Examples of fruit & seed imaging
for a toxic seed identification tool

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Why toxic seeds?
  • May be used in crimes
  • Accidental exposure can be harmful or fatal (garden, landscaping, jewelry/crafts)
  • May be encountered by field personnel

Handheld reference guide for U.S. government field agents
  • FBI - Forensic sites, evidence
  • CBP (Customs & Border Protection) - port and field inspections
  • Non-specialists

Intended scope
  • To aid recognition of toxic seeds and symptoms of exposure
  • To protect field personnel who may encounter toxic seeds

seID images available at ITP Node:
https://www.ipmimages.org/browse/projectthumb.cfm?proj=1166
Pre-imaging process

• Seed sources: US plant inspection stations and ports, USDA ARS GRIN library, university museums and arboretums, some verified field collections

• Worked with CSU botanist to review diagnostic features from published floras, broken down into simple categories

• Seed diagnostics = 3-4 major categories
  ➢ Shape
  ➢ Color
  ➢ Size
  ➢ Other
  ▪ Surface texture
  ▪ Hilum (seed attachment scar) location
  ▪ Associated structures (e.g. Asteraceae pappus, Poaceae inflorescence)
More imaging considerations

• Equipment:
  • Microscope to see & position seeds
  • Imaging system (camera, microscope, etc.)

• Materials
  • Diffusers (e.g., vellum cylinder, modified paper lantern)
  • Glass stage to reduce shadows, background texture
  • Background color (grey paper)
  • Tweezers or probe to manipulate seeds
  • Positioning aids (dental wax, photo putty)

• Light post-editing in Photoshop
  • Improve contrast, remove dust, add annotations & scale bars
What to image?

• Seed group
  • Show representative variation
  • Include scale

• “Typical” seed close-ups
  • One or few mature seeds
  • Multiple sides
  • Highlight diagnostic features: color, shape, size, texture

• Fruits
  • Multiple sides
  • Show alongside seeds
Representative Variation:
Seed Group

- Show variation in color, size, shape

*Datura stramonium*

*Hura crepitans*
Diagnostic Features: Color

- Often neutral colors but can be vibrant!
- Aim for true-to-life
  - Neutral background
  - Color-balance
  - Diffused/indirect lighting (reduce reflection, esp. for glossy seeds)

*Abrus precatorius*
Diagnostic Features: Shape

- *Can* be diagnostic to family or lower rank
  - Many (but not all) Fabaceae have characteristic “bean shape”

- Difficult to show 3D shapes in “flat” photo

- Capture at least 2 views:
  - Flat side (“face”)
  - Edge, esp. showing attachment scar (“hilum”)
  - More complex shapes may need 3-4 views
    - Multiple sides, ends, any diagnostic features

- Prop seeds up to show non-flat sides
  - *Small* amount of dental wax or adhesive putty

Flat and Hilar Seed Views

*Baptisia australis*
Diagnostic Features:
Shape - Flat

Two Views of Seed

Hura crepitans

Anadenanthera peregrina
Diagnostic Features:
Shape - Cylindrical, spherical

&emsp;&emsp;Agrostemma githago - face and edge views

Opposite Edge Views

1 mm

hilar scar (=hilum)

Agrostemma githago - face and edge views
Diagnostic Features:
Shape – pyramidal, wedge

- Common from round or compressed fruit
- Show flat side, inner ridge, end/hilum if distinct

Three Views of the Same Seed

Aconitum columbianum

Consolida ajacis, hilum & lateral

Delphinium elatum
Diagnostic Features: Size

- Digitalis purpurea – small seed
- Pouteria sapota (non-toxic) – large seed
Diagnostic Features:
Other - Texture

- Macroscopic texture
Diagnostic Features:
Other - Texture

- Microscopic texture

*Hyoscyamus niger*
Diagnostic Features:
Other

Ipomoea carnea

Sometimes Seeds of This Species are Hairy
Fruits

- Show multiple sides as with seeds (convey 3D shape)
- Capture any diagnostic features
- Size comparison with seeds
  - Seed location in fruit can be diagnostic

*Datura stramonium* (jimsonweed) fruits and seeds
Mescal bean
(Dermatophyllum secundiflorum)
Mescal bean
(*Dermatophyllum secundiflorum*)

Three Lateral Views and Two End Views

- looking down on rounder end
- looking down on flattened end

1 cm
Black locust
(*Robinia pseudoacacia*)

Group image
(branch with fruits, seeds)
Black locust
(*Robinia pseudoacacia*)

Group image
(seeds)
Black locust
*(Robinia pseudoacacia)*

Left: seed, multiple sides
Right: four seeds, multiple sides
Belladonna lily
(*Amaryllis belladonna*)

Pink fleshy seeds with papery pod (fruit)
Belladonna lily
(Amaryllis belladonna)
Belladonna lily
(Amaryllis belladonna)