volatility

Based on Monsanto's extensive testing and ﬁeld observations

- Geographical, environmental conditions & surfaces
- Field studies that were representative of multiple ﬁeld conditions including varying
- Controlled tests in various laboratory environments (humidome & hoophouse)
- 1200+ controlled tests and ﬁeld studies

Monsanto has conducted extensive volatility testing since 2009

What Have We Learned from Volatility Research

Conﬁdence in XtendiMax® with VaporGrip® Technology
Dicamba Off Target Movement

- Symptomology normally appears on new growth in soybeans typically 7 to 21 days after exposure.
- Timing of exposure, level of exposure and growing conditions after exposure are some of the factors that could impact potential yield response.
- Weeds will often demonstrate symptomology more quickly following application.

Existing Leaves at time of dicamba exposure

New leaf growth 7 to 21 days after dicamba exposure
Within the first 24 hours, 90% of any potential volatility occurs measured 5 meters from edge of field.

Modelled air concentration was matched with the highest testing standards (California or similar) for Dicamba Air Concentration (ng/l/minute) and in-crop to plant tissue.

Compared applications to bare ground.

Typical growing areas (Texas & Georgia) Test locations were representative of.

A visual response outside of the treated fields.

Field volatility studies do not demonstrate levels that would produce Confidence in XtendiMax® with VaporGrip® Technology.