

# Growth Regulators

Banvel, Clarity, Distinct, 2,4-D, 2,4-DB  
– drift, volatility, and tank contamination

Yield loss is more likely if damage occurs after blooming.



Leaf cupping

Strapping



Onion leafing

Lodging of brittle plants



# Amino Acid Synthesis Inhibitors

Sulfonylureas (Accent, Classic, Canopy), Imidazolinones (Lightning, Pursuit, Raptor), Sulfonanilides (Python, FirstRate), and glyphosate (Glyphomax Plus, Roundup WeatherMax, etc. – drift, carry over, hybrid sensitivity and tank contamination



**Purple veins – tank contamination or drift  
Accent**



**Chlorotic leaves –  
Accent tank contamination**



**Lightning tank contamination**



**Exceed carry over**

Certain corn hybrids can be sensitive to ALS inhibitors.  
**Amino Acid Synthesis Inhibitors**



The symptoms above and to the right can be exhibited when a hybrid is sensitive or when ALS is applied to late.



High pH soils induce carry over, dry cold conditions can also increase carry over.



## Amino Acid Synthesis Inhibitors

Glyphosate can damage non-Roundup Ready crops through drift, tank contamination, or misapplication. Glyphosate can also cause chlorosis of young leaf in RR crops.



**Chlorosis of the new growth or growing point in soybean.**

**Left: characteristic banding and chlorosis of glyphosate drift on corn.**



**Early season injury that caused 30% or more chlorosis of plant tissue caused significant yield reductions (usually greater than 10%). 50% or more chlorosis caused yield reductions in excess of 50%.**

# Glufosinate

Liberty



## Seedling Growth Inhibitors

Dinitroanilines (DNA's) – Disruption of microtubule production  
Root growth inhibition. (Prowl, Treflan, and Balan) PRE activity



Club like roots inhibit water and nutrient uptake

# Seedling Growth Inhibitors

**Chloroacetamides – Mechanism not fully understood. Inhibition of cell division, and protein synthesis. - affects shoot growth with soil activity**



**Inhibition of the leaf mid-rib growth, causing “heart shaped” leaves on soybean.**

**Yield loss in soybean is rare, but possible if stands were reduced to less than 80,000 plants/A.**



**Corn plants will leaf out underground or have improperly unfurled leaves.**



# Photosynthesis Inhibitors

Triazines (atrazine, Sencor, Princep, Velpar), Nitriles (Buctril) – Inhibit the electron transport chain at the D1 protein in photosystem II.



**Atrazine and Sencor Injury.**

Leaf burn occurs on the tips or margins of the leaf due to atrazines and metribuzins solubility.



Buctril injury is confined to where the herbicide has contacted the foliage.

# Cell Membrane Disruptors

Include the Triazolinones (Authority, Spartan), N-phenylapthalimides (Resource), and the Diphenylethers (Cobra, Reflex, FlexStar, Ultra Blazer). All inhibit protoporphyrinogen oxidase (PPO) which is involved in chlorophyll and heme biosynthesis.



**Browning of leaf tissue, intervienal chlorosis then browning. Extremely cool wet temperatures will increase injury.**



**Certain varieties can be more sensitive to sulfentrazone (Authority) and flumioxazin (Valor).**



**Cobra, Ultra Blazer, Reflex, Aim, and Resource can speckle or pucker soybean leaves.**



**Reflex can carry over in the soil, causing chlorosis or clearing of corn's vein.**

# Cell Membrane Disruptors

**Bipyridylliums (Gramoxone Extra, Diquat) – interferes with the flow of energy in the electron transport chain resulting in the production of toxic molecules and the break down of cell membranes.**



**A water soaked tan spot on corn with a red margin**



**Basagran injury – similar to Buctril**



# Lipid Biosynthesis Inhibitors

Aryloxyphenoxy propionates (Assure II, Fusilade, Poast Plus, Select) disrupts Acetyl CoA Carboxylase (ACCase), this inhibits lipid synthesis.



Lipid biosynthesis herbicides destroy the growing points of grasses. The newest leaf will pull easily from the whorl.



# Pigment inhibitors

Command, Balance Pro, and Callisto

