2019 Auxin Specific Applicator Training

Training and Education for use of approved dicamba and 2,4-D herbicides

TEXAS A&M AGRILIFE EXTENSION

THESE TRAINING MATERIALS ARE DESIGNED TO SATISFY FEDERAL TRAINING REQUIREMENTS AND THE TRAINING AND APPLICATION REQUIREMENTS IMPOSED BY THE TEXAS DEPARTMENT OF AGRICULTURE. V1-12/18

Training For Approved Dicamba & 2,4-D Formulations

- This training satisfies the
  - US EPA requirement for mandatory dicamba applicator training
  - Texas Dept Ag (TDA) requirement for auxin specific training for approved dicamba and 2,4-D formulations
- This training is not a substitute for the state-specific Certified Applicator training which is required to purchase and use Restricted Use Pesticides
- This training certifies you to use approved auxin formulations for the 2019 season only
- Qualifies you for 2 CEU's of Laws and Regs??

THESE TRAINING MATERIALS ARE DESIGNED TO SATISFY FEDERAL TRAINING REQUIREMENTS AND THE TRAINING AND APPLICATION REQUIREMENTS IMPOSED BY THE TEXAS DEPARTMENT OF AGRICULTURE. V1-12/18

Training For Approved Dicamba Formulations

The following dicamba formulations are approved for use on dicamba-tolerant and certain conventional crops and are covered by this training:

- **Engenia® herbicide (BASF)**
  - www.engeniaherbicide.com
  - Tank-mixtures: www.engeniatankmix.com
- **XtendiMax® herbicide with VaporGrip® Technology (Bayer)**
  - xtendimaxapplicationrequirements.com
- **DuPont® FeXapan® herbicide Plus VaporGrip Technology**
  - www.dupont.com/products-and-services/crop-protection/soybean-protection/articles/fexapan-application.html

Always read and follow the specific product label.

These products are US EPA Restricted Use Pesticides & State limited use in TX
For retail sale to and use only by certified applicators.

Training For Approved 2,4-D Formulations

The following 2,4-D formulations are approved for use on 2,4-D tolerant crops and certain conventional crops and are covered by this training:

- **Enlist One™**
- **Enlist Duo®**
  - www.EnlistTankMix.com
  - Always read and follow the specific product label.

These products are State limited use pesticides in TX.

For retail sale to and use only by certified applicators or those working under the supervision of a certified applicator.

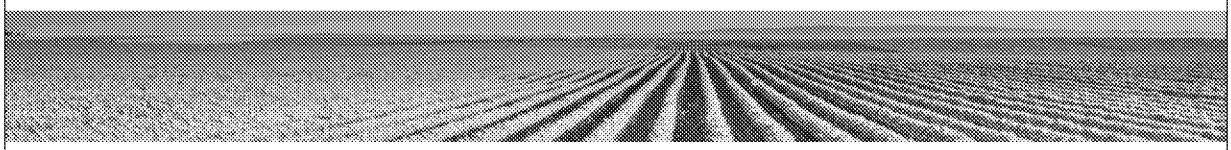
THESE TRAINING MATERIALS ARE DESIGNED TO SATISFY FEDERAL TRAINING REQUIREMENTS AND THE TRAINING AND APPLICATION REQUIREMENTS IMPOSED BY THE TEXAS DEPARTMENT OF AGRICULTURE. V1-12/18

Clarify the difference between SLUP and RUP

Training For Approved Auxin Formulations

Topics:

- Why do Auxin herbicides require additional precautions
- Label requirements for approved auxin formulations
- Understanding temperature inversions
- Spray system hygiene
- Record keeping
- Using dicamba and 2,4-D in a weed management system
- Summary

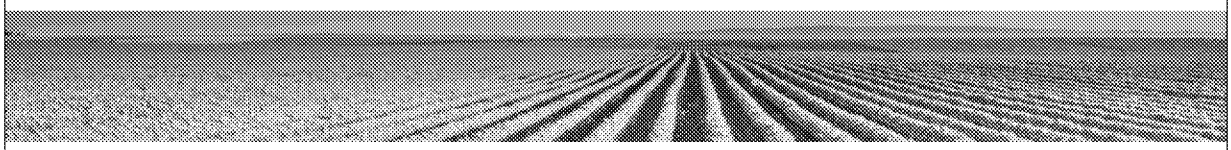


THESE TRAINING MATERIALS ARE DESIGNED TO SATISFY FEDERAL TRAINING REQUIREMENTS AND THE TRAINING AND APPLICATION REQUIREMENTS IMPOSED BY THE TEXAS DEPARTMENT OF AGRICULTURE. v1-12/18

Training For Approved Auxin Formulations

Topics:

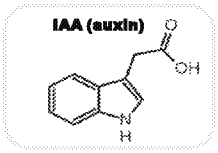
- Why do Auxin herbicides require additional precautions
- Label requirements for approved auxin formulations
- Understanding temperature inversions
- Spray system hygiene
- Record keeping
- Using dicamba and 2,4-D in a weed management system
- Summary

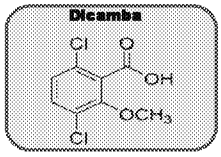


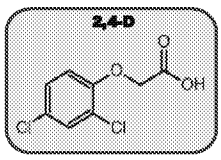
THESE TRAINING MATERIALS ARE DESIGNED TO SATISFY FEDERAL TRAINING REQUIREMENTS AND THE TRAINING AND APPLICATION REQUIREMENTS IMPOSED BY THE TEXAS DEPARTMENT OF AGRICULTURE. v1-12/18

Dicamba & 2,4-D are Synthetic Auxin Herbicides

- **Synthetic auxins are very effective herbicides**
  - Broadleaf plants (dicots) are very susceptible
  - Grass plants (monocots) are generally tolerant
- **Effect on plant growth is "systemic"**
- **Symptomology can develop at very low rates**
  - Only affects new growth
  - Visual symptoms are delayed

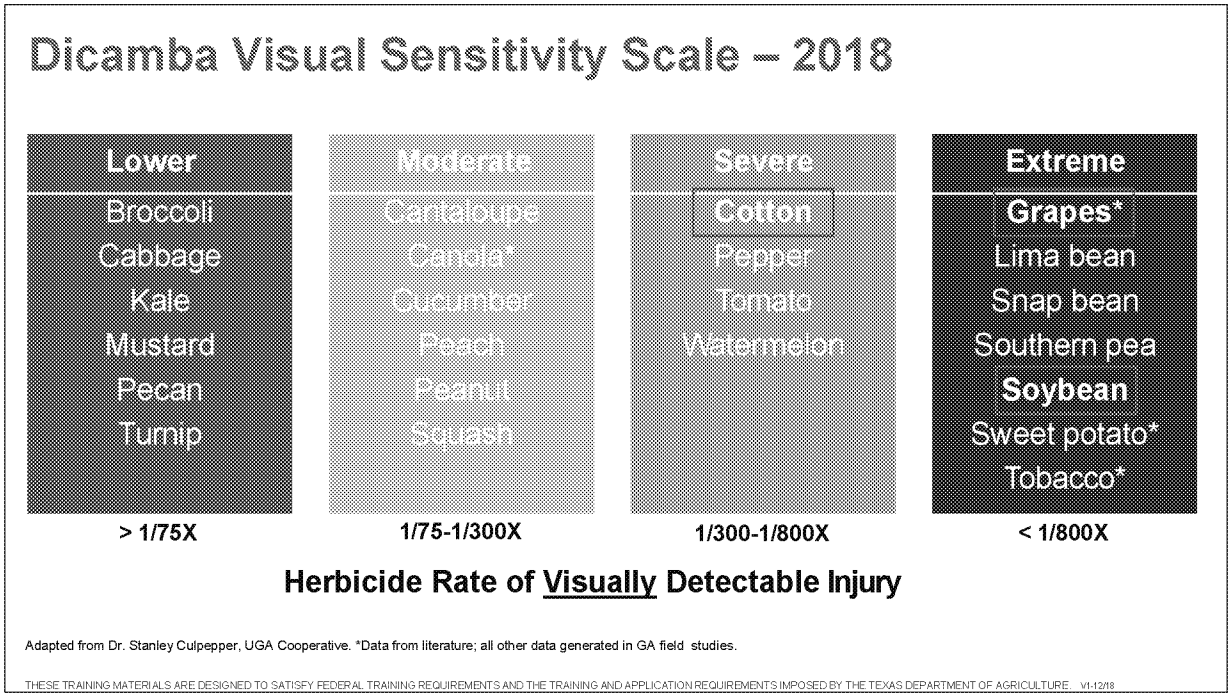






Very low rates can cause symptomology in new growth

THESE TRAINING MATERIALS ARE DESIGNED TO SATISFY FEDERAL TRAINING REQUIREMENTS AND THE TRAINING AND APPLICATION REQUIREMENTS IMPOSED BY THE TEXAS DEPARTMENT OF AGRICULTURE. V1-12/18



This is a scale to show

2,4-D Visual Sensitivity Scale - 2018

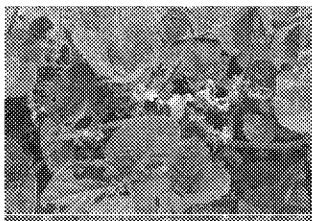
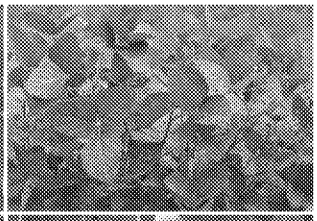
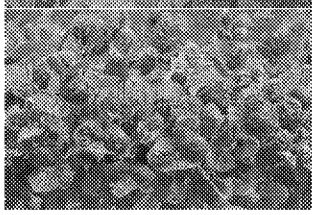
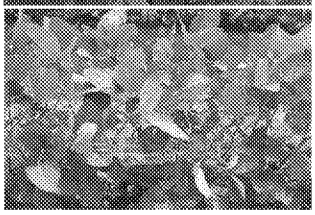
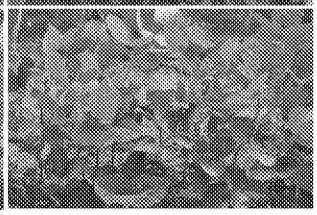
Lower	Moderate	Severe	Extreme
Broccoli Cabbage Kale Mustard Onions Peaches Peanut Pecan Turnip	Cantaloupe Canola Cucumber Soybean Squash	Pepper Tomato Watermelon	Cotton Grapes* Sweet potato* Tobacco*
> 1/75X	1/75-1/300X	1/300-1/800X	< 1/800X

Herbicide Rate of Visually Detectable Injury

Adapted from Dr. Stanley Culpepper, UGA Cooperative. *Data from literature; all other data generated in GA field studies.

THESE TRAINING MATERIALS ARE DESIGNED TO SATISFY FEDERAL TRAINING REQUIREMENTS AND THE TRAINING AND APPLICATION REQUIREMENTS IMPOSED BY THE TEXAS DEPARTMENT OF AGRICULTURE. V1-12/18

Soybean Sensitivity To Herbicides

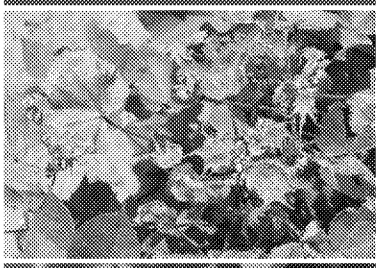
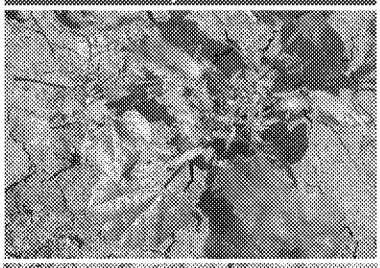
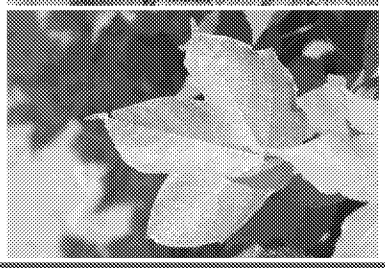
Rate	Dicamba	Glufosinate	Glyphosate
1/100 of field rate			
1/1000 of field rate			

Soybeans are extremely sensitive to dicamba relative to other herbicides

2017 BASF field research trials

THESE TRAINING MATERIALS ARE DESIGNED TO SATISFY FEDERAL TRAINING REQUIREMENTS AND THE TRAINING AND APPLICATION REQUIREMENTS IMPOSED BY THE TEXAS DEPARTMENT OF AGRICULTURE. v1-12/18

Cotton Sensitivity To Herbicides

Rate	Dicamba	Rate	2,4-D
1/10 of field rate		1/28 of field rate	
1/500 of field rate		1/500 of field rate	

Cotton is much more sensitive to 2,4-D compared to dicamba

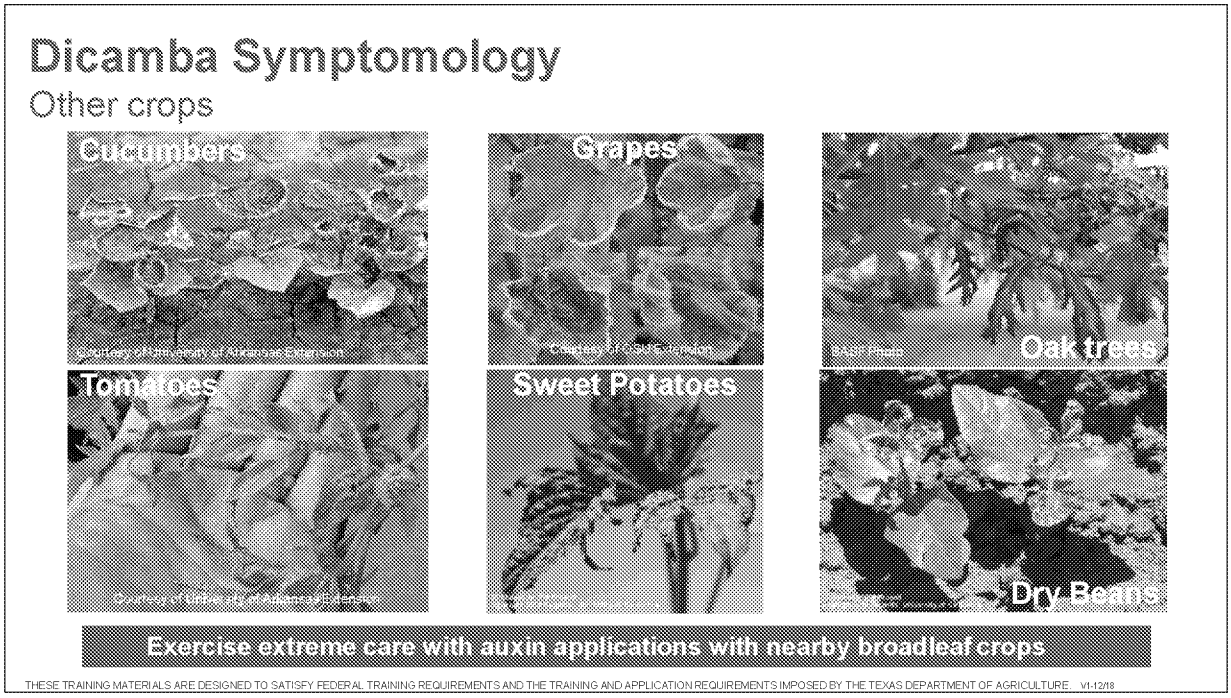
THESE TRAINING MATERIALS ARE DESIGNED TO SATISFY FEDERAL TRAINING REQUIREMENTS AND THE TRAINING AND APPLICATION REQUIREMENTS IMPOSED BY THE TEXAS DEPARTMENT OF AGRICULTURE. V1-12/18

Cotton Sensitivity To Herbicides

Rate	Dicamba	Rate	2,4-D

Add slide from Adam Hixon/Pete Dotray with cotton leaf photos demonstrating the difference in cotton response

THESE TRAINING MATERIALS ARE DESIGNED TO SATISFY FEDERAL TRAINING REQUIREMENTS AND THE TRAINING AND APPLICATION REQUIREMENTS IMPOSED BY THE TEXAS DEPARTMENT OF AGRICULTURE. V1-12/18



This can affect much more than just surrounding ag related crops, potential for gardens, orchards, and wooded area injury.

Synthetic Auxin Herbicides

Summary

- Dicamba and 2,4-D are synthetic auxin herbicides
- Most dicot plants are very sensitive to synthetic auxin herbicides
- Extremely low doses (below 1% of a full rate) can cause auxin like symptoms
- Product labels must be carefully followed to prevent both drift to sensitive species or spray system contamination

Following application requirements is critical to mitigate off-target movement

THESE TRAINING MATERIALS ARE DESIGNED TO SATISFY FEDERAL TRAINING REQUIREMENTS AND THE TRAINING AND APPLICATION REQUIREMENTS IMPOSED BY THE TEXAS DEPARTMENT OF AGRICULTURE. V1-12/18

Training For Approved Auxin Formulations

Topics:

- Why do Auxin herbicides require additional precautions
- **Label requirements for approved auxin formulations**
- Understanding temperature inversions
- Spray system hygiene
- Record keeping
- Using dicamba and 2,4-D in a weed management system
- Summary

THESE TRAINING MATERIALS ARE DESIGNED TO SATISFY FEDERAL TRAINING REQUIREMENTS AND THE TRAINING AND APPLICATION REQUIREMENTS IMPOSED BY THE TEXAS DEPARTMENT OF AGRICULTURE. V1-12/18

Approved Auxin Formulations

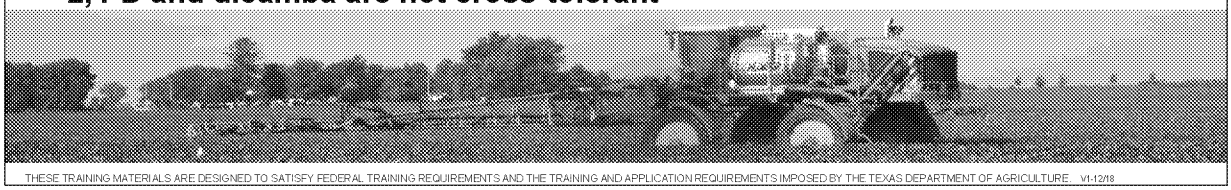
Key elements for on-target applications in auxin-tolerant crops

Dicamba - Only Engenia®, Xtendimax® and FeXapan® herbicides are registered for use on dicamba tolerant cotton and soybeans.

2,4-D - Only Enlist One™ and Enlist Duo® herbicides are registered for use on Enlist™ tolerant crops.

Use of other dicamba or 2,4-D formulations is illegal and applicators could be subjected to significant fines by regulatory authorities.

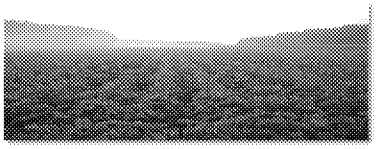
2,4-D and dicamba are not cross-tolerant

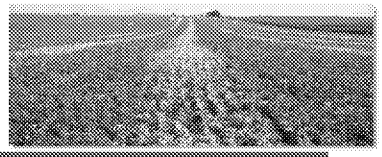


THESE TRAINING MATERIALS ARE DESIGNED TO SATISFY FEDERAL TRAINING REQUIREMENTS AND THE TRAINING AND APPLICATION REQUIREMENTS IMPOSED BY THE TEXAS DEPARTMENT OF AGRICULTURE. V1-12/18

Mechanisms of off-target movement

- **Primary:**
  - Wind transport of spray particles
    - Including temperature inversion
  - Tank/equipment contamination
- **Secondary:**
  - Water movement
  - Volatility





Approved dicamba & 2,4-D formulations and label requirements address these mechanisms of off-target movement

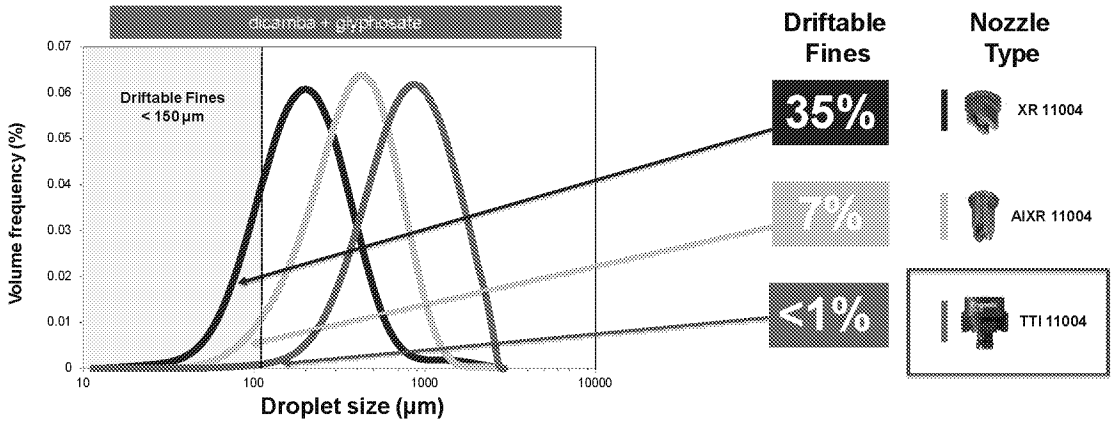
THESE TRAINING MATERIALS ARE DESIGNED TO SATISFY FEDERAL TRAINING REQUIREMENTS AND THE TRAINING AND APPLICATION REQUIREMENTS IMPOSED BY THE TEXAS DEPARTMENT OF AGRICULTURE. V1-12/18

Key elements for on-target applications

1. **Nozzles and boom height**
2. **Wind speed/direction and buffers**
3. **Tank mixtures**
4. **Avoid temperature inversions**
5. **Spray system hygiene**

THESE TRAINING MATERIALS ARE DESIGNED TO SATISFY FEDERAL TRAINING REQUIREMENTS AND THE TRAINING AND APPLICATION REQUIREMENTS IMPOSED BY THE TEXAS DEPARTMENT OF AGRICULTURE. v1-12/18

Nozzle Selection



Go to website of approved dicamba formulation for list of nozzles
Check the Enlist product labels for approved list of nozzles

THESE TRAINING MATERIALS ARE DESIGNED TO SATISFY FEDERAL TRAINING REQUIREMENTS AND THE TRAINING AND APPLICATION REQUIREMENTS IMPOSED BY THE TEXAS DEPARTMENT OF AGRICULTURE. V1-12/18

Nozzle Selection Requirement

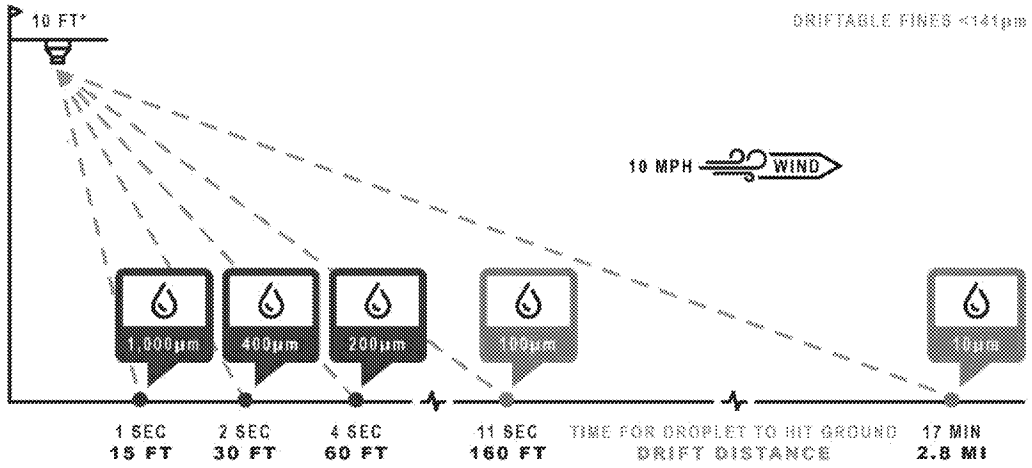
Nozzle Type

- Use only approved nozzles within the pressure ranges listed on the specific product websites for dicamba or on the label for Enlist One and Enlist Duo.
- **Do not use** any nozzle and pressure combination not specifically listed on the label or the specific product website.
- Applicators are required to consult specific product website no more than 7 days before application for a complete list of nozzles, DRAs, and other herbicides, pesticides, and additives approved for use with dicamba.

THESE TRAINING MATERIALS ARE DESIGNED TO SATISFY FEDERAL TRAINING REQUIREMENTS AND THE TRAINING AND APPLICATION REQUIREMENTS IMPOSED BY THE TEXAS DEPARTMENT OF AGRICULTURE. V1-12/18

Control the Controllable

Effect of Droplet Size Over Fall of 10 Feet



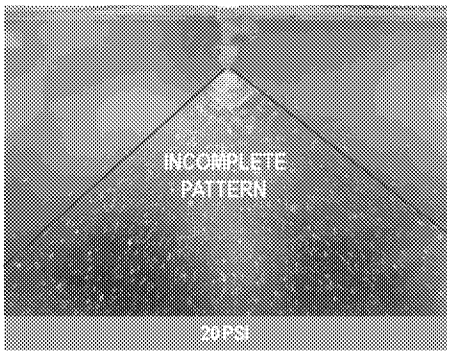
Adapted from: Ross and Lembi, 1985 *Ten foot boom height for illustrative purposes only.

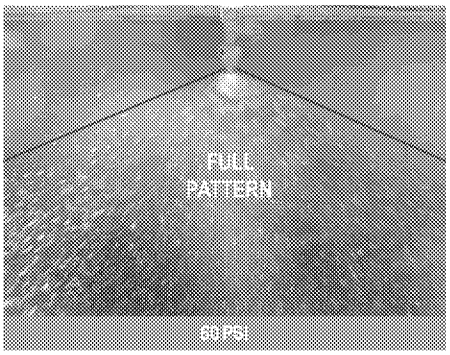
THESE TRAINING MATERIALS ARE DESIGNED TO SATISFY FEDERAL TRAINING REQUIREMENTS AND THE TRAINING AND APPLICATION REQUIREMENTS IMPOSED BY THE TEXAS DEPARTMENT OF AGRICULTURE. V1-12/18

TTI 11004 NOZZLE AT VARIABLE OPERATING PRESSURE RANGE

Dicamba (0.5 lb ae/acre) + Roundup PowerMAX® herbicide (1.125 lb ae/acre) + DRA (0.5% V/V)

Both pressures shown below are within approved range; yet higher PSI improves coverage





THESE TRAINING MATERIALS ARE DESIGNED TO SATISFY FEDERAL TRAINING REQUIREMENTS AND THE TRAINING AND APPLICATION REQUIREMENTS IMPOSED BY THE TEXAS DEPARTMENT OF AGRICULTURE. V1-11/17

Nozzle Selection

THESE TRAINING MATERIALS ARE DESIGNED TO SATISFY FEDERAL TRAINING REQUIREMENTS AND THE TRAINING AND APPLICATION REQUIREMENTS IMPOSED BY THE TEXAS DEPARTMENT OF AGRICULTURE. v1-12/18

Boom Height Requirement*

Key for consistency of nozzle performance

24” **Maximum Boom Height Above Target**

*dicamba required / 2,4-D recommended

48” height can increase drift potential by 5.6 times**

**Based on increased deposition at 110” in AGDISP modelling comparing 24” vs. 48” above target with approved TTI 11004 at 60 PSI

THESE TRAINING MATERIALS ARE DESIGNED TO SATISFY FEDERAL TRAINING REQUIREMENTS AND THE TRAINING AND APPLICATION REQUIREMENTS IMPOSED BY THE TEXAS DEPARTMENT OF AGRICULTURE. V1-12/18

Wind Speed Requirements

Apply when winds are 3 to 10 mph

Wind Speed	Label Requirement
< 3 mph	**DO NOT** spray
3 to 10 mph*	Spray **ONLY IF** wind is blowing away from neighboring sensitive crops or residential areas
> 10 mph	**DO NOT** spray

Additional state restrictions may apply

*Sustained wind speed, but consider potential of wind gusts based on frequency and speed of "gust". Measure wind speed as an average over 2 minutes.

Monitor wind speed and direction during application and adjust accordingly

THESE TRAINING MATERIALS ARE DESIGNED TO SATISFY FEDERAL TRAINING REQUIREMENTS AND THE TRAINING AND APPLICATION REQUIREMENTS IMPOSED BY THE TEXAS DEPARTMENT OF AGRICULTURE. V1-12/18

Below 3 mph is at high risk for being a temperature inversion and wind direction can be more variable.

Wind Speed

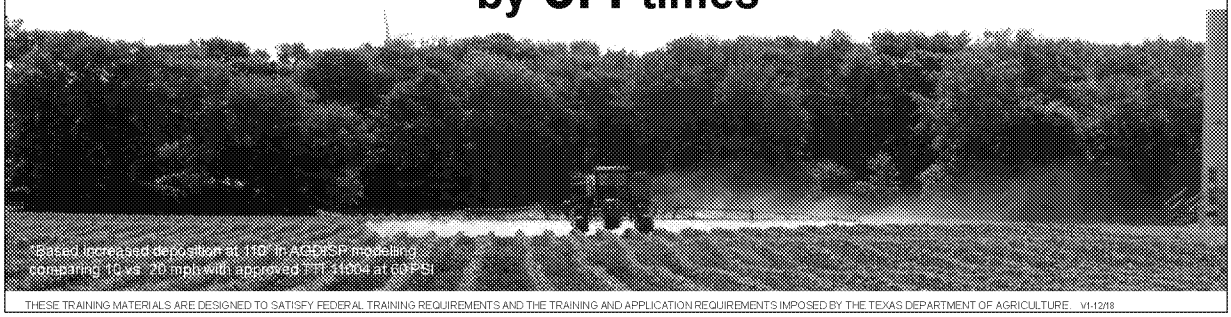
Influence on physical spray drift

Doubling wind speed

(i.e. from 10 to 20 MPH)

can increase potential drift

by 3.4 times*



*Based increased deposition at 110' in AGDISP modeling comparing 10 vs. 20 mph with approved TT-11004 at 60 PSI

THESE TRAINING MATERIALS ARE DESIGNED TO SATISFY FEDERAL TRAINING REQUIREMENTS AND THE TRAINING AND APPLICATION REQUIREMENTS IMPOSED BY THE TEXAS DEPARTMENT OF AGRICULTURE. v1-12/18

Sensitive Areas and Crops

Know your surroundings prior to application

- Survey surroundings for potential neighboring sensitive areas and crops
- Visit with your neighbors on their cropping plans around your fields
- TX does not have an active sensitive crop registry (Consult sensitive crop registries for location of specialty crops and other sensitive sites)

Dicamba Specific

- Consult www.epa.gov/espp or call 1-844-447-3813 and follow any county specific dicamba use restrictions for corresponding endangered species
- Record areas of potential buffer zones around all edges of the field
- Document your efforts to identify sensitive crops

Improve decision making with prior knowledge of your surroundings

THESE TRAINING MATERIALS ARE DESIGNED TO SATISFY FEDERAL TRAINING REQUIREMENTS AND THE TRAINING AND APPLICATION REQUIREMENTS IMPOSED BY THE TEXAS DEPARTMENT OF AGRICULTURE. V1-12/18

Sensitive Areas, Sensitive Crops & Residential Areas

Buffer zones and when not to spray - Dicamba

Category	Examples	Application Requirement
Sensitive Areas: Bodies of water and non-residential, uncultivated areas that may harbor sensitive plants	• Native vegetation • Woodland • Bodies of water	**110' downwind buffer (0.5 lb ae/ac)** **220' buffer (>0.5 to 1 lb ae/ac)** **<u>Endangered Species Counties:</u>** **57' buffer on remaining sides**
Sensitive Crops and Residential Areas	• Non-dicamba-tolerant soybeans and cotton • Fruiting vegetables (e.g., tomatoes) • Tobacco • Grapes • Fruit trees • Homesteads	**DO NOT spray if these are neighboring and downwind**

Know your surroundings before you make a dicamba application

THESE TRAINING MATERIALS ARE DESIGNED TO SATISFY FEDERAL TRAINING REQUIREMENTS AND THE TRAINING AND APPLICATION REQUIREMENTS IMPOSED BY THE TEXAS DEPARTMENT OF AGRICULTURE. V1-12/18

Sensitive Areas and Susceptible Crops

Buffer zones and when not to spray - Enlist

Category	Examples	Application Requirement
Sensitive Areas: areas identified that may be potential habitat or locations of protected species	• Wooded areas • Pasture • Roadside ditch • Lawns and gardens • Tree Plantation	**30' downwind buffer**
Susceptible Crops	• Non-2,4-D-tolerant cotton • Fruiting vegetables (e.g., tomatoes) • Tobacco • Grapes • Fruit trees • Homesteads	**DO NOT spray if these are neighboring and downwind**

Know your surroundings before you make a 2,4-D application

THESE TRAINING MATERIALS ARE DESIGNED TO SATISFY FEDERAL TRAINING REQUIREMENTS AND THE TRAINING AND APPLICATION REQUIREMENTS IMPOSED BY THE TEXAS DEPARTMENT OF AGRICULTURE. V1-12/18

Buffer Zone Requirement - Dicamba

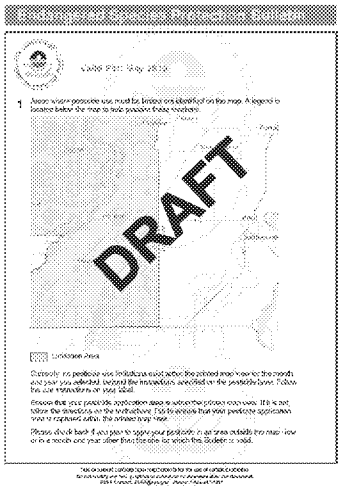
- **Applicators must maintain a 110 foot buffer from the downwind field edge**
- Non-Sensitive Crops and Areas may be included as part of the buffer:
  1. Roads, paved or gravel surfaces, **mowed and/or managed areas** adjacent to the field, such as roadside rights-of-way
  2. Agriculture fields that have been prepared for planting
  3. Planted Agricultural Fields to DT soybeans, DT cotton, asparagus, corn, sorghum, proso millet, small grains, and sugarcane
  4. Areas covered by the footprint of a building, shade house, silo, feed crib, or other man made structure with walls and or roof

Buffer zone determination is a record keeping requirement

THESE TRAINING MATERIALS ARE DESIGNED TO SATISFY FEDERAL TRAINING REQUIREMENTS AND THE TRAINING AND APPLICATION REQUIREMENTS IMPOSED BY THE TEXAS DEPARTMENT OF AGRICULTURE. V1-12/18

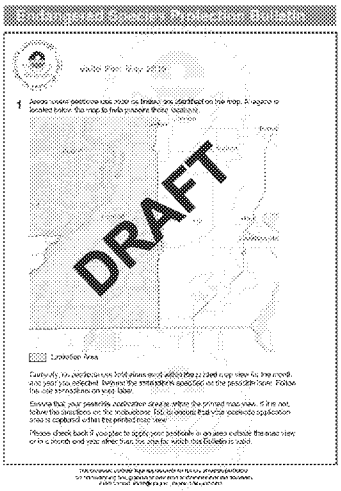
Endangered Species Buffer Zone Requirement – Dicamba

- **Some counties may potentially harbor threatened or endangered species**
- Fields in these counties require a 110 foot downwind buffer **plus a 57 foot buffer** on all other sides of the field
- Non-Sensitive Crops and Areas may be included as part of the required buffer zones
- Bulletins showing these counties can be found at www.epa.gov/espp/ or call 1-844-447-3813



Buffer zone determination is a record keeping requirement

Endangered Species Buffer Zone Requirement – Dicamba



Add list of endangered species counties in TX or a map

THESE TRAINING MATERIALS ARE DESIGNED TO SATISFY FEDERAL TRAINING REQUIREMENTS AND THE TRAINING AND APPLICATION REQUIREMENTS IMPOSED BY THE TEXAS DEPARTMENT OF AGRICULTURE. V1-12/18

Buffer Zone Requirement - Enlist

- **Applicators must maintain a 30 foot buffer from the downwind field edge**
- Non-Sensitive Crops and Areas may be included as part of the buffer:
  1. Roads, paved or gravel surfaces
  2. Agriculture fields that have been prepared for planting
  3. Planted Agricultural Fields to rice, peanuts, corn, sorghum, soybeans, wheat, alfalfa
  4. Areas covered by the footprint of a building, shade house, silo, feed crib, or other man made structure with walls and or roof

30 ft. buffers do not apply to downwind susceptible crops, including non-Enlist cotton. DO NOT SPRAY when adjacent susceptible crops are downwind.

THESE TRAINING MATERIALS ARE DESIGNED TO SATISFY FEDERAL TRAINING REQUIREMENTS AND THE TRAINING AND APPLICATION REQUIREMENTS IMPOSED BY THE TEXAS DEPARTMENT OF AGRICULTURE. V1-12/18

Sensitive Crops and Residential Areas

- **DO NOT** apply where spray drift may occur to food, forage or other plantings
- **DO NOT** apply when wind is blowing in the direction of neighboring sensitive crops or residential areas
- It is up to the applicator to use proper judgement to decide what field is "neighboring" and thereby susceptible to drift

Avoiding spray drift at the application site is the responsibility of the applicator

THESE TRAINING MATERIALS ARE DESIGNED TO SATISFY FEDERAL TRAINING REQUIREMENTS AND THE TRAINING AND APPLICATION REQUIREMENTS IMPOSED BY THE TEXAS DEPARTMENT OF AGRICULTURE. V1-12/18

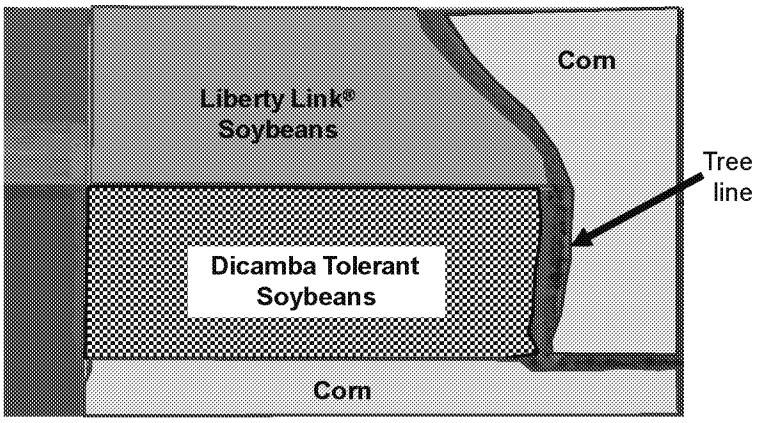
Spray Buffer Requirements

Example of no in-field buffer required (non-endangered species county)

North Wind
3 to 10 MPH

- Corn (a non-sensitive crop) counts as part of the 110' downwind buffer
- **No in-field buffer needed**

Additional state restrictions may apply



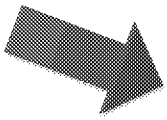
Avoiding spray drift at the application site is the responsibility of the applicator

THESE TRAINING MATERIALS ARE DESIGNED TO SATISFY FEDERAL TRAINING REQUIREMENTS AND THE TRAINING AND APPLICATION REQUIREMENTS IMPOSED BY THE TEXAS DEPARTMENT OF AGRICULTURE. V1-12/18

Application Decisions

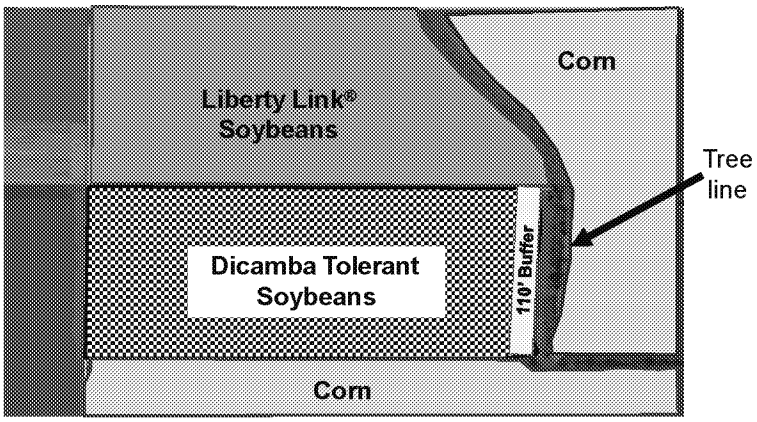
Example of in-field buffer required (non-endangered species county)

Northwest Wind
3 to 10 MPH



- The sensitive area (tree line) requires a 110' downwind buffer to the **east**
- Corn (a non-sensitive crop) counts as part of the 110' downwind buffer to the **south**

Additional state restrictions may apply



Avoiding spray drift at the application site is the responsibility of the applicator

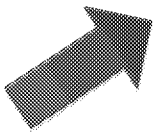
THESE TRAINING MATERIALS ARE DESIGNED TO SATISFY FEDERAL TRAINING REQUIREMENTS AND THE TRAINING AND APPLICATION REQUIREMENTS IMPOSED BY THE TEXAS DEPARTMENT OF AGRICULTURE. V1-12/18

Application Decisions

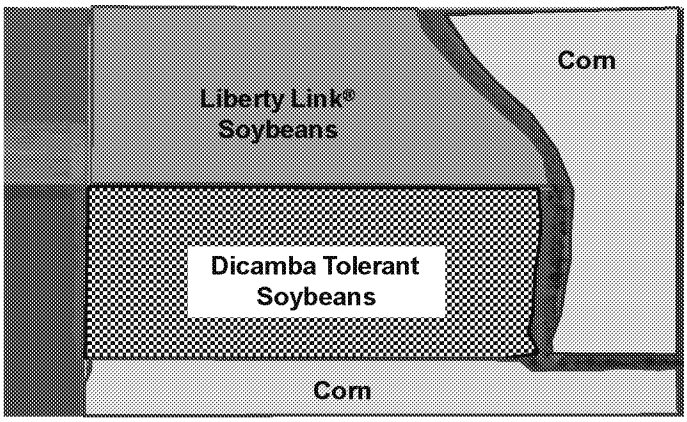
Example of when not to spray

- **DO NOT** spray with neighboring sensitive crops downwind (e.g. Liberty Link soybeans)

Southwest Wind 3 to 10 MPH



Additional state restrictions may apply



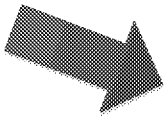
Avoiding spray drift at the application site is the responsibility of the applicator

THESE TRAINING MATERIALS ARE DESIGNED TO SATISFY FEDERAL TRAINING REQUIREMENTS AND THE TRAINING AND APPLICATION REQUIREMENTS IMPOSED BY THE TEXAS DEPARTMENT OF AGRICULTURE. V1-12/18

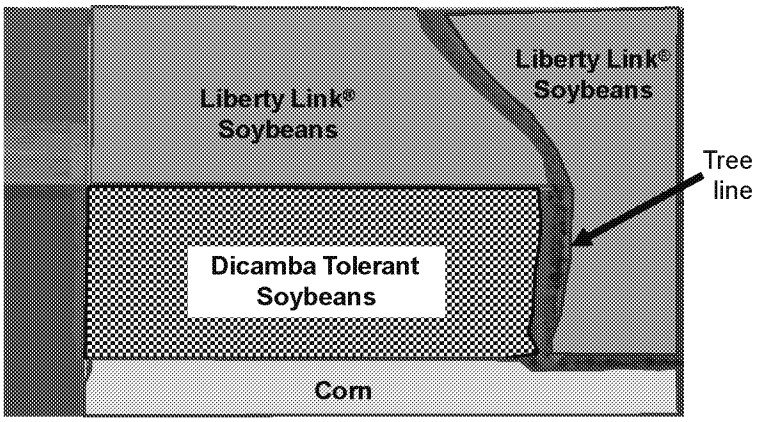
Spray Buffer Requirements

When not to spray

Northwest Wind
3 to 10 MPH



- **DO NOT** spray with neighboring sensitive crop exists downwind just past the sensitive area



Additional state restrictions may apply

Consider your surroundings – not every field should be sprayed with dicamba

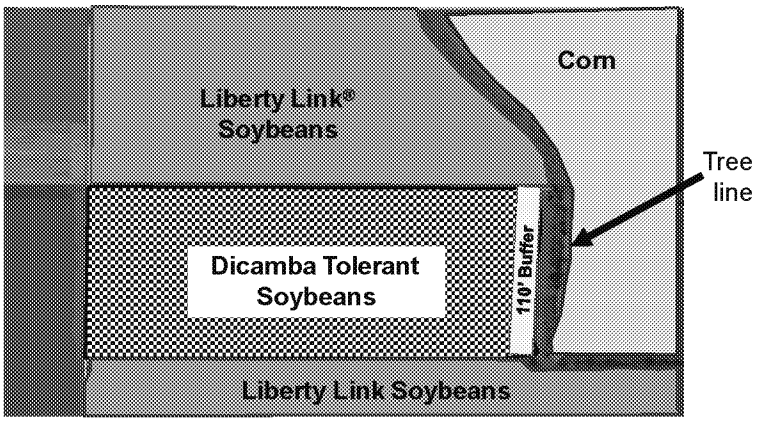
THESE TRAINING MATERIALS ARE DESIGNED TO SATISFY FEDERAL TRAINING REQUIREMENTS AND THE TRAINING AND APPLICATION REQUIREMENTS IMPOSED BY THE TEXAS DEPARTMENT OF AGRICULTURE. V1-12/18

Spray Buffer Requirements

When not to spray

West Wind
3 to 10 MPH

- Slight variation in wind direction will result in downwind sensitive crops and a DO NOT SPRAY situation



Additional state restrictions may apply

Consider your surroundings – not every field should be sprayed with dicamba

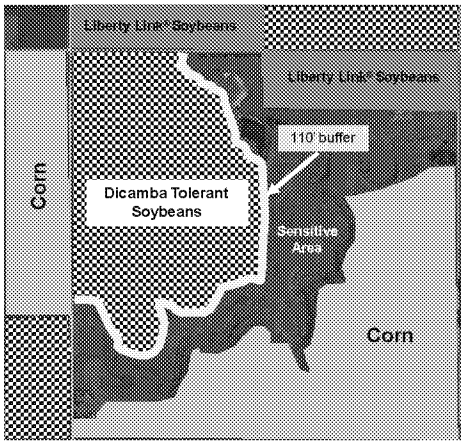
THESE TRAINING MATERIALS ARE DESIGNED TO SATISFY FEDERAL TRAINING REQUIREMENTS AND THE TRAINING AND APPLICATION REQUIREMENTS IMPOSED BY THE TEXAS DEPARTMENT OF AGRICULTURE. V1-12/18

Spray Buffer Requirements

For Endangered Species Counties

Northwest Wind
3 to 10 MPH

- 110' downwind buffer adjacent to sensitive areas on **east** and **south**
- Maintained road ditches and roads count as part of the 57' buffers on the **north** and **west**
  - No **in-field** buffers needed there



Additional state restrictions may apply

Avoiding spray drift at the application site is the responsibility of the applicator

THESE TRAINING MATERIALS ARE DESIGNED TO SATISFY FEDERAL TRAINING REQUIREMENTS AND THE TRAINING AND APPLICATION REQUIREMENTS IMPOSED BY THE TEXAS DEPARTMENT OF AGRICULTURE. V1-12/18

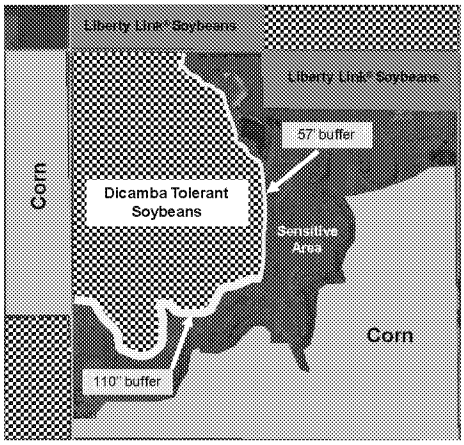
Spray Buffer Requirements

For Endangered Species

Northeast Wind
3 to 10 MPH

- 110' downwind buffer adjacent to sensitive areas on **south**
- 57' buffer next to sensitive area on **east**
- Maintained road ditches and road count as part of the 57' buffers on the **north**
- Maintained road ditches, road, and non-sensitive areas count part of the 110' downwind buffer to the **west**

Additional state restrictions may apply

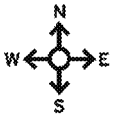


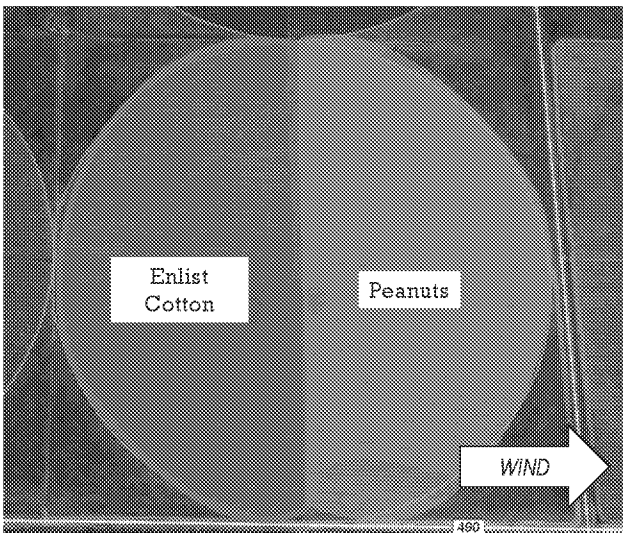
Avoiding spray drift at the application site is the responsibility of the applicator

THESE TRAINING MATERIALS ARE DESIGNED TO SATISFY FEDERAL TRAINING REQUIREMENTS AND THE TRAINING AND APPLICATION REQUIREMENTS IMPOSED BY THE TEXAS DEPARTMENT OF AGRICULTURE. V1-12/18

Should you spray?

Wind blowing from the west to the east at 8 mph

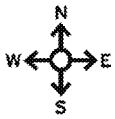


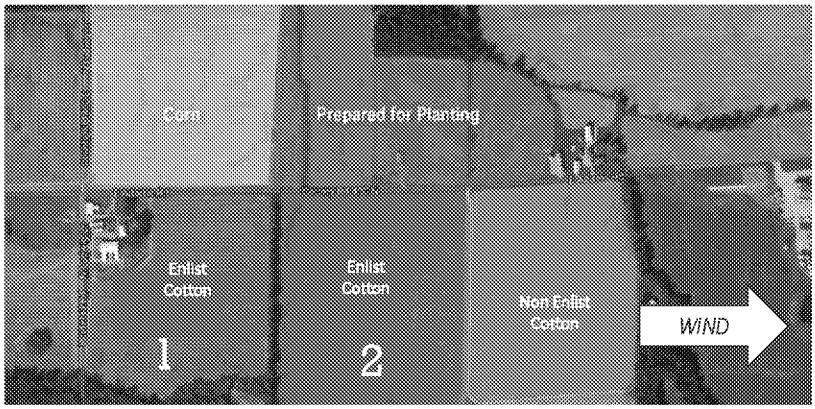


THESE TRAINING MATERIALS ARE DESIGNED TO SATISFY FEDERAL TRAINING REQUIREMENTS AND THE TRAINING AND APPLICATION REQUIREMENTS IMPOSED BY THE TEXAS DEPARTMENT OF AGRICULTURE. V1-12/18

Should you spray?

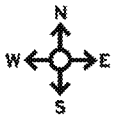
Wind blowing from the west to the east at 10 mph

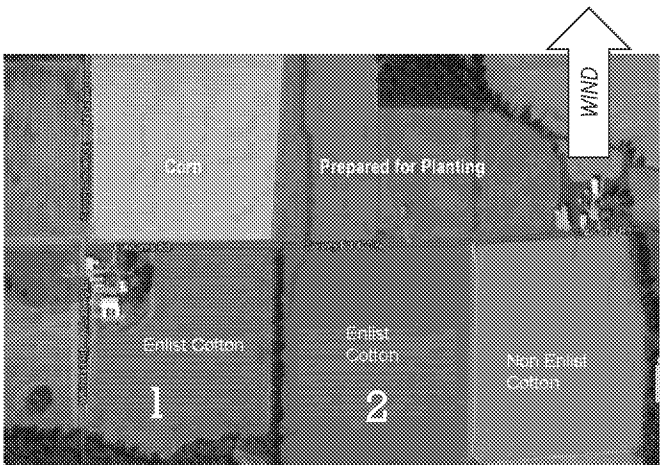




Should you spray?

Wind blowing from the south into the north at 8 mph

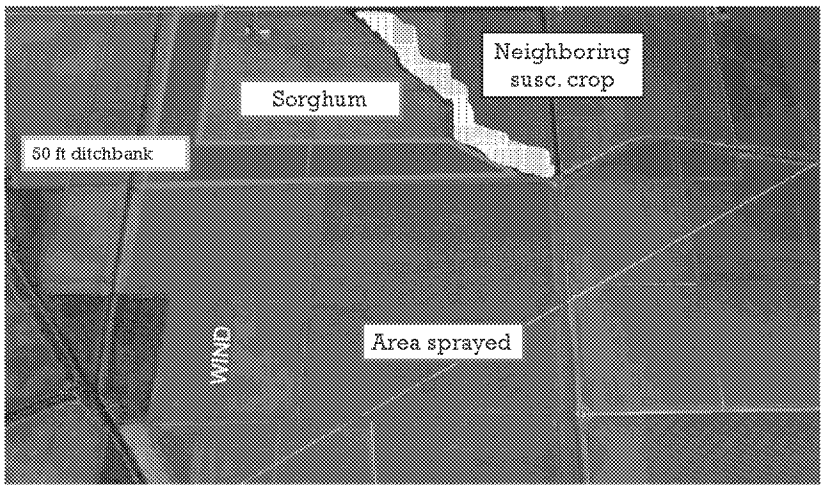




Although the field prepared for planting is not a susceptible crop for Enlist herbicides, use caution when wind is blowing parallel to non-Enlist cotton. Recommendation in this scenario is to wait until wind is blowing away from the susceptible crop.

THESE TRAINING MATERIALS ARE DESIGNED TO SATISFY FEDERAL TRAINING REQUIREMENTS AND THE TRAINING AND APPLICATION REQUIREMENTS IMPOSED BY THE TEXAS DEPARTMENT OF AGRICULTURE. V1-12/18

Beware - buffers do not apply to downwind susceptible crops, such as cotton without the herbicide trait.



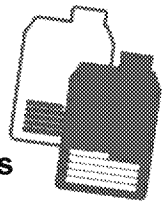
Susceptible crops examples

- Cotton without herbicide trait
- Grapes
- Cucurbits
- Fruiting Vegetables
- Tomatoes
- Tobacco

THESE TRAINING MATERIALS ARE DESIGNED TO SATISFY FEDERAL TRAINING REQUIREMENTS AND THE TRAINING AND APPLICATION REQUIREMENTS IMPOSED BY THE TEXAS DEPARTMENT OF AGRICULTURE. V1-12/18

Tank Mixtures

Only use products approved by the EPA



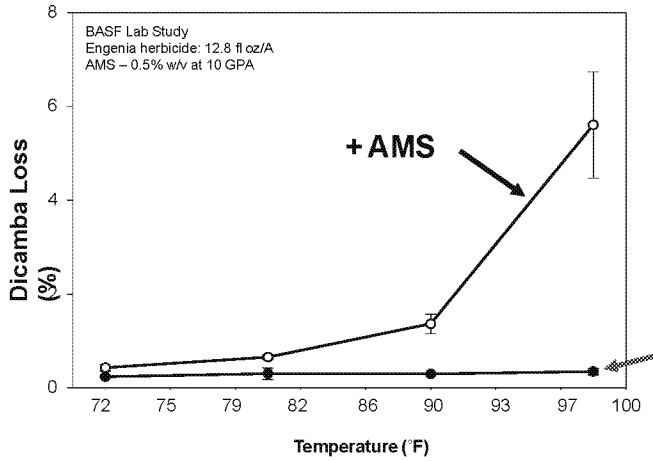
- **Consult respective websites for list of approved tank-mix partners**
  - Engenia® herbicide : www.EngeniaTankMix.com
  - Xtendimax® herbicide: www.xtendimaxapplicationrequirements.com
  - FeXapan® herbicide: www.dupont.com/products-and-services/crop-protection/soybean-protection/articles/fexapan-application.html
  - Enlist One™ & Enlist Duo®: www.EnlistTankMix.com
- **Use approved DRA if required**
- **NO ammonium salts (AMS, UAN) or acidifying water conditioners - Dicamba**
  - Tank must be cleaned prior to mixing so that no AMS or UAN residues remain

These restrictions apply to all conventional and HT crop uses

THESE TRAINING MATERIALS ARE DESIGNED TO SATISFY FEDERAL TRAINING REQUIREMENTS AND THE TRAINING AND APPLICATION REQUIREMENTS IMPOSED BY THE TEXAS DEPARTMENT OF AGRICULTURE. V1-12/18

Tank Mixtures – Dicamba Only

Impact of AMS on dicamba volatility



Test Conditions:

Duration: 24 hours

Air flow: 0.5 l/min using 2.5 l tank

RH: 35%

Substrate: glass

Engenia® herbicide Alone

AMS increases potential volatility by 20 times

THESE TRAINING MATERIALS ARE DESIGNED TO SATISFY FEDERAL TRAINING REQUIREMENTS AND THE TRAINING AND APPLICATION REQUIREMENTS IMPOSED BY THE TEXAS DEPARTMENT OF AGRICULTURE. V1-12/18

Tank Mixtures – Dicamba Only

Solution pH

- Spray solutions with pH levels less than 5 may increase the potential volatility of dicamba
- Litmus paper and pH meters can help determine the final solution pH
- Water source and/or tank-mixtures may impact final solution pH
- Neutral buffering agents can be added if listed on www.engeniatankmix.com
  - DO NOT use ammonium containing products or acidifying water conditioners

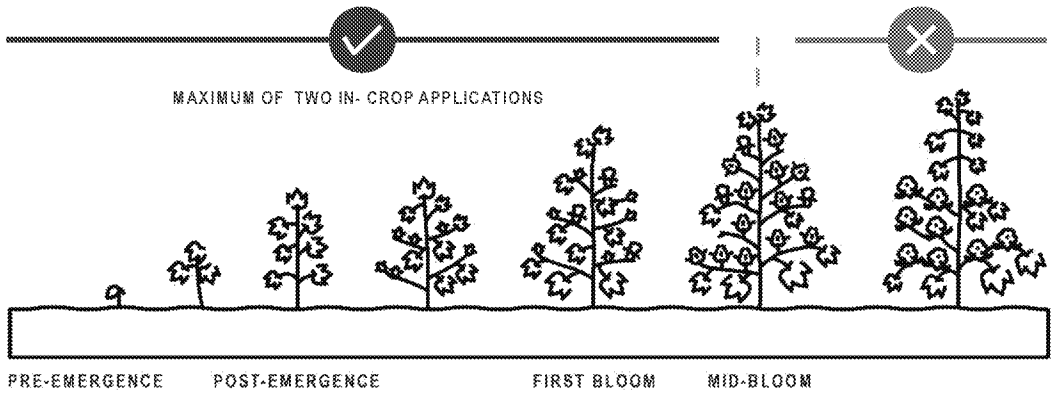
THESE TRAINING MATERIALS ARE DESIGNED TO SATISFY FEDERAL TRAINING REQUIREMENTS AND THE TRAINING AND APPLICATION REQUIREMENTS IMPOSED BY THE TEXAS DEPARTMENT OF AGRICULTURE. V1-12/18

Crop Specific Directions

Applications to Cotton - Enlist

Cotton

Approved 2,4-D formulations can be made up to **mid bloom**



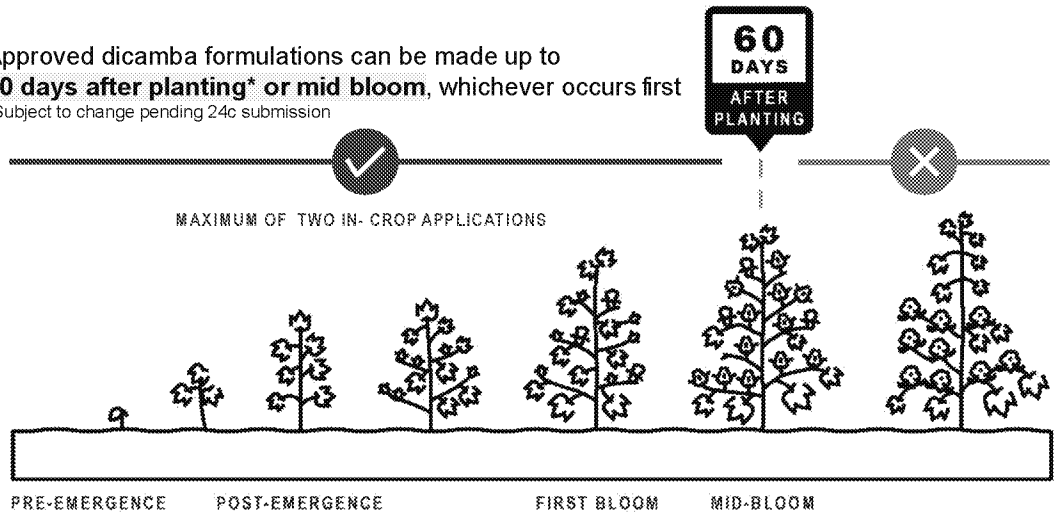
THESE TRAINING MATERIALS ARE DESIGNED TO SATISFY FEDERAL TRAINING REQUIREMENTS AND THE TRAINING AND APPLICATION REQUIREMENTS IMPOSED BY THE TEXAS DEPARTMENT OF AGRICULTURE. V1-12/18

Crop Specific Directions

Cotton

Applications to Cotton - Dicamba

Approved dicamba formulations can be made up to
60 days after planting* or mid bloom, whichever occurs first
*Subject to change pending 24c submission



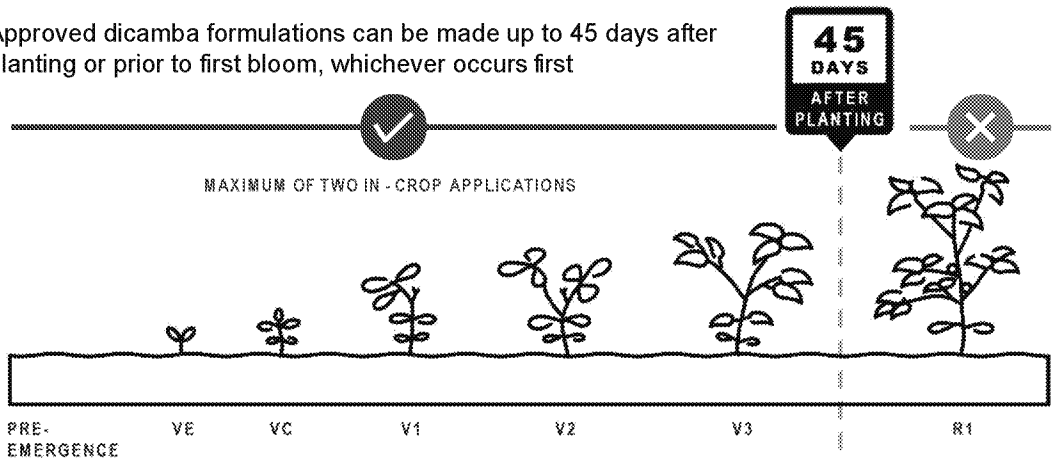
THESE TRAINING MATERIALS ARE DESIGNED TO SATISFY FEDERAL TRAINING REQUIREMENTS AND THE TRAINING AND APPLICATION REQUIREMENTS IMPOSED BY THE TEXAS DEPARTMENT OF AGRICULTURE. V1-12/18

Crop Specific Directions

Applications to Soybean - Dicamba

Soybean

Approved dicamba formulations can be made up to 45 days after planting or prior to first bloom, whichever occurs first

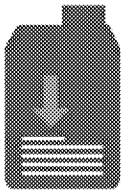


R1 GROWTH STAGE IN SOYBEANS = BEGINNING BLOOM (OPEN FLOWER AT ANY NODE ON THE MAIN STEM)

THESE TRAINING MATERIALS ARE DESIGNED TO SATISFY FEDERAL TRAINING REQUIREMENTS AND THE TRAINING AND APPLICATION REQUIREMENTS IMPOSED BY THE TEXAS DEPARTMENT OF AGRICULTURE. V1-12/18

Restrictions

Highlighted Label Requirements



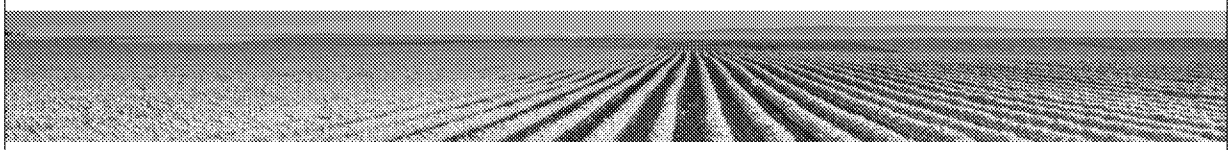
- **Minimum application volume:**
  - **15 GPA for dicamba**
  - 10-15 GPA for Enlist
- **Sprayer speed: ≤ 15 mph**
- **Rainfall:** DO NOT apply if expected rainfall within 24 hours after application will result in runoff – dicamba specific
  - Rainfast: 4 hours
- **DO NOT apply aerially**

THESE TRAINING MATERIALS ARE DESIGNED TO SATISFY FEDERAL TRAINING REQUIREMENTS AND THE TRAINING AND APPLICATION REQUIREMENTS IMPOSED BY THE TEXAS DEPARTMENT OF AGRICULTURE. V1-12/18

Training For Approved Dicamba Formulations

Topics:

- Why does dicamba require additional precautions
- Label requirements for approved dicamba formulations
- **Understanding temperature inversions**
- Spray system hygiene
- Record keeping
- Using dicamba in a weed management system
- Summary



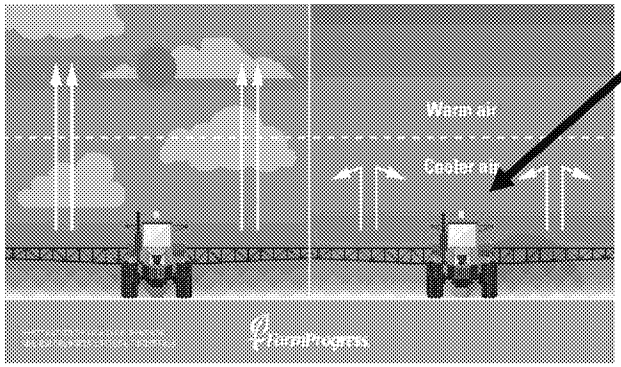
THESE TRAINING MATERIALS ARE DESIGNED TO SATISFY FEDERAL TRAINING REQUIREMENTS AND THE TRAINING AND APPLICATION REQUIREMENTS IMPOSED BY THE TEXAS DEPARTMENT OF AGRICULTURE. v1-12/18

Avoid Temperature Inversions

- **DO NOT apply when temperature inversions exist at the field level**
  - Temperature inversions occur when temperatures increase with altitude
  - Presence often indicated by ground fog, smoke not rising, dust hanging over a road, or presence of dew or frost
- **ONLY apply Dicamba from one hour after sunrise until two hours before sunset***

Temperature Inversions

Impact on physical spray drift



During an inversion small droplets remain suspended in air and move great distances horizontality for as long as inversion lasts

- Larger area potentially impacted
- Symptomology possible over large area
- Direction & distance of movement is unpredictable

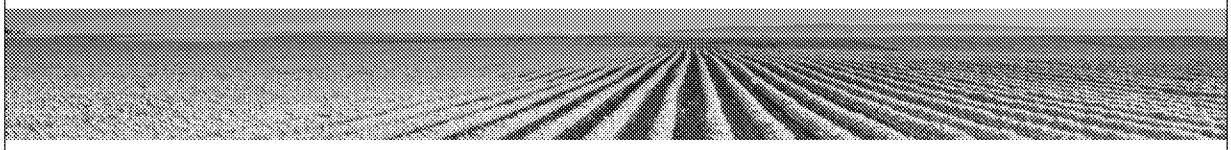
DO NOT make applications when an inversion exists at the field level

THESE TRAINING MATERIALS ARE DESIGNED TO SATISFY FEDERAL TRAINING REQUIREMENTS AND THE TRAINING AND APPLICATION REQUIREMENTS IMPOSED BY THE TEXAS DEPARTMENT OF AGRICULTURE. V1-12/18

Training For Approved Auxin Formulations

Topics:

- Why do Auxin herbicides require additional precautions
- Label requirements for approved auxin formulations
- Understanding temperature inversions
- **Spray system hygiene**
- Record keeping
- Using dicamba and 2,4-D in a weed management system
- Summary



THESE TRAINING MATERIALS ARE DESIGNED TO SATISFY FEDERAL TRAINING REQUIREMENTS AND THE TRAINING AND APPLICATION REQUIREMENTS IMPOSED BY THE TEXAS DEPARTMENT OF AGRICULTURE. v1-12/18

Spray System Hygiene

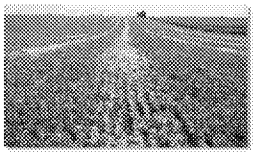
2019 US EPA requirements

- **Spray equipment must be thoroughly cleaned before and after application of approved auxin formulations**
- **Document that required cleanout procedures were followed (dicamba)**
  - Date and method at minimum
- **Triple rinse procedure outlined on the label**
  - Use detergent based tank cleaner in 2nd rinse
  - Wash the exterior of the sprayer
  - Remove and clean end caps, nozzles, screens, and filters

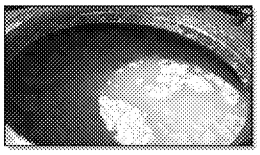
Hygiene is critical at all points in the handling and mixing process

THESE TRAINING MATERIALS ARE DESIGNED TO SATISFY FEDERAL TRAINING REQUIREMENTS AND THE TRAINING AND APPLICATION REQUIREMENTS IMPOSED BY THE TEXAS DEPARTMENT OF AGRICULTURE. V1-12/18

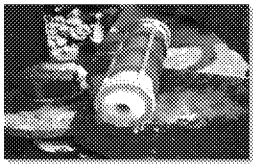
Why focus on hygiene of the entire handling process of pesticides?



- **Contamination can damage susceptible crops**
  - Potential to affect multiple fields
  - Patterns may or may not be visible



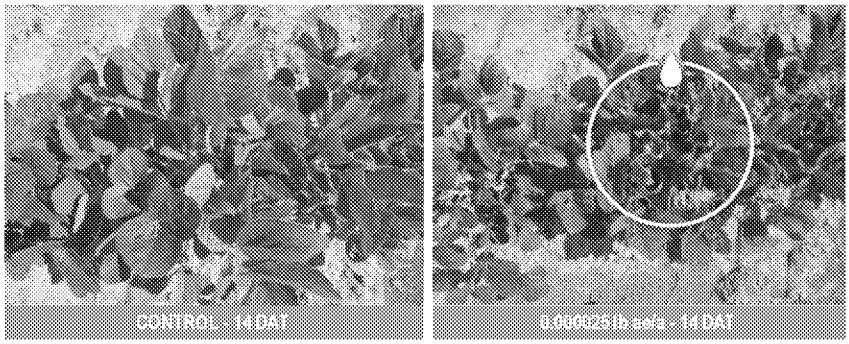
- **Contamination can cause incompatibility and plug screens and/or other sprayer parts**



- **Contamination with ammonium sulfate (AMS) can compromise lower volatility improvements of new dicamba formulations**

THESE TRAINING MATERIALS ARE DESIGNED TO SATISFY FEDERAL TRAINING REQUIREMENTS AND THE TRAINING AND APPLICATION REQUIREMENTS IMPOSED BY THE TEXAS DEPARTMENT OF AGRICULTURE. V1-12/18

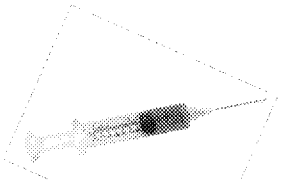
1/20,000th of the 1x Use Rate (0.000025 lb ae/A dicamba) – 14 days after vegetative stages (V3) application on non-dicamba tolerant soybeans



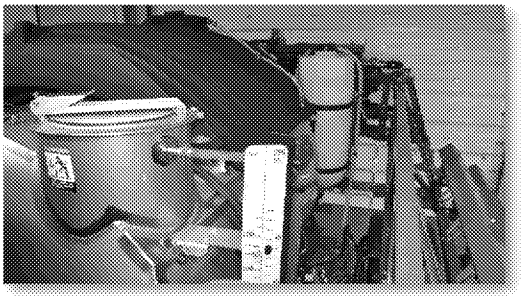
THESE TRAINING MATERIALS ARE DESIGNED TO SATISFY FEDERAL TRAINING REQUIREMENTS AND THE TRAINING AND APPLICATION REQUIREMENTS IMPOSED BY THE TEXAS DEPARTMENT OF AGRICULTURE. V1-12/18

How much dicamba does it take to potentially contaminate a sprayer?

3 ml of formulated <u>product</u>



12 fl oz of spray <u>solution</u>



Commercial sprayer with 1000 gallon tank

Application volume: 10 GPA

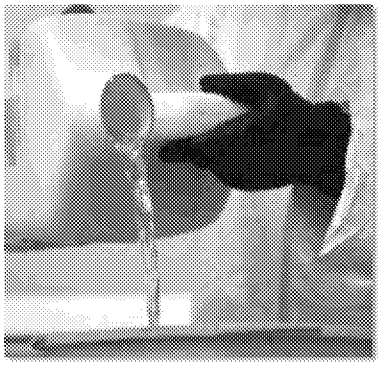
Hygiene is critical to preventing spray system contamination

These slides were prepared by BASF to satisfy US EPA requirements. Please check with your state pesticide regulatory authority as additional requirements may be imposed by state regulatory authorities. DATE 11/18.

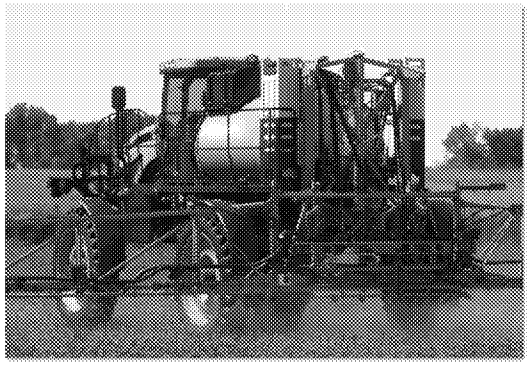
Simple Handling and Mixing Model

Limited points of potential contamination

Product mixed directly in sprayer



Product applied



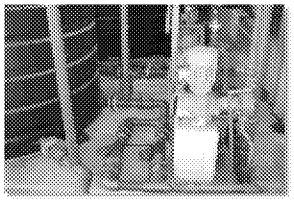
If there is no "upstream" product handling, then the sprayer is sole source of contamination concern

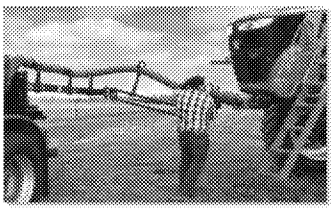
These slides were prepared by BASF to satisfy US EPA requirements. Please check with your state pesticide regulatory authority as additional requirements may be imposed by state regulatory authorities. DATE 11/18.

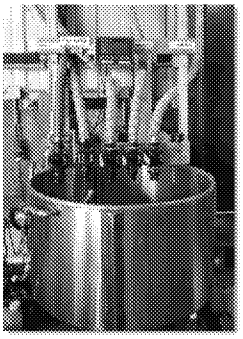
"Upstream" Handling and Mixing

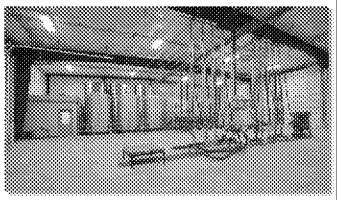
Multiple points of potential contamination

- **Storage tanks/shuttles**
- **Hoses and pumps at the "shed" and in the field**
  - Especially unlined EPDM hoses
- **Mixing and loading equipment**
- **Nurse trucks**









Any thing formulated product and/or spray solution touches prior to the sprayer can be a source of contamination

These slides were prepared by BASF to satisfy US EPA requirements. Please check with your state pesticide regulatory authority as additional requirements may be imposed by state regulatory authorities. DATE: 11/18.

Spray System Hygiene

Summary

- Spray equipment must be thoroughly cleaned **before** and **after** application of approved dicamba or 2,4-D products
- Ensure all pumps, hoses, tanks, and other mixing and loading equipment are thoroughly cleaned before using that equipment for susceptible crops
- Consider having dedicated system for all equipment used in measuring, mixing, loading, and applying dicamba or 2,4-D products

Hygiene is critical at all points in the handling and mixing process

These slides were prepared by BASF to satisfy US EPA requirements. Please check with your state pesticide regulatory authority as additional requirements may be imposed by state regulatory authorities. DATE 11/18.

Training For Approved Auxin Formulations

Topics:

- Why do Auxin herbicides require additional precautions
- Label requirements for approved auxin formulations
- Understanding temperature inversions
- Spray system hygiene
- **Record keeping**
- Using dicamba and 2,4-D in a weed management system
- Summary

These slides were prepared by BASF to satisfy US EPA requirements. Please check with your state pesticide regulatory authority as additional requirements may be imposed by state regulatory authorities. DATE 11/18

Record Keeping – Dicamba

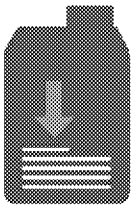
2019 US EPA & TX requirements

Engenia, Fexapan, and Xtendimax herbicides are Restricted Use Pesticides (RUP)

- **New for 2019:** Only Certified Applicators may purchase and apply Engenia, Fexapan, and Xtendimax herbicides
- State Limited Use Pesticide - TX

RESTRICTED USE PESTICIDE

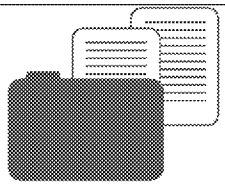
For retail sale to and use only by Certified Applicators.



These slides were prepared by BASF to satisfy US EPA requirements. Please check with your state pesticide regulatory authority as additional requirements may be imposed by state regulatory authorities. DATE 11/18.

Record Keeping - Dicamba

2019 US EPA requirements



Record keeping of all applications is required

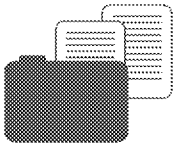
- Records must be generated as soon as practical but no later than **72 hours** after application
- Records must be retained for 2 years
- Records must be kept by field as defined by borders
  - If you move to a new field with different borders, new records must be kept
- Must be made available upon request to State Pesticide Control Officials, USDA, and/or EPA
- All required records per 7 CFR Part 110
- Refer to federal label for full listing of record keeping requirements

Paper and electronic forms will be provided to ease recording of information

These slides were prepared by BASF to satisfy US EPA requirements. Please check with your state pesticide regulatory authority as additional requirements may be imposed by state regulatory authorities. DATE 11/18.

Record Keeping - Dicamba

Details that must be recorded



1. Certified applicator full name
2. Certification number
3. Product name
4. EPA registration number
5. Total amount applied
6. Application month, day, year
7. Crop planting date
8. Start and finish times
9. Location of application
10. Crop or site receiving the application
11. Size of area treated
12. Applicator proof of training
13. Application timing (PRE or days after planting)
14. Receipts of purchase
15. Product label(s) including 24(c) state local needs
16. Document awareness of sensitive crops
17. Buffer distance calculation
18. Date and procedure for spray system cleanout (before and after spraying)
19. List of tank-mix products with EPA registration numbers
20. Nozzle and pressure
21. Air temperature at boom height at start and finish
22. Wind speed and direction at start and finish

Record must be made for each application of approved dicamba products

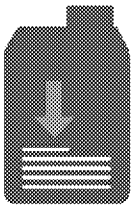
These slides were prepared by BASF to satisfy US EPA requirements. Please check with your state pesticide regulatory authority as additional requirements may be imposed by state regulatory authorities. DATE 11/18.

Record Keeping - Enlist

2019 US EPA & TX requirements

Enlist One and Enlist Duo herbicides are State Limited Use Pesticides

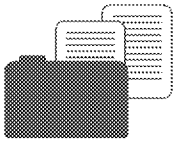
- **New for 2019:** Only Certified Applicators may purchase, but must also receive auxin training to apply.
- State Limited Use Pesticide - TX



These slides were prepared by BASF to satisfy US EPA requirements. Please check with your state pesticide regulatory authority as additional requirements may be imposed by state regulatory authorities. DATE 11/18.

Record Keeping - Enlist

Details that must be recorded



TDA QS27
7/15

Texas Department of Agriculture
Pesticide Applicator Record

Business/Applicator Name _____ **Address** _____

Application Date	Time Started	Name of the person for whom the application was made	Location of Land Treated	Site Treated	Wind Direction	Wind Velocity	Air Temp

Product Trade Name	EPA Registration Number	Target Pest	Rate of Product Per Unit	Method or Type of Equipment Used To Make Application	FAA "N" Number for Aerial Application Equipment:

Is Application Applied in Regulated County: ☐ Yes ☐ No	Regulated Herbicide Permit Number:

Licensed Applicator's Name and License Number	Non-licensed Applicator's Name Working Under Licensee	Total Acres or Volume of Area Treated	Total Volume of Spray Mix, Dust, Granules or Other Materials Applied Per Unit

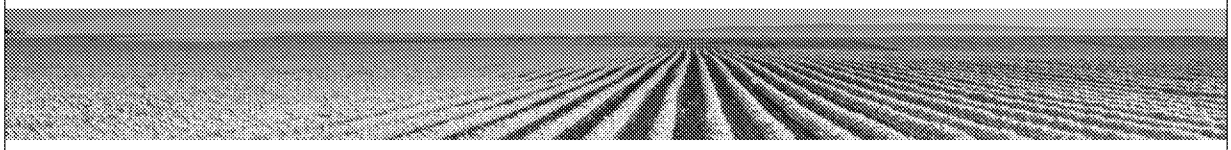
Documentation used to verify training of non-licensed applicator (Mark Applicable Box)
☐ **Direct Supervisor Affidavit** ☐ **WPS Handler Card** ☐ **Signed & Dated Label**

These slides were prepared by BASF to satisfy US EPA requirements. Please check with your state pesticide regulatory authority as additional requirements may be imposed by state regulatory authorities. DATE 11/18.

Training For Approved Auxin Formulations

Topics:

- Why do Auxin herbicides require additional precautions
- Label requirements for approved auxin formulations
- Understanding temperature inversions
- Spray system hygiene
- Record keeping
- **Using dicamba and 2,4-D in a weed management system**
- Summary



These slides were prepared by BASF to satisfy US EPA requirements. Please check with your state pesticide regulatory authority as additional requirements may be imposed by state regulatory authorities. DATE 11/18

Effective Weed Management

Key strategies

- **Identify the target weeds**
- **Include multiple, effective sites of action (SOA)**
- **Use a good residual PRE herbicide**
- **Spray your POST herbicide early**
  - 4" max weed height
  - Target application at 3 to 5 weeks after planting for soybeans or sooner for cotton[1]
  - Add a residual herbicide to the POST

[1]Additional state restrictions may apply.

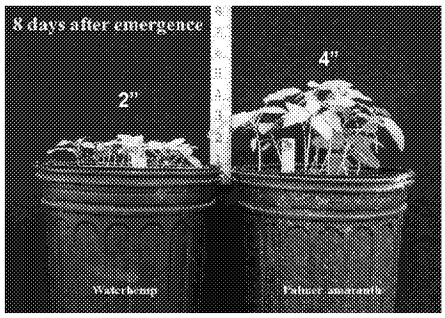
Tailor your weed management plan to the field

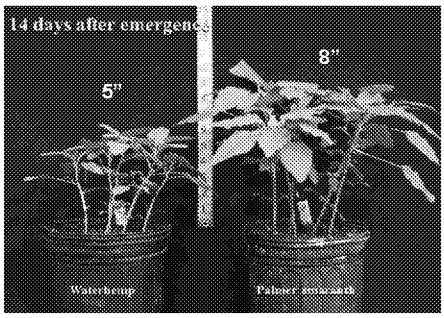
These slides were prepared by BASF to satisfy US EPA requirements. Please check with your state pesticide regulatory authority as additional requirements may be imposed by state regulatory authorities. DATE 11/18.

Effective Weed Management

Palmer amaranth and waterhemp can grow fast!

- Start with a good residual PRE herbicide
- Plan to spray POST when weeds are <1 inch tall
- Minimizes weed competition and impact on crop yield





Weeds, especially pigweed species, grow fast!

These slides were prepared by BASF to satisfy US EPA requirements. Please check with your state pesticide regulatory authority as additional requirements may be imposed by state regulatory authorities. DATE 11/18.

Effective Weed Management

Use residual herbicide at planting

2016 – BASF Trial – 30 Days After Post – Story City, IA

POST ONLY (V3):
Engenia® herbicide (12.8 fl oz) + glyphosate

PRE: Zidua® PRO herbicide (6 fl oz)
POST (V3): Engenia herbicide (12.8 fl oz) + glyphosate

PRE residual followed by POST dicamba preserves yield potential

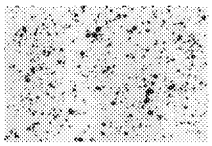
Always read and follow label directions. Engenia is a US EPA Restricted Use Pesticide.
These slides were prepared by BASF to satisfy US EPA requirements. Please check with your state pesticide regulatory authority as additional requirements may be imposed by state regulatory authorities. DATE 11/18.

Effective Weed Management

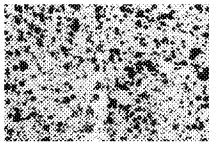
Best practices to optimize efficacy

- **Required minimum spray volume – 15 GPA**
  - Better coverage for tough weeds
  - Match nozzle to GPA, pressure, and sprayer speed as specified by the label
- **Use an adjuvant, such as a NIS**
  - Maximizes dicamba uptake
  - Add approved Drift Reduction Agent (DRA) if required as listed on website for approved dicamba formulation
- **Plan an early post application**

2017 BASF Spray Chamber Results



10 GPA
TTI 11003 at 40 PSI



15 GPA
TTI 11004 at 40 PSI

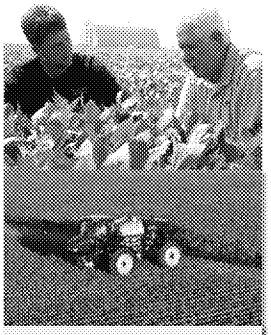
Engenia® herbicide + glyphosate + adjuvant

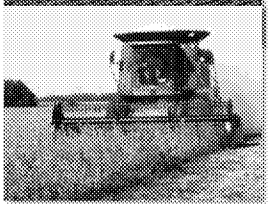
Optimize efficacy with proper application volume and adjuvant

Always read and follow label directions. Engenia is a US EPA Restricted Use Pesticide.
These slides were prepared by BASF to satisfy US EPA requirements. Please check with your state pesticide regulatory authority as additional requirements may be imposed by state regulatory authorities. DATE 11/18.

Effective Weed Management

Success requires a plan





- **Use Multiple effective Sites-of-Action**
  - Reduce potential for development of weed resistance
- **Use Preemergence Residual herbicides**
  - Reduce weed pressure for better control with POST herbicides
  - More time to select the proper spray day for POST
  - Preserve yield potential
- **Plan an Early Post treatment with a residual herbicide**
  - Reliable control of small weeds
  - Extended in-season control

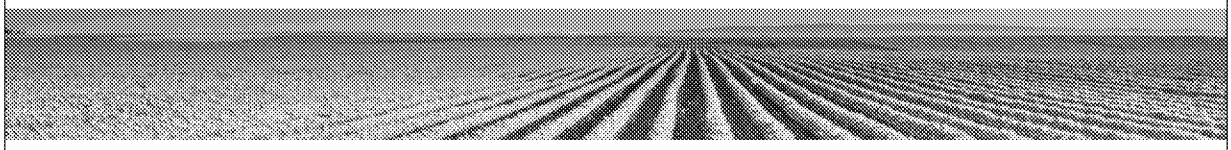
Tailor your weed management plan to each field

These slides were prepared by BASF to satisfy US EPA requirements. Please check with your state pesticide regulatory authority as additional requirements may be imposed by state regulatory authorities. DATE 11/18.

Training For Approved Auxin Formulations

Topics:

- Why do Auxin herbicides require additional precautions
- Label requirements for approved auxin formulations
- Understanding temperature inversions
- Spray system hygiene
- Record keeping
- Using dicamba and 2,4-D in a weed management system
- **Summary**



These slides were prepared by BASF to satisfy US EPA requirements. Please check with your state pesticide regulatory authority as additional requirements may be imposed by state regulatory authorities. DATE 11/18

2019 requirements for on-target applications

	Dicamba[1]	Enlist[2]
Nozzle	Go to herbicide website[1] or label[2] for list of approved nozzles and pressures	
Wind Speed	3 to 10 mph	
Tank Mixtures/ Additives	Go to herbicide website for updated list	
	NO ammonium salts or acidifying water conditioners (AMS or UAN)	No restrictions for using AMS
Ground Speed	< 15 mph	< 15 mph recommended
Boom Height	< 24 inches to spray target	Consult nozzle manufacturer < 24 inches recommended
Application Volume	15 GPA minimum	10-15 GPA minimum

THESE TRAINING MATERIALS ARE DESIGNED TO SATISFY FEDERAL TRAINING REQUIREMENTS AND THE TRAINING AND APPLICATION REQUIREMENTS IMPOSED BY THE TEXAS DEPARTMENT OF AGRICULTURE. V1-12/18

2019 requirements for on-target applications

	Dicamba[1]	Enlist[2]
Sensitive[1] / Susceptible[2] Crops and Residential Areas	**DO NOT** spray if wind is blowing toward neighboring sensitive[1]/susceptible[2] crops or residential areas	
	Includes non-dicamba tolerant soybeans	Includes non-enlist cotton
Sensitive Areas	110' downwind buffer to non-residential, uncultivated areas or bodies of water. 57' omni-directional buffer in **EPA endangered species counties**.	30' downwind buffer to wooded areas, pasture, lawns, roadside ditch
Timing (which ever comes first)	Soybeans: Up to 45 DAP or beg. bloom Cotton: Up to 60 DAP or mid-bloom	Cotton: up to mid-bloom
Weed Height	4 inches or less for best performance	4-6 inches

THESE TRAINING MATERIALS ARE DESIGNED TO SATISFY FEDERAL TRAINING REQUIREMENTS AND THE TRAINING AND APPLICATION REQUIREMENTS IMPOSED BY THE TEXAS DEPARTMENT OF AGRICULTURE. V1-12/18

2019 requirements for on-target applications

	Dicamba	Enlist
Training	Complete annual auxin-specific training	
Sprayer Cleanout	Triple rinse – use detergent based cleaner before & after application	
Temperature Inversions	**DO NOT** apply during a field level temperature inversion	
Daytime Applications	Only apply one hour after sunrise until two hours before sunset??	Don't apply during inversion
Rainfall	DO NOT apply w/in 24 hrs of expected rainfall – runoff potential	Don't allow runoff
Record Keeping	Including application, tank cleanout, planting date, and buffer zone calculation information	TX Dept of Ag Requirement
No Aerial Applications		

THESE TRAINING MATERIALS ARE DESIGNED TO SATISFY FEDERAL TRAINING REQUIREMENTS AND THE TRAINING AND APPLICATION REQUIREMENTS IMPOSED BY THE TEXAS DEPARTMENT OF AGRICULTURE. V1-12/18

Triple rinse is required before and after for dicamba and recommended for Enlist

Training for Approved Auxin Formulations

Summary of application requirements

Additional state restrictions may apply

- **Use residual herbicides at-planting**
- **Plan to spray early post**
- **Know your surroundings**
- **Know the weather conditions**
- **Follow label directions for application success**
- **Clean the spray system before and after application**

Handling and applying dicamba requires extra caution and attention
Failure to follow any of the label requirements can lead to off-target movement

DO NOT use dicamba if you are unwilling or unable to follow requirements

Always read and follow label directions. Engenia, Xtendimax, and FeXapan are US EPA Restricted Use Pesticides.

These slides were prepared by BASF to satisfy US EPA requirements. Please check with your state pesticide regulatory authority as additional requirements may be imposed by state regulatory authorities. DATE 11/18.

Additional Information

- **Engenia® herbicide from BASF**
  - www.engeniastewardship.com
  - www.engeniaherbicide.com
  - Tank-mixtures: www.engeniatankmix.com
- **XtendiMax® herbicide with VaporGrip® Technology**
  - www.xtendimaxapplicationrequirements.com
- **DuPont® FeXapan® herbicide Plus VaporGrip Technology**
  - www.dupont.com/products-and-services/crop-protection/soybean-protection/articles/fexapan-application.html
- **Enlist One™ & Enlist Duo®**
  - www.EnlistTankMix.com

These slides were prepared by BASF to satisfy US EPA requirements. Please check with your state pesticide regulatory authority as additional requirements may be imposed by state regulatory authorities. DATE: 11/18.