

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

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seID: Toxic Seed ID Tool

- 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:

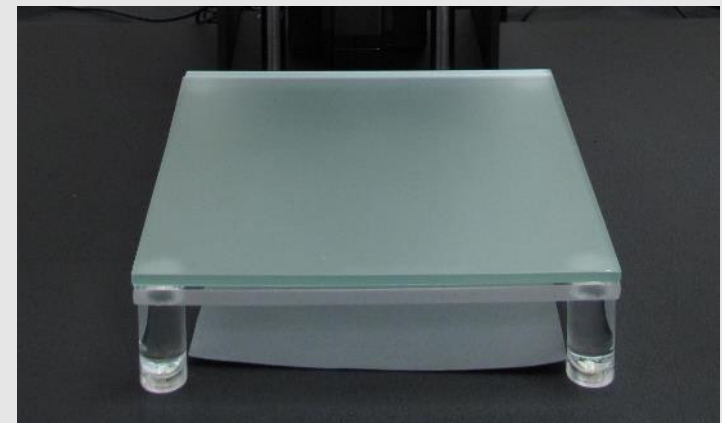
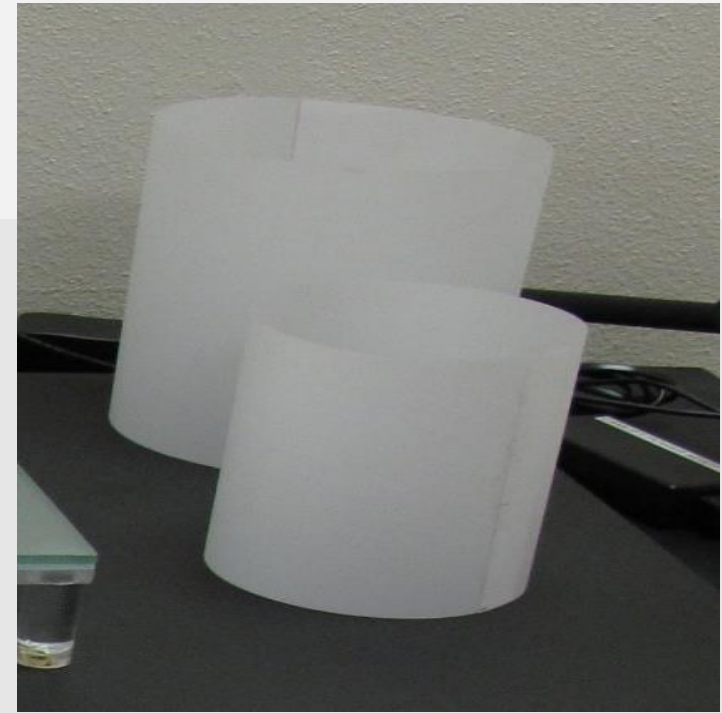
<https://www.ipmimages.org/browse/projectthumb.cfm?proj=1166>

Pre-imaging process

- Seed sources: US plant inspection stations and ports, USDA ARS GRIN library, university museums and arboreta, 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



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)



5 mm

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

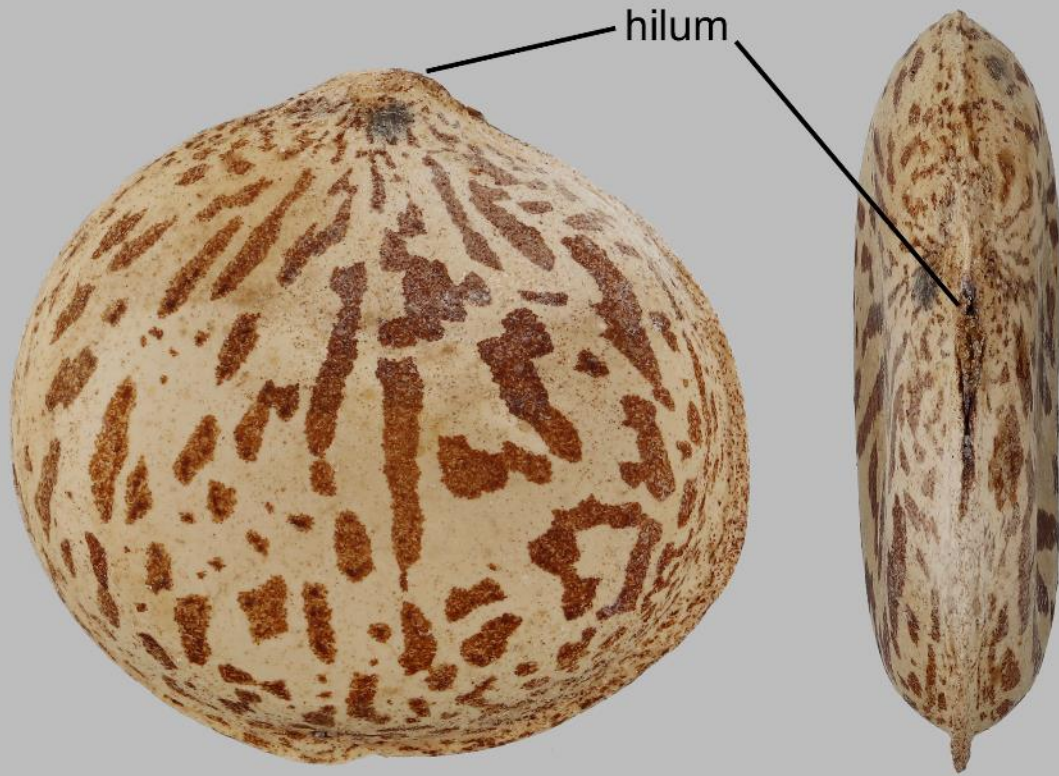


Baptisia australis

5 mm

Diagnostic Features: Shape - Flat

Two Views of Seed



1 cm

Hura crepitans

hilar notch



1 cm

Anadenanthera peregrina

Diagnostic Features: Shape - Cylindrical, spherical



1 mm

Agrostemma githago - face and edge views

Opposite Edge Views



hilar scar
(=hilum)

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

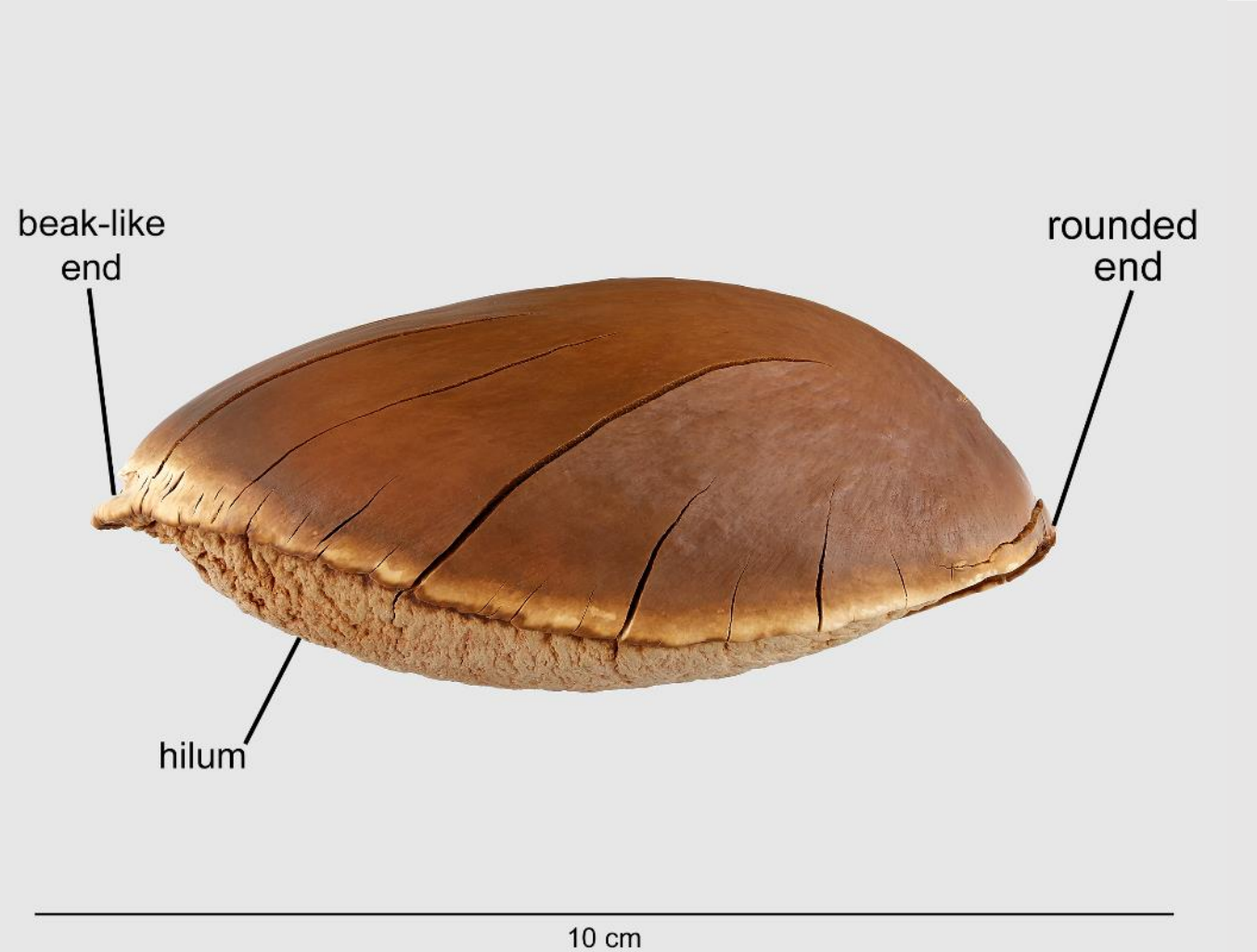
outer edge lateral inner edge



Diagnostic Features: Size



Digitalis purpurea – small seed



Pouteria sapota (non-toxic) – large seed

Diagnostic Features: Other - Texture

- Macroscopic texture



5 mm

Tabernanthe iboga



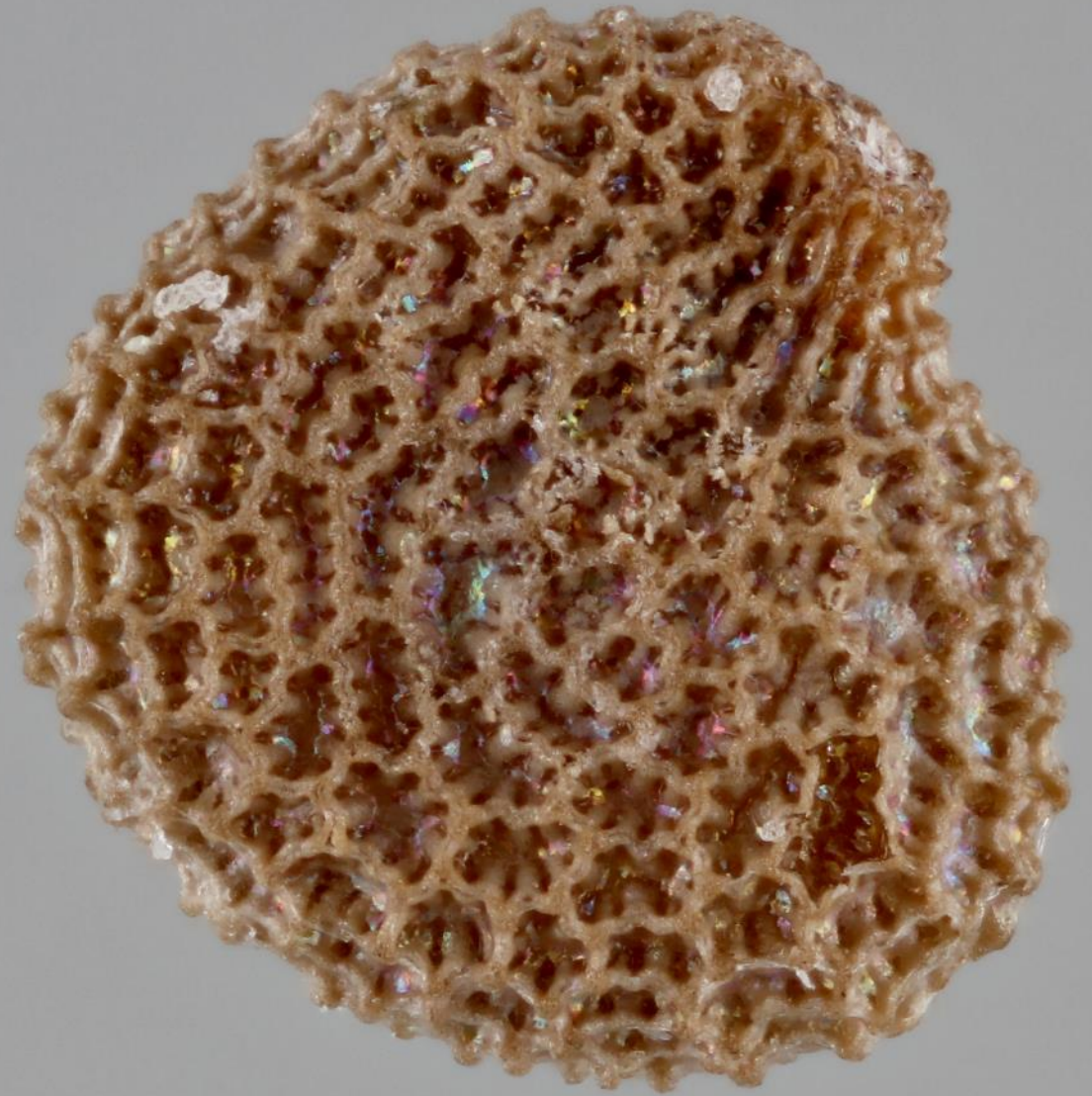
5 mm

Diagnostic Features: Other - Texture

- Microscopic texture



Hyoscyamus niger



1 mm



Hyoscyamus niger (Solanaceae)
face view of seed

Diagnostic Features: Other



1 mm

Ipomoea carnea

Sometimes Seeds of This Species are Hairy



1 cm

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

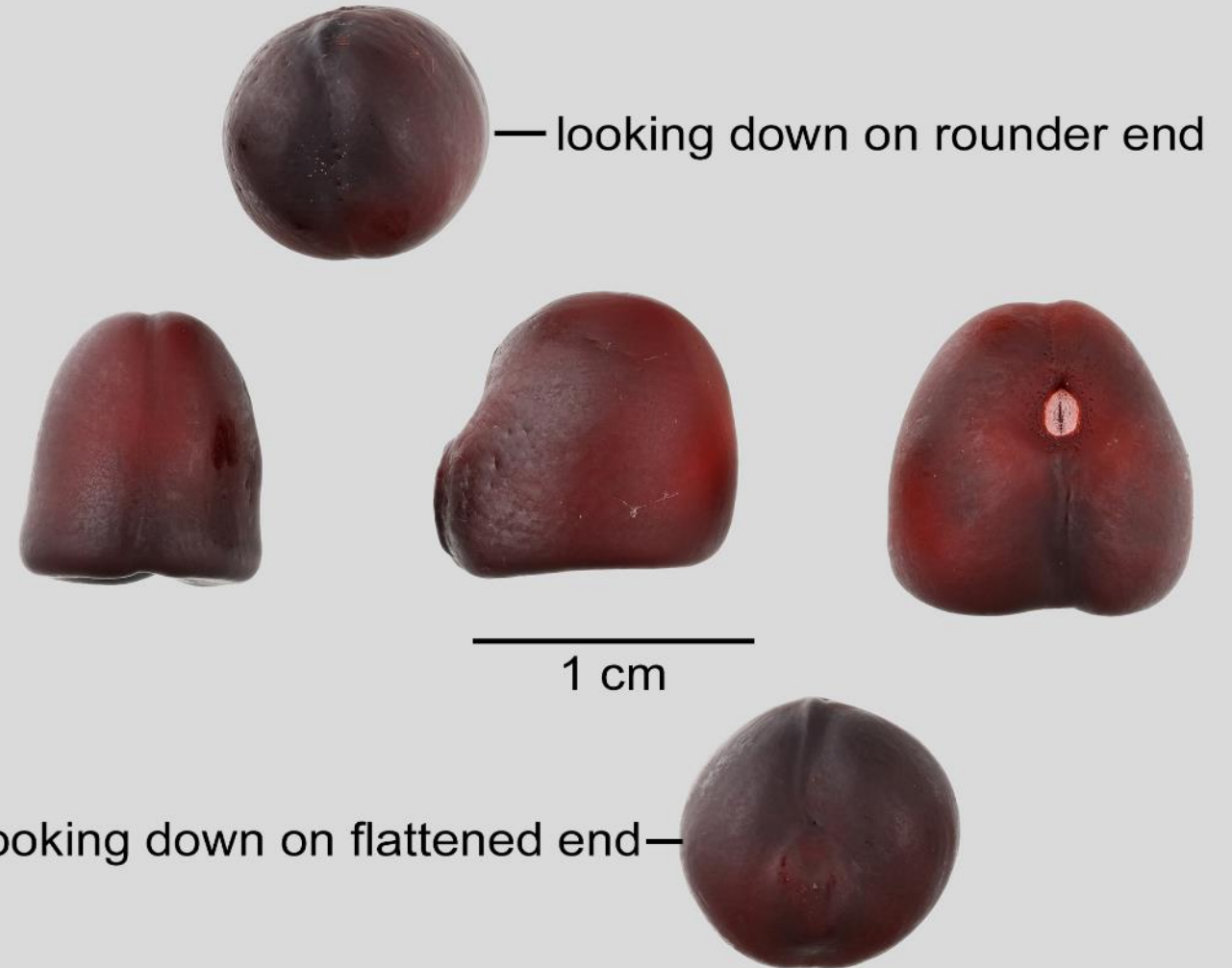


Mescal bean

Dermatophyllum secundiflorum



Three Lateral Views and Two End Views



looking down on flattened end—

Black locust

(*Robinia pseudoacacia*)



Group image
(branch with fruits, seeds)

Black locust

(*Robinia pseudoacacia*)

funicle still attached to hilum



Group image
(seeds)

1 cm

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*)

fruit, lateral



5 cm

fruit, apical



1 cm

Belladonna lily

(*Amaryllis belladonna*)

