# Waterhemp and Palmer Amaranth: Genetic Identification and Research Toward Control

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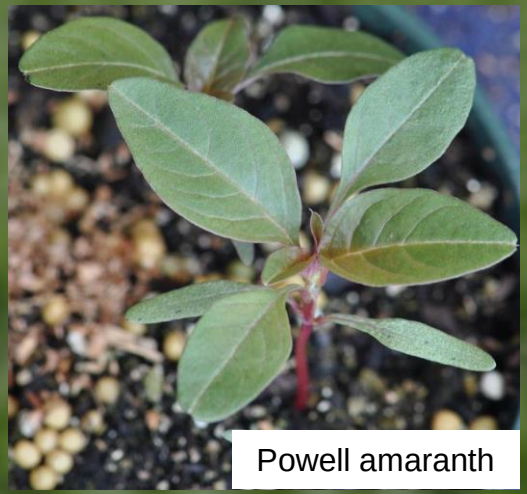
# Pigweed ID


Palmer amaranth


Powell amaranth


Waterhemp


Redroot pigweed

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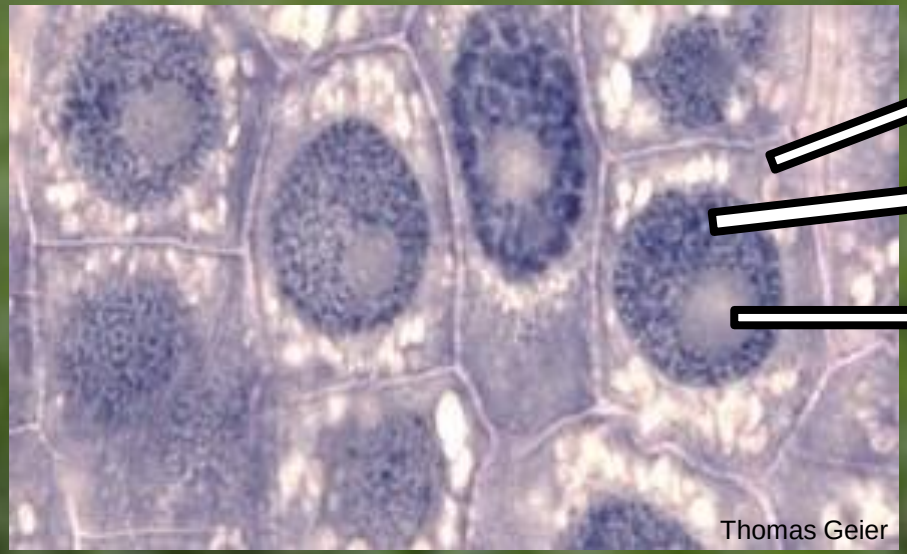
Credits: Univ. of Illinois (Palmer amaranth); Bruce Ackley, The Ohio State Univ., Bugwood.org (Powell amaranth, redroot pigweed, waterhemp)

# Species ID—What is Analyzed?




Cell

Nucleus

Nucleolus

- critical for protein synthesis

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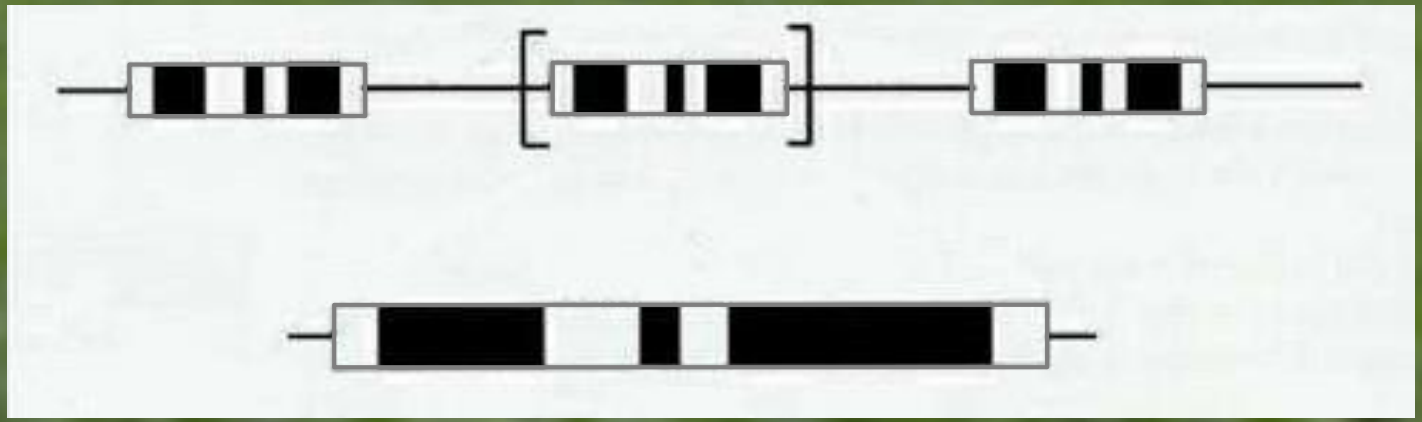
# Species ID—What is Analyzed?

## Repeated gene complexes at nucleolus



Internal transcribed spacers (ITS)

rRNA genes

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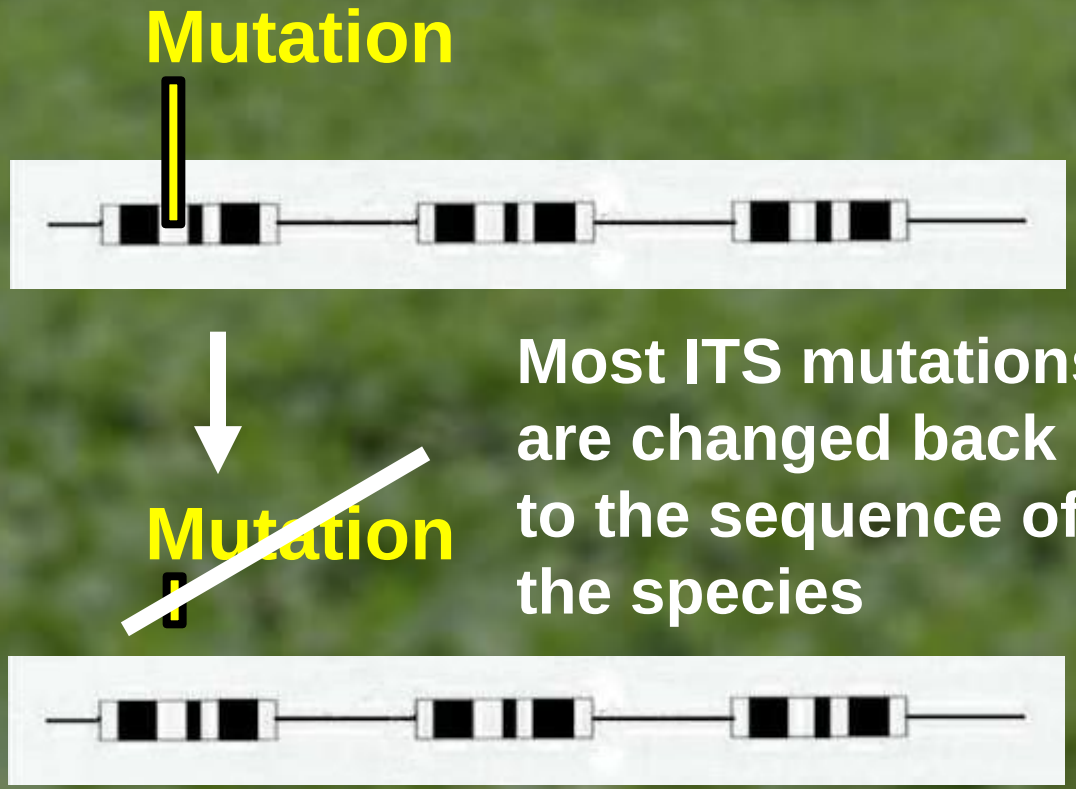
# Species ID—What is Analyzed?

ITS sequences are conserved within species, so they are excellent for species ID




Most ITS mutations are changed back to the sequence of the species

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# Gene Drives for Pest Control

## African malaria mosquito


## House mouse


## Palmer amaranth


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# Gene Drives

- First proposed in 2003
- CRISPR proposed for gene drives in 2014
- Gene drive lab experiments successful in:
  - Yeast (2015)
  - Fruit flies (2015)
  - Mosquitoes (2015)
  - Mice (2018)

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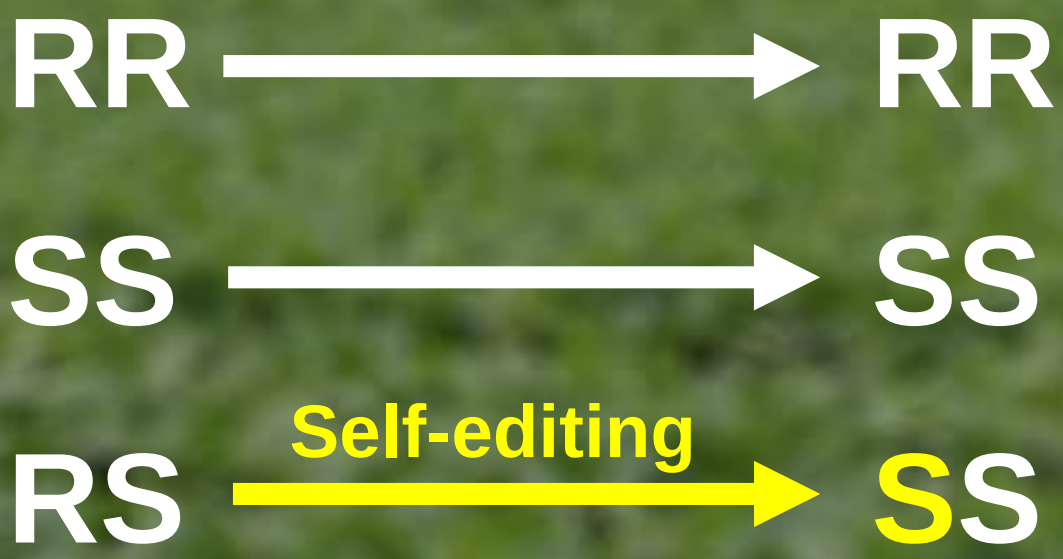
# Gene Drive for Herbicide Resistance

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# Our Current Projects Related to Herbicide Resistance and Gene Drives

- Waterhemp tissue culture
- Artificial pollination (*Brassica rapa* as model)
- Waterhemp pollen viability after storage
- CRISPR editing of ALS gene (yeast as a model)

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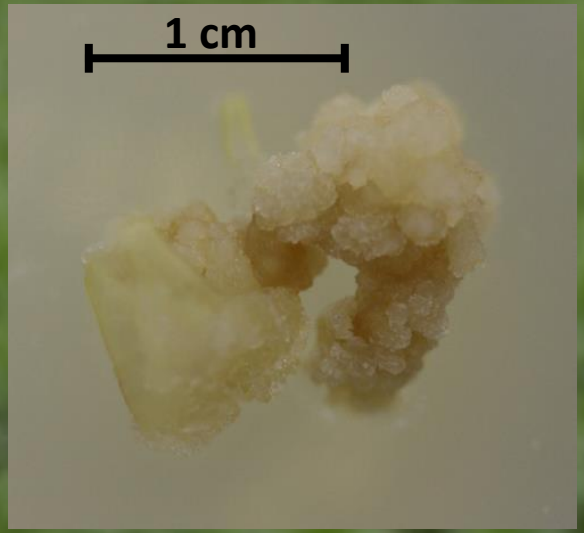
# Waterhemp Tissue Culture

Remove a portion of the stem (hypocotyl)




Successful growth of waterhemp callus tissue (shown after 40 days on growth medium)

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# Acknowlegments


- ND Agricultural Experiment Station
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- ND Soybean Council
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