Vegetative Bioassay to Determine the Presence of Imazapyr in Soil

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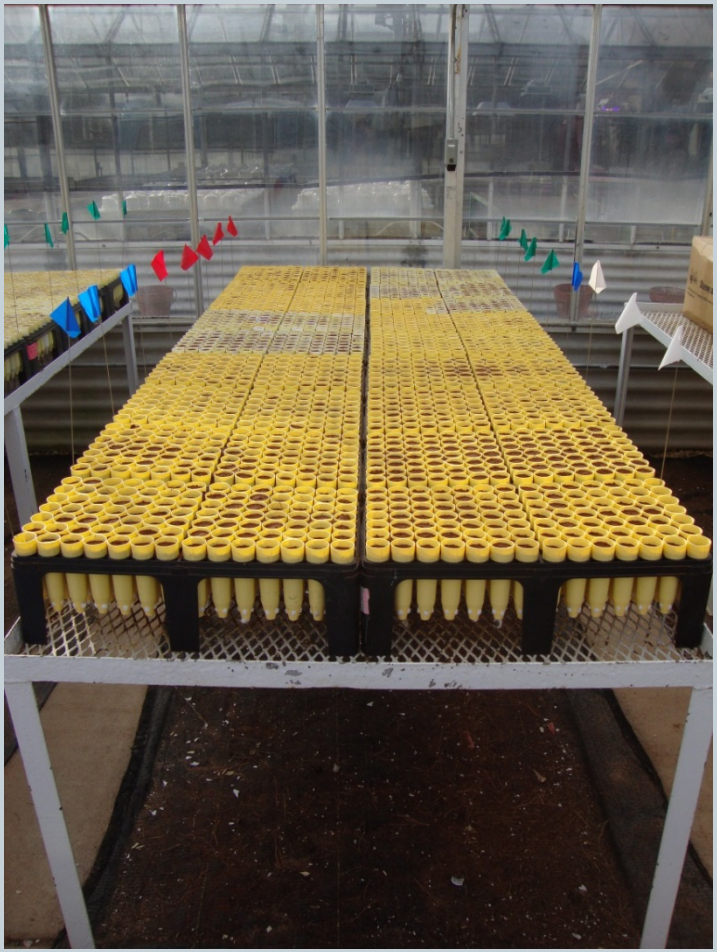
Imazapyr Bioassay



Site Preparation

- Imazapyr (Chopper® or Arsenal®) is a common forestry herbicide used in site preparation
- However, longleaf pine are particularly sensitive to imazapyr
- No good way to determine if the soil is still toxic
- Based on results from this study and others, longleaf pine can survive in soil that has been treated with imazapyr but there may be a lack of root growth and they can be severely stunted

Literature

- Washington State University (2002) developed a bioassay to test for herbicide residues in compost.
- Clopyralid (Stinger®), which is a common turf and lawn herbicide, was found in yard compost and some manure based products.
- Used garden peas as the indicator species to determine if clopyralid was present in compost.

Literature

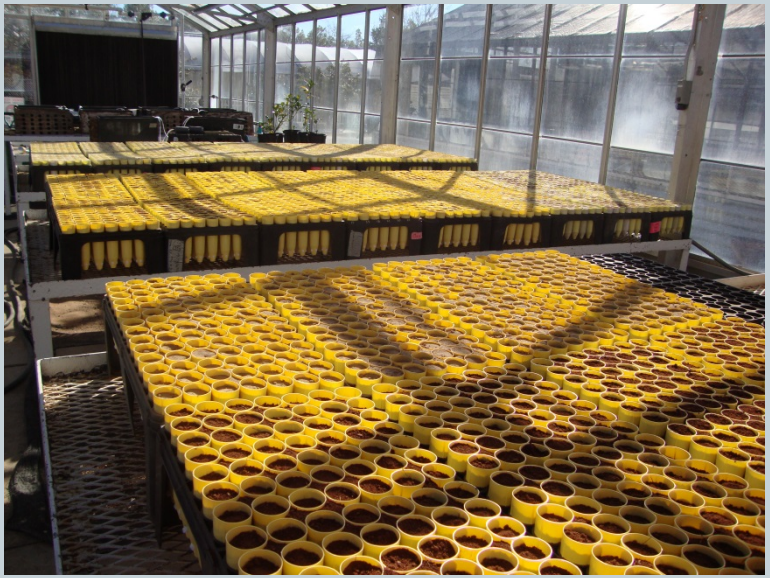
- Dickens et al (2012) developed a guide to using imazapyr as a site preparation herbicide for southern pine plantation establishment.
- Outlined when each southern pine species should be planted based on chemical formulation, application rate, and timing of application.

Purpose

- Quick and easy way to determine the toxicity in soil.
- Indicator plants determine if the herbicide concentration in the soil is safe to plant longleaf pine seedlings.
- Benefits land managers who use imazapyr during site preparation.

Methods

- 2 Soil Textures:
  - Coarse
  - Fine
- 5 Treatments
  - 15 oz/ac
  - 30 oz/ac
  - 45 oz/ac
  - 60 oz/ac
  - Control



Methods

- 6 Indicator Species
  - 1) Tomato
  - 2) Sorghum
  - 3) Cucumber
  - 4) Lettuce
  - 5) Radish
  - 6) Cabbage
  - + Longleaf Pine

Methods

- All plants are sown from seed weekly for 14 weeks.
- Data is collected weekly
  - Survival
  - Chlorosis/Discoloration
  - Injury (wilting, stunting, etc.)
- Dry weight biomass was also collected 15 weeks after the seeds were sown

Results

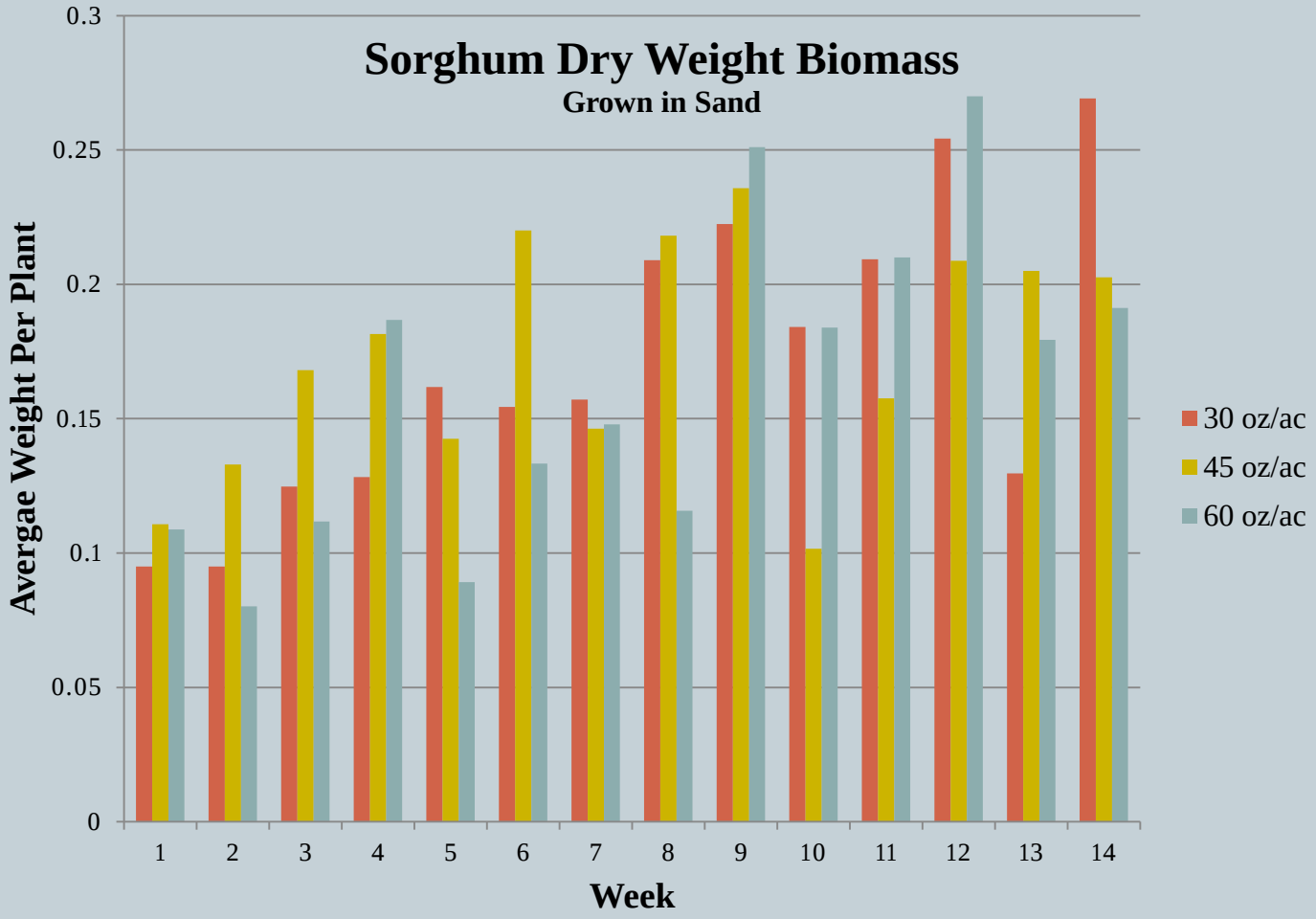
- Which species didn't work as indicators and why:

- Tomato did not provide any indication of herbicide presence. There was occasional herbicidal injury but it was inconsistent and unreliable.
- Cucumber had poor germination and was too sensitive to water stress.
- Lettuce was unique because of its resiliency. Although it would be impacted by imazapyr it would often recover which made it difficult to determine the full extent that the herbicide had on the plant.
- Radish and cabbage experienced similar effects but were overall too sensitive to the imazapyr.

Results

- Of the six species used, sorghum is the best indicator species
- Turns red in treated soil in about 2-3 weeks.
- If sorghum is planted in treated soil and after 2-3 weeks if it is not red, then the soil is safe for longleaf seedlings.

Results



Imazapyr Bioassay

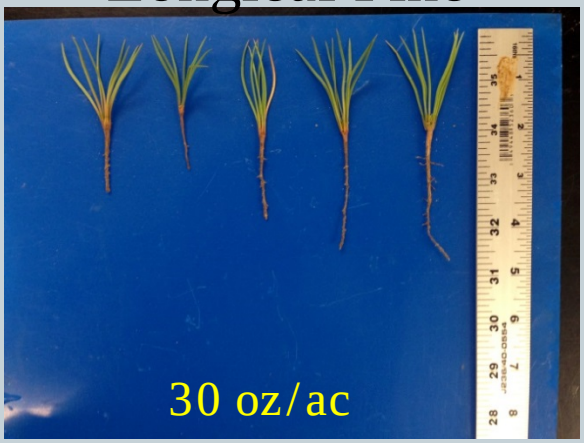
Discussion

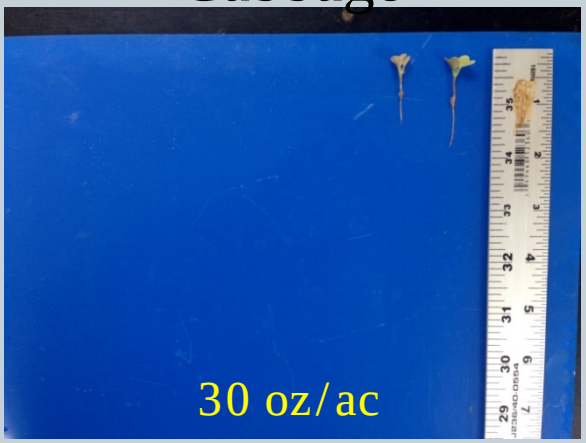
- As imazapyr is broken down and leached through the soil column, the plants survive longer and as a result produce more root growth and biomass.
  - Exposes them to more opportunities to experience minor herbicidal effects such as discoloration.

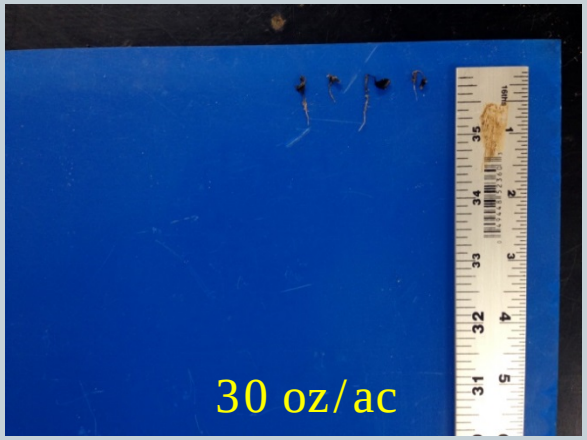
Discussion

- Imazapyr is a foliar and soil active herbicide.
- It is a broad spectrum herbicide that can be absorbed by the foliage, stem, and the roots of the plant and targets new growth of the plant.
- The soil activity and root uptake is the primary concern regarding longleaf pine.
- Although there may not always be above ground symptoms, imazapyr can significantly effect the root growth.

Imazapyr Bioassay







Plants grown in coarse textured soil treated with 30 oz/ac and sown 3 weeks after the herbicide application

Imazapyr Bioassay

Lettuce

Cucumber

Sorghum

Plants grown in coarse textured soil treated with 30 oz/ac and sown 3 weeks after the herbicide application

Imazapyr Bioassay

Tomato

Plants grown in coarse textured soil treated with 30 oz/ac and sown 3 weeks after the herbicide application

Conclusion

- Sorghum is the best indicator species to determine if imazapyr is present in the soil.
- Turns purple 2-3 weeks after growing in the treated soil.
- If the sorghum does turn purple then wait longer before planting longleaf pine seedlings.

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Questions?