



Canadian Food
Inspection Agency

Agence canadienne
d'inspection des aliments

CSAAC Purity Presentation 2019

Thistles

May 29, 2019

Seed Science and Technology Section
CFIA Saskatoon Laboratory



Learning objectives for this presentation

1. Become familiar with the structures and features of the achenes in the Asteraceae thistle group that analysts use to gather information about their identity.
2. Know how to apply botany knowledge to distinguish selected species of thistles.

Thistles, Thistles and Thistles

Asteraceae - Carduoideae



Carduus spp.



Centaurea spp.



Cirsium spp.

Cynara
spp.



Silybum
spp.



Features of Thistle Achenes (Cypsela)

Scar from
flower
parts



Scar from
flower
head

Artichoke thistle
(*Cynara cardunculus*)

Pappus



Yellow starthistle
(*Centaurea solstitialis*)

Remnant peg



Canada thistle
(*Cirsium arvense*)

Asteraceae Fruit Features: Top attachment points



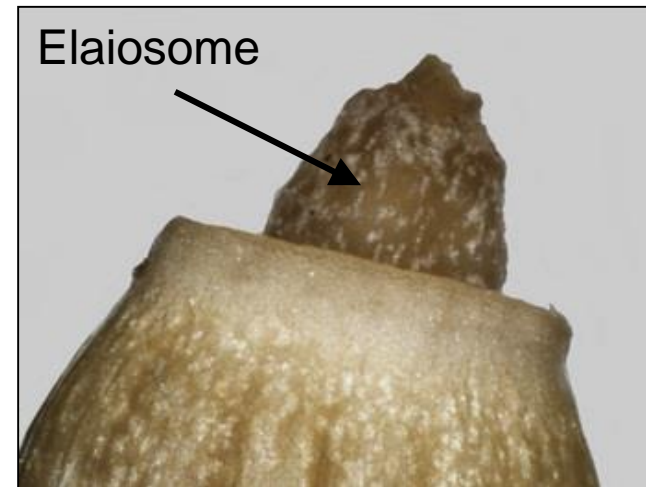
Scar

Yarrows (*Achillea* spp.)
Goldenrods (*Solidago* spp.)
Wormwoods (*Artemisia* spp.)



Collar and small peg

Groundsels (*Senecio* spp.)
Knapweeds (*Centaurea* spp.)
Chamomiles (*Matricaria* &
Tripleurospermum spp.)



Collar and large peg

Thistles
(*Cirsium* & *Carduus* spp.)

Asteraceae Fruit Features: Basal attachment points



Ring

Yarrows (*Achillea* spp.)
Goldenrods (*Solidago* spp.)
Wormwoods (*Artemisia* spp.)



Small end notch

Thistles (*Cirsium* &
Carduus spp.)
Sunflowers (*Helianthus* spp.)



Large end or side notch

Knapweeds (*Centaurea* spp.)

***Cirsium* spp. vs *Carduus* spp.**



**Feather-like pappus
(*Cirsium* spp.)**



**Thread-like pappus
(*Carduus* spp.)**

Introduced Thistles vs. Native Thistles

Introduced to North America

- **Nodding thistle**
(*Carduus nutans*)
- **Spiny plumeless thistle**
(*Carduus acanthoides*)
- **Canada thistle**
(*Cirsium arvense*)
- **Marsh thistle**
(*Cirsium palustre*)
- **Bull thistle** (*Cirsium vulgare*)

Native to North America

- **Wavy-leaved thistle**
(*Cirsium undulatum*)
- **Flodman's thistle**
(*Cirsium flodmanii*)

Canada Thistle (*Cirsium arvense*)



- *Weed Seeds Order Class 2*
- Similar length as nodding thistle
- Generally more narrow and straight than *Carduus* spp. achenes with a thin style remnant
- Smooth surface with thin longitudinal grooves
- Light or medium yellowish-brown coloured

Canada Thistle Variants



Nodding Thistle (*Carduus nutans*)



- *Weed Seeds Order Class 2*
- Smooth surface with darker longitudinal lines and irregular transverse lines
- Golden or brown coloured, may be yellow at the collar and base
- Thick style remnant, straight or curved at top





Question #1

1. What is the main seed feature that separates *Cirsium* spp. from *Carduus* spp.?
2. What are the 3 seed features used to separate nodding thistle from Canada thistle ?

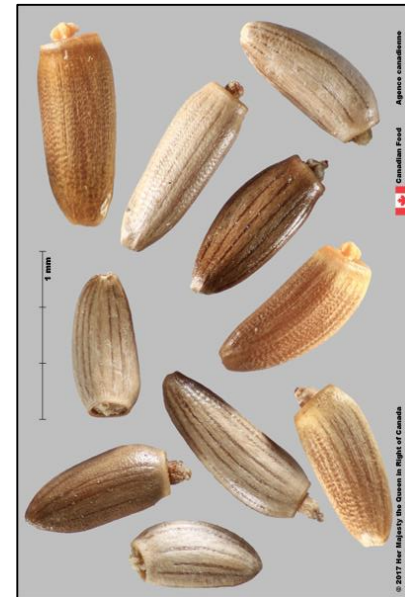
Question #1

1. What is the main seed feature that separates *Cirsium* spp. from *Carduus* spp.?
 - The pappus of *Cirsium* spp. is plumose, thread-like in *Carduus* spp.
2. What are the 3 seed features used to separate nodding thistle from Canada thistle ?
 - Nodding thistle has a wider achene
 - Nodding thistle achenes have transverse lines
 - Nodding thistle achenes appear varnished
 - Remnant peg thicker in nodding thistle

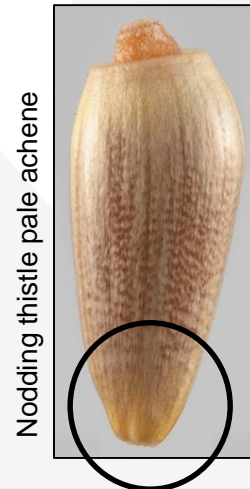
Distinguishing Canada from Nodding thistle

| | Canada thistle (<i>Cirsium arvense</i>) | Nodding thistle (<i>Carduus nutans</i>) |
|--------------------|--|--|
| |  |  |
| Shape | <ul style="list-style-type: none"> Longer than wide; lens-shaped in x-section; more narrow than nodding thistle | <ul style="list-style-type: none"> Longer than wide; lens-shaped in x-section; wider than Canada thistle |
| Surface | <ul style="list-style-type: none"> Dull, fibrous, light brown–coloured with thin longitudinal grooves | <ul style="list-style-type: none"> Smooth surface, golden or brown coloured; thin, darker longitudinal and irregular transverse lines |
| |  |  |
| Remnant peg | <ul style="list-style-type: none"> Thinner than nodding thistle | <ul style="list-style-type: none"> Wider than Canada thistle |

Spiny Plumeless Thistle (*Carduus acanthoides*)



- *Weed Seeds Order Class 2*
- Smooth surface with thin longitudinal lines and irregular transverse ridges
- Pale, grey or light brown coloured, often pinkish at the base
- Thick style remnant, similar size as nodding thistle






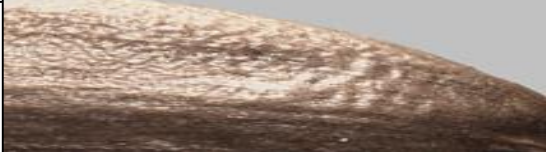
Question #2

1. What is the main seed feature that separates spiny plumeless thistle from nodding thistle achenes?
2. What looks similar between spiny plumeless thistle achenes and immature nodding thistle achenes? What can be used to distinguish them?

Question #2

1. What is the main seed feature that separates spiny plumeless thistle from nodding thistle achenes?
 - Spiny plumeless thistle has transverse ridges visible at the surface
 - The surface of nodding thistle is smooth
1. What looks similar between spiny plumeless thistle achenes and immature nodding thistle achenes? What can be used to distinguish them?
 - Transverse ridges at the achene surface
 - Look for the yellow base

Distinguishing Nodding from Spiny Plumeless Thistle

| | Nodding thistle <i>(Carduus nutans)</i> | Spiny plumeless thistle <i>(Carduus acanthoides)</i> |
|-------------------------|---|---|
| |  |  |
| Shape | <ul style="list-style-type: none"> Longer than wide; lens-shaped in x-section, similar size as spiny plumeless thistle | <ul style="list-style-type: none"> Longer than wide; lens-shaped in x-section, similar size as nodding thistle |
| Surface | <ul style="list-style-type: none"> Smooth/ varnished; light brown coloured; thin longitudinal lines and irregular transverse lines | <ul style="list-style-type: none"> Wrinkled surface; pale, grey or light brown coloured; thin longitudinal lines and irregular transverse ridges |
| |  |  |
| Immature achenes | <ul style="list-style-type: none"> Pale coloured, may have transversely wrinkled surface, base and/or collar yellow | <ul style="list-style-type: none"> Pale coloured, transversely wrinkled surface, base and/or collar same colour as rest of achene |

Bull Thistle (*Cirsium vulgare*)



Flodmann's thistle (*Cirsium flodmanii*)

- Similar size and shape as bull thistle
- Smooth surface with thin longitudinal grooves, dull
- Light brown coloured with distinctive glossy yellow collar

- On Minimum List of Species, Part III
- Similar size and shape as nodding thistle, remnant peg with bulb at top
- Smooth, dull or shiny surface with thin longitudinal grooves
- Light brown coloured with pale collar and dark streaks

Marsh Thistle (*Cirsium palustre*)



- Not regulated, but range is expanding
- Shortest of the thistles in this presentation, similar shape as nodding thistle, but narrows at the base
- Smooth surface with dull, fibrous, white coating
- Pale coloured or light brown surface
- Thick style remnant

Wavy-leaved Thistle (*Cirsium undulatum*)



- Largest achenes of the thistles in this presentation
- Similar shape as nodding or bull thistle, but narrows at the base
- Roughened, shiny, light brown or brown coloured surface
- Thick style remnant

Biocontrol of Thistles

- The flowerhead weevil is native to Europe, Asia and north Africa;
- Introduced in the US and Canada in 1968 to control the spread of a number of invasive thistle species;
- Successful in reducing thistle populations, but has since spread to native thistles.



Weevil (*Rhinocyllus conicus*)

By Landcare Research New Zealand Ltd - <http://www.landcareresearch.co.nz/science/plants-animals-fungi/animals/invertebrates/systematics/weevils/weevil-list>, CC BY 4.0,
<https://commons.wikimedia.org/w/index.php?curid=52937930>



Mark Schwarzlander, University of Idaho, Bugwood.org
<https://www.weedimages.org/browse/detail.cfm?imgnum=1594209>

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/>