

## ALS Inhibiting herbicides

Angela R. Post

PLNT 4013  
Principles of Weed Science

## Terms to remember

- ▶ photosynthesis (food)
- ▶ respiration (energy)
- ▶ amino acids (proteins/growth)
- ▶ lipids (cell membranes)
- ▶ pigments (energy/light capture)
- ▶ mitosis (cell division)

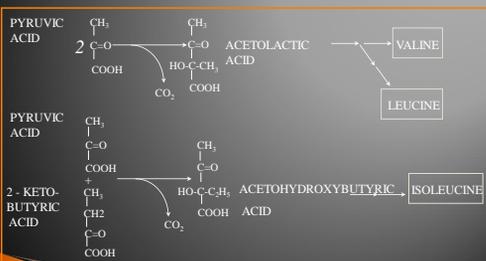
## ALS Inhibitor Discovery

- ▶ Sulfonylurea and imidazolinone herbicides were discovered independently in the mid-1970's.
- ▶ Triazolopyrimidine herbicides were discovered in the 1980s by manipulations of known active chemistry.
- ▶ Pyrimidinyl thiobenzoate herbicides were discovered in the mid-1980's in Japan.

## ALS Inhibitor Mode-Of-Action

- ▶ Inhibits plant growth within 2h after treatment.
- ▶ Growth inhibition reversed by addition of branched-chain AA's.

## Reactions Catalyzed by Acetolactate Synthase Leading to Branched Chain Amino Acids



## ALS Inhibitors

- ▶ Persistence can be short or long
  - High pH - sulfonylurea rotation restriction is long
  - Low pH - imidazolinone rotation restriction is long
- ▶ Adsorption is low
- ▶ Leaching is low to moderate
- ▶ Microbial degradation is moderate to high
- ▶ Chemical decomposition is very high and decreases as soil pH increases.
- ▶ Photodecomposition is low

## Sulfonylureas, Imidizolinones

- ▶ Most of these herbicides have soil and foliar activity
- ▶ Systemically translocated in plants
- ▶ Soil activity herbicide-dependent
- ▶ Generally, low use-rate herbicides

## ALS-Inhibitor Resistant Crops – none are transgenic

IR Corn
IT Corn
ST Soybeans
IR Canola
IR Wheat
IR Rice
IR Sunflower
ST Cotton
ST Sunflower

## ALS Inhibitors

- ▶ Prevent synthesis of certain amino acids
- ▶ produced by plants but not animals
- ▶ Excellent foliar and root absorption
- ▶ Broad weed spectrum
- ▶ Translocated to shoot and root new growth
- ▶ Plants stop growing shortly after application
- ▶ Plant death may be slow

## ALS Inhibitor Symptomology

- ▶ Rapid inhibition of root and shoot growth
- ▶ Vein reddening
- ▶ Leaf chlorosis
- ▶ Terminal bud necrosis
- ▶ Slow whole plant necrosis (2–4 weeks)

## ALS Inhibitor Symptomology

- ▶ Grass symptoms include: stunting, purple coloration, and inhibited root systems with bottle-brush appearance
- ▶ Broadleaf symptoms include: red or purple veins, yellowing of new leaves and blackened terminal growth



### Chlorsulfuron



19 days after exposure

25 days after exposure

### Arsenal (imazapyr)



blackberry



sweetgum

14

### Arsenal (imazapyr)



Compact growth Untreated on azalea

15

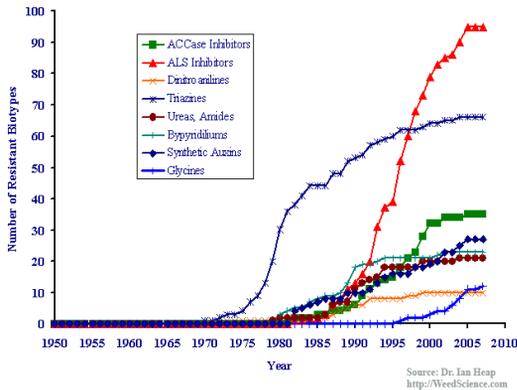
### Arsenal (imazapyr)



Bunched, compact growth on dogwood and sassafras



16



### Selection of ALS-Inhibitor Resistant weeds



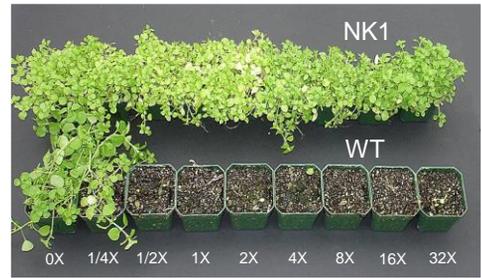
Occurs at the level of the ALS enzyme

112 species

### Italian Ryegrass – ALS Herbicides?



### Effect of Thifensulfuron-methyl Application Rate on Common Chickweed Control – NK1 Source – 28 DAT



### Sulfonyleurea damage to soybean





Root stunting and witches broom or bottle brush symptoms

