Building Virtual Reference for Seed Identification

https://www.idseed.org/

https://analyzeseeds.com/

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Images ©RBG Kew
Presenters

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Animal and Plant Health Inspection Service (APHIS)
U.S. Department of Agriculture (USDA)
Overview

• Specimen selection and image plan (Ruojing Wang)
• Examples of seed/fruit imaging on a toxic-seed-ID tool for the FBI (Lindsey Seastone)
• Imaging techniques and troubleshooting (Madeline Maher)
• Q&A
Principles of Specimen Selection

Virtual/image reference:
• True to the plant identity (verified specimens)
• Representation
• Reference function

ISMA image protocol
https://www.idseed.org/authors/details/protocol_for_imaging_seed_features.html
Ensuring the identity of seeds

- Expertise required, e.g.,
  - **Field Collection**: Verified plant species
  - **Herbarium**: Verified seed specimens
  - **Laboratory or Authority**: Specialist verified materials
Specimen Representation

Image of seed features:

- **Mature seeds (common use)**
- Immatures seeds (special needs, shall be labeled)
- Deformed seeds (Special needs, shall be labeled)
Specimen Representation

Typical features:

• **Single seed**
• **Close up**

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*Cuscuta* spp.

*Setaria pumila* subsp. *pumila*

*Apium graveolens* var. *dulce*

*Atriplex hortensis*
Specimen Representation

Typical features:
• Single seed
• Close up

ageratum conyzoides  Bromus secalinus  Aegilops cylindrica
Specimen Representation

Feature variations:
• Group seeds to show variations such as color, size, and shape.

*Anthriscus sylvestris*

*Papaver somniferum*

*Picris echioides*
Specimen Representation

Diversity of botanical form:
• Dispersal and botanical forms
• Dimorphism

Atriplex hortensis

Danthonia spicata

Aegilops cylindrica
Image presentation: File name

Image set up:
- **Name:** Scientific name + notes
- **Background:** white, black, and grey
- **Scale:** scale bar
- **Labels:** feature indication
- **Copyright statement & logo**

File names of an image:
Species name + Notes (spec + serial number + Author)
Poa alpine-Floret-01-NSH
Image presentation: Background

Image set up:

- **Name:**
  Scientific name + notes
- **Background:** white, black and grey
- **Scale:** scale bar
- **Labels:** feature indication

Avena sativa fatuoid

Rumex maritimus

Bothriochloa barbinodis
Image presentation

Image set up:
• Feature labelling
• **Scale bar or a reference**
• Copyrights

*Avena sativa* fatuoid
Avoid

Seeds touch each other

unnecessary arrangement

Setaria pumila subsp. pumila

What is wrong here?
Question?
Acknowledgement

- Images credited to CFIA (National Seed Herbarium)
- Authors for the imaging protocol published in ISAM website
- *QUAD Digital Identification Tool Team

*Quadrilateral Scientific Collaboration Working Group (the National Plant Protection Organizations (NPPOs) of Australia, Canada, New Zealand, and the United States).