Canadian Food Inspection Agency | Agence canadienne d'inspection des aliments

# CSAAC Purity Presentation 2019
# *Linaria* spp. - Toadflax
# May 29, 2019

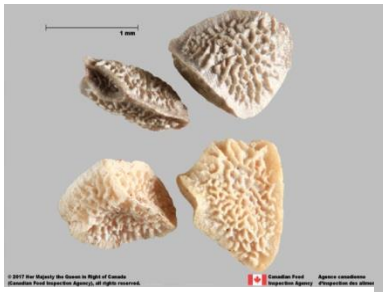
Seed Science and Technology Section
CFIA Saskatoon Laboratory

Canada

# Learning objectives for this presentation

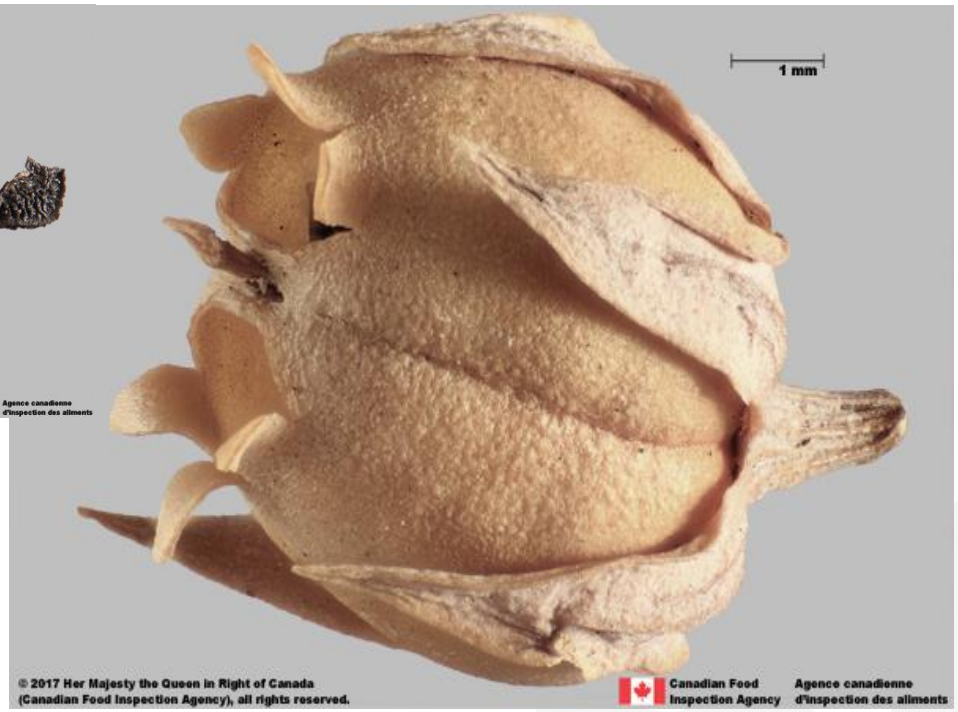
1. Become familiar with the structures and features of the seeds of selected *Linaria* spp. that analysts use to gather information about their identity.
2. Know how to apply botany knowledge to distinguish selected species of toadflax.

# *Linaria dalmatica* fruit and seeds



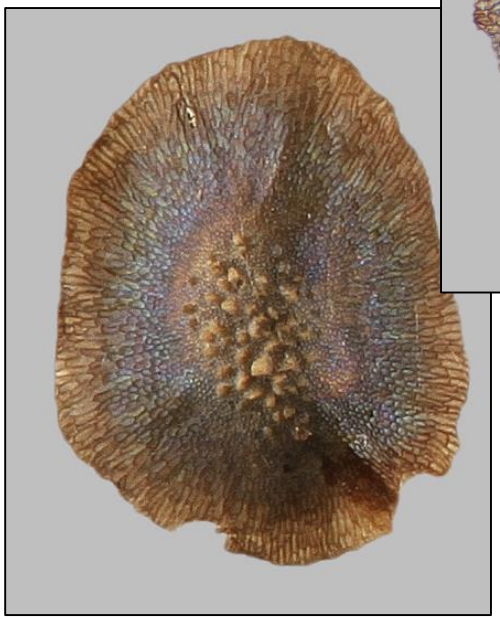
Immature seeds


Angular shapes from close packing in capsule

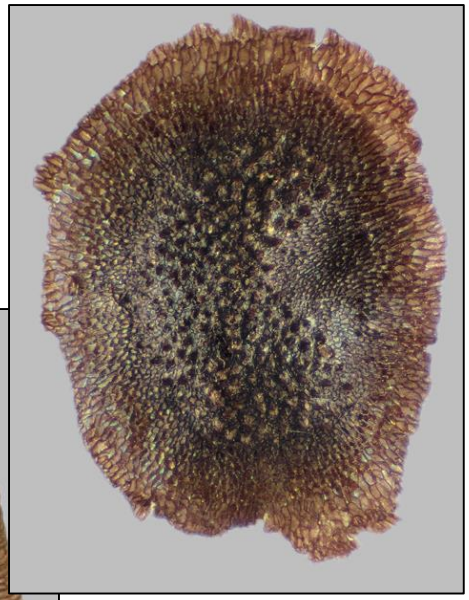



Seeds form inside of a 2-chambered capsule

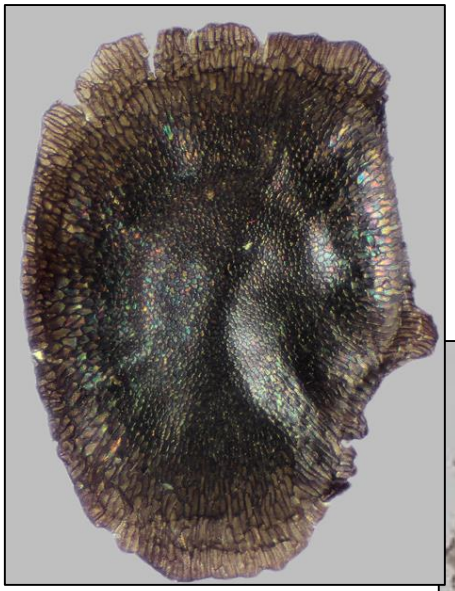
# Seed features of round *Linaria* spp.



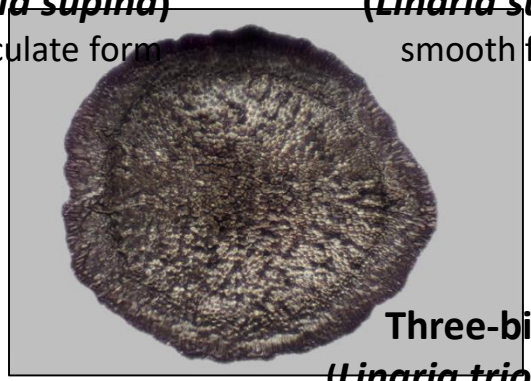
**Yellow toadflax**
**(*Linaria vulgaris*)**



**Prostrate toadflax**
**(*Linaria supina*)**
tuberculate form



**Prostrate toadflax**
**(*Linaria supina*)**
smooth form



**Three-birds-flying**
**(*Linaria triornithophora*)**

**Melancholy toadflax**
**(*Linaria tristis*)**

# Question #3

1. What are the 2 seed features used to separate the selected species of round-seeded *Linaria* spp.?

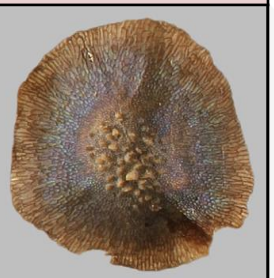
2. What are the 2 seed features that confirm yellow toadflax (*L. vulgaris*)?

# Question #3

1. What are the 2 seed features used to separate the selected species of round-seeded *Linaria* spp.?
    - Shape of central area
    - Texture of the central area

1. What are the 2 seed features that confirm yellow toadflax (*L. vulgaris*)?
    - Oval central area
    - Tuberculate central area

# Seed features of round *Linaria* spp.

| **Feature/ Species** | ***Linaria tristis*** (melancholy toadflax) | ***Linaria supina*** (prostrate toadflax) | ***Linaria triornithophora*** (3 birds flying) | ***Linaria vulgaris*** (yellow toadflax) |
|---|---|---|---|---|
| Tuberculate centre | | ✓ | | ✓ |
| Smooth centre | ✓ | ✓ | | |
| Ridged centre | | | ✓ | |
| Oval-shaped centre | ✓ | | | ✓ |
| C-shaped centre | ✓ | ✓ | | |
| Image |  |  |  |  |

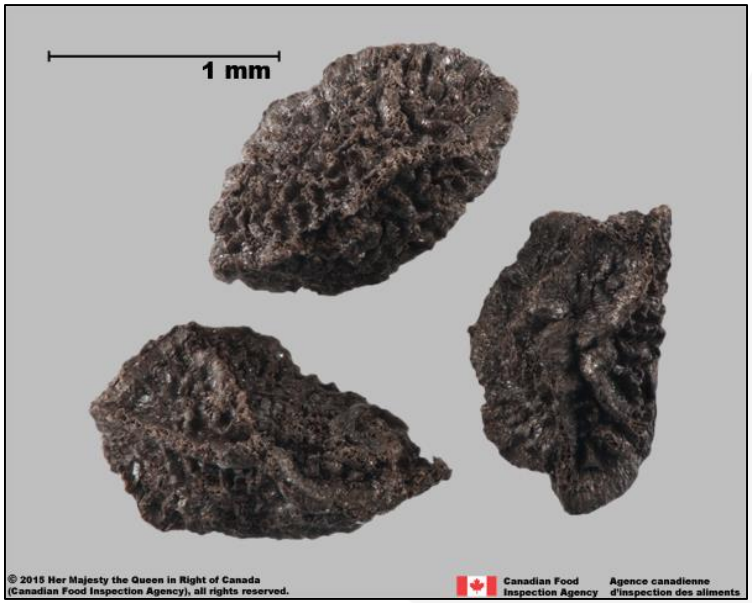
# Seed features of angular *Linaria* spp.


**Purple toadflax (*Linaria purpurea*)**

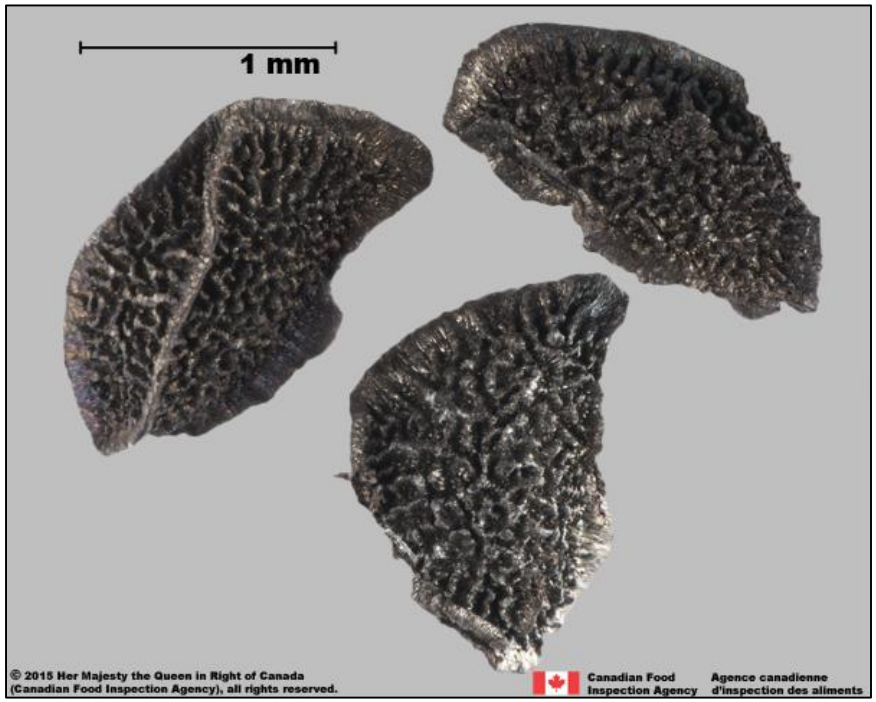
- Dull, granular, 'dusty'
- Smaller than striped toadflax
- Strongly angular
- Reticulations are thicker

**Striped toadflax (*Linaria repens*)**

- Dull, occasionally with faint metallic shine
- Larger than purple toadflax
- Strongly curved on one side, almost 3 sided
- Edges appear to erode



# Seed features of angular *Linaria* spp.

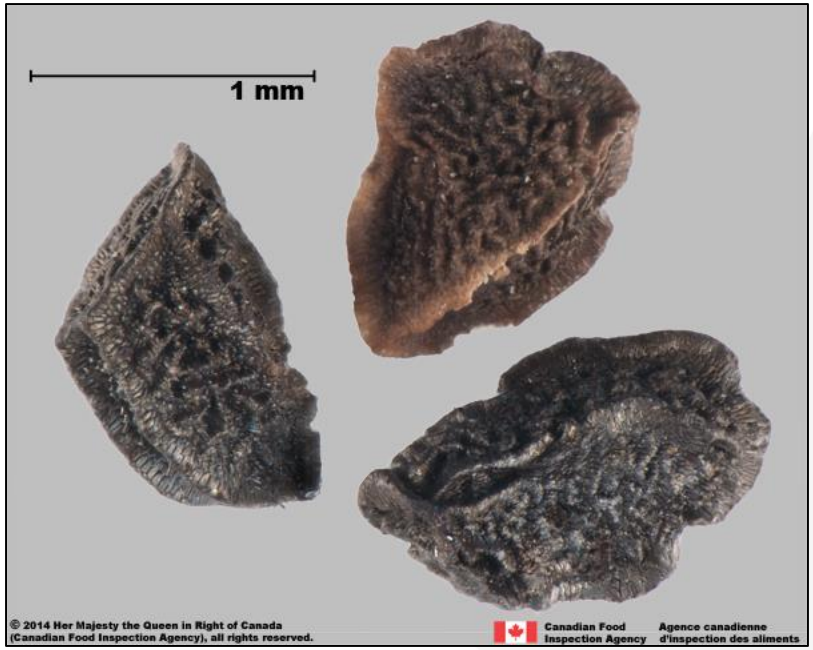



**Dalmatian toadflax (*Linaria dalmatica*)**

- Metallic shine
- Larger than broomleaf toadflax
- Strongly angular shape
- Reticulations have smaller interspaces than broomleaf toadflax

**Broomleaf toadflax (*Linaria genistifolia*)**

- Metallic shine
- Smaller than Dalmatian toadflax
- Strongly angular shape
- Reticulations have larger interspaces than Dalmatian toadflax



# Question #4

1. What are the 3 seed features used to separate the selected species of angular-seeded *Linaria* spp.?

2. What are the 3 seed features that describe Dalmatian toadflax (*L. dalmatica*)?

# Question #4

1. What are the 3 seed features used to separate the selected species of angular-seeded *Linaria* spp.?
    - Surface colour – dull or metallic
    - Shape of seeds – polygonal or 1 side curved
    - Relative size of the reticulation interspaces

2. What are the 3 seed features that describe Dalmatian toadflax (*L. dalmatica*)?
    - Metallic shine
    - Polygonal seeds, all sides angular
    - Small interspaces

# Seed features of angular *Linaria* spp.

| Feature/ Species | ***Linaria dalmatica*** (Dalmatian toadflax) | ***Linaria genistifolia*** (broomleaf toadflax) | ***Linaria purpurea*** (purple toadflax) | ***Linaria repens*** (striped toadflax) |
|---|---|---|---|---|
| Surface dull | | | ✓ | ✓ |
| Surface shining | ✓ | ✓ | | |
| Interspaces small | ✓ | | | |
| Interspaces large | | ✓ | ✓ | ✓ |
| Strongly curved on one side | | | | ✓ |
| Image |   |   |  |   |

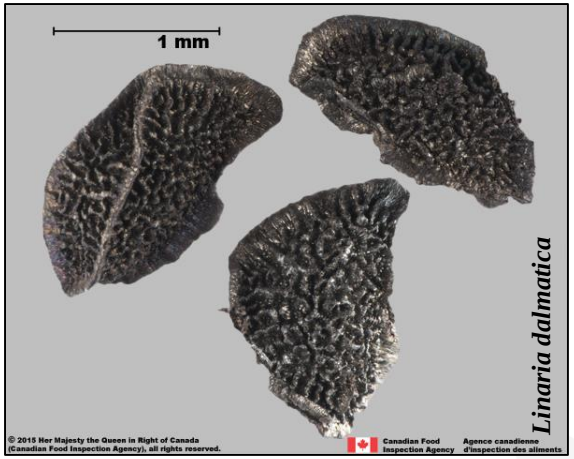
# *Linaria genistifolia* subsp. *dalmatica*

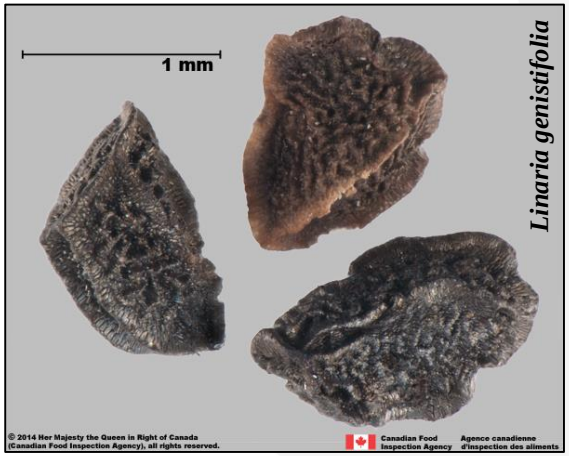
- The seeds of *Linaria dalmatica* and *L. genistifolia* are similar looking and challenging to distinguish.

- *L. dalmatica* was once a subspecies of *L. genistifolia (*as *L. genistifolia subsp. dalmatica)* and was split into separate species in the last decade (ref: GRIN).

- Be aware that descriptions of "*L. genistifolia*" may refer to either species in older books or websites if a subspecies is not given.

- If the common name is given, that can be used to check the species



# Thank you!

**Acknowledgements:**

Seeds for imaging: National Seed Herbarium

Questions/comments send to: SSTS@canada.ca

ISMA: International Seed Morphology Association

https://www.idseed.org/