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Inspection Agency

Agence canadienne
d'inspection des aliments

Seed Identification of *Festuca* species

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Learning objectives

1. Become familiar with the structures and features of the Poaceae family used in identification of fescue species.
2. Apply knowledge of fescue floret features to distinguish between fescue species, ryegrass species and their hybrids.

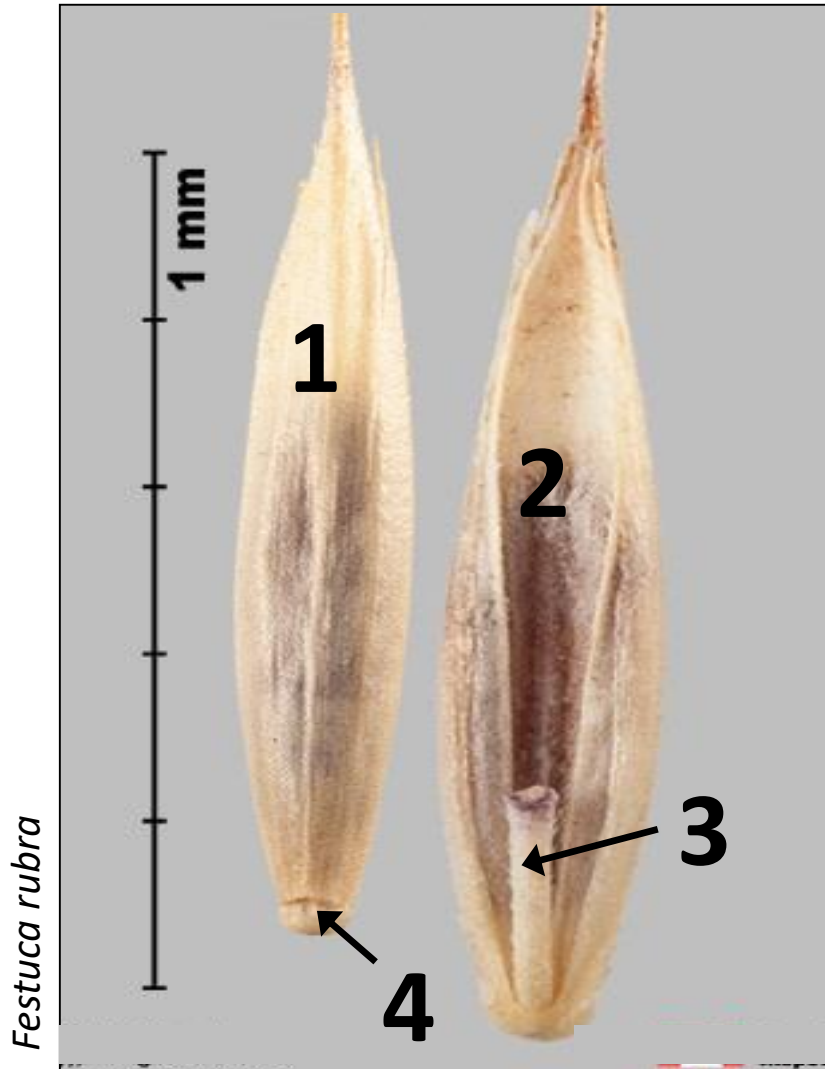
Grass Family Florets: Poöideae subfamily



Question #1

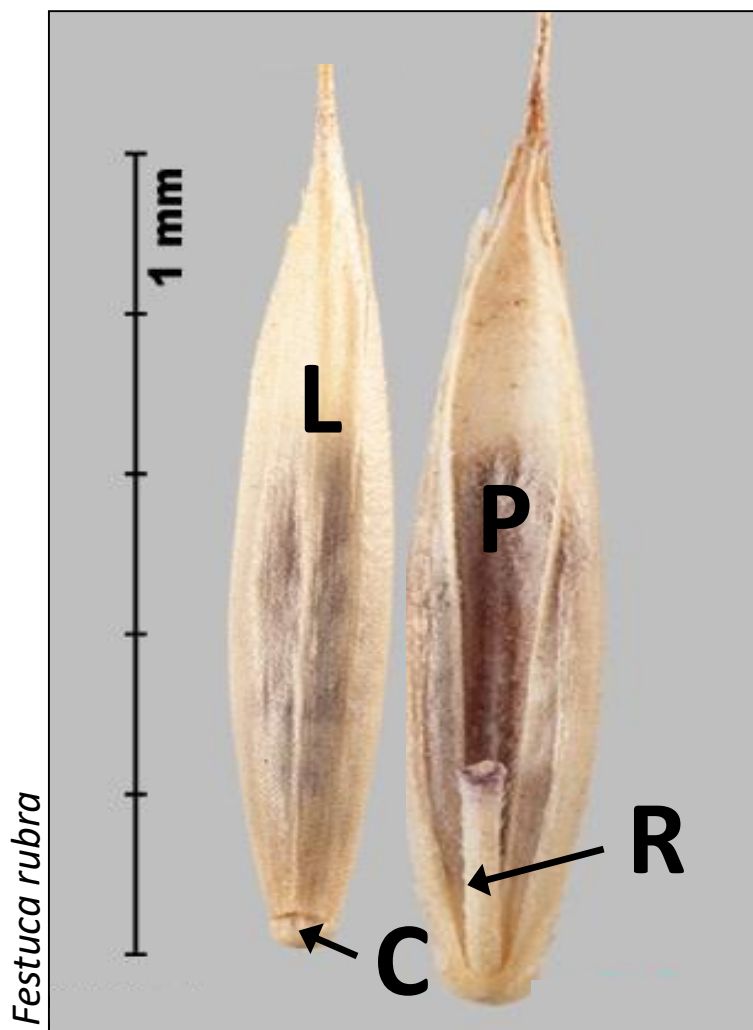
What is the order of floret parts A-D?

- A.** 1. Lemma, 2. Callus, 3. Palea, 4. Rachilla
- B.** 1. Lemma, 2. Palea, 3. Rachilla, 4. Callus
- C.** 1. Palea, 2. Lemma, 3. Rachilla, 4. Callus



Festuca rubra

Floret Features of Fescue Species



General: Shorter than other crop florets (~5.0 mm long), pale colour, visible, dark coloured grain, narrow ends

Lemma: Granular, dense to scattered or smooth textured, hairs near pointed end, often awned from tip

Palea: Generally smooth, hairs at pointed end, in-rolled, with small, fine teeth

Rachilla: Cylindrical, narrow, generally short-hairy

Callus: Thick, base flat or rounded, like a lip



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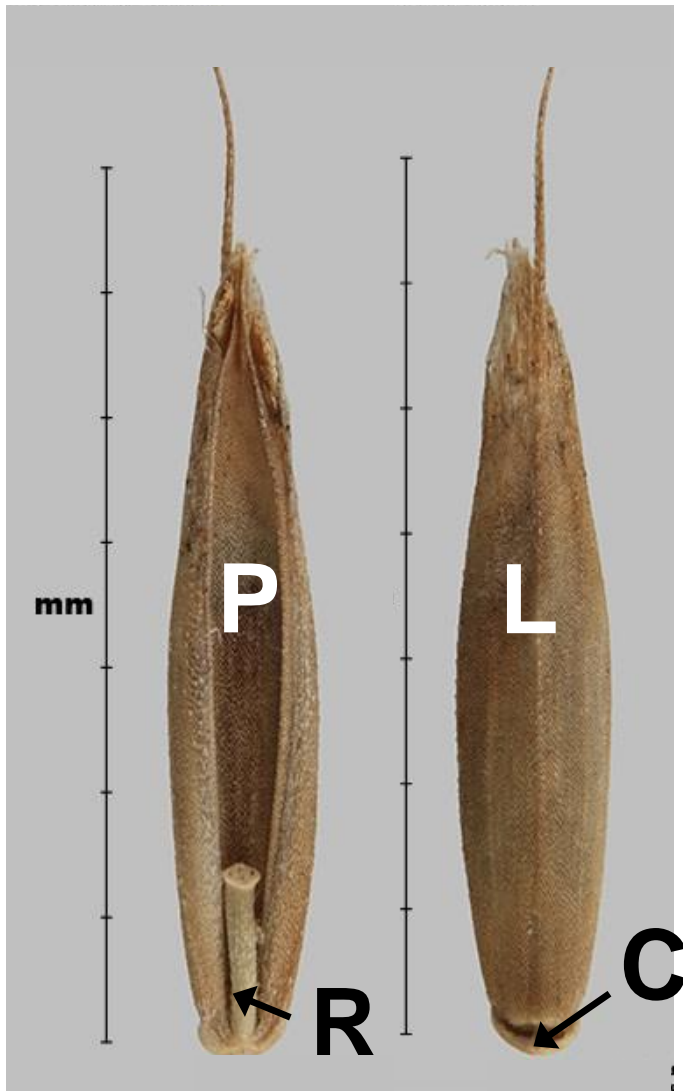
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Features of Broad-leaved Fescues: Tall and Meadow Fescue (subgenus *Schedonorus*)



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Festuca arundinacea (tall fescue)



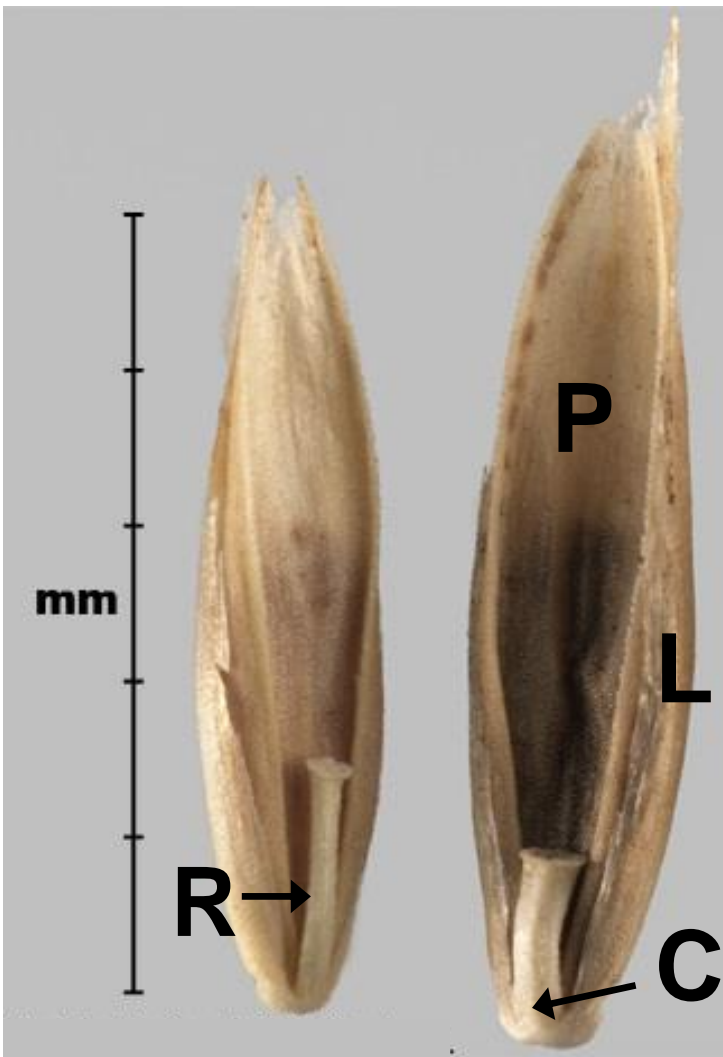
Lemma: Brown, short awned, granular texture, folded over palea almost to top

Palea: Granular texture, small teeth that can extend to base

Rachilla: Cylindrical, with bristles

Callus: Flared at sides rounded at base, space above

Festuca pratensis (meadow fescue)



Lemma: Light brown, smooth to slightly granular, shining, may have small awn

Palea: Smooth to slightly granular, shining, wrinkled, teeth not obvious

Rachilla: Compressed, smooth, curves to one side

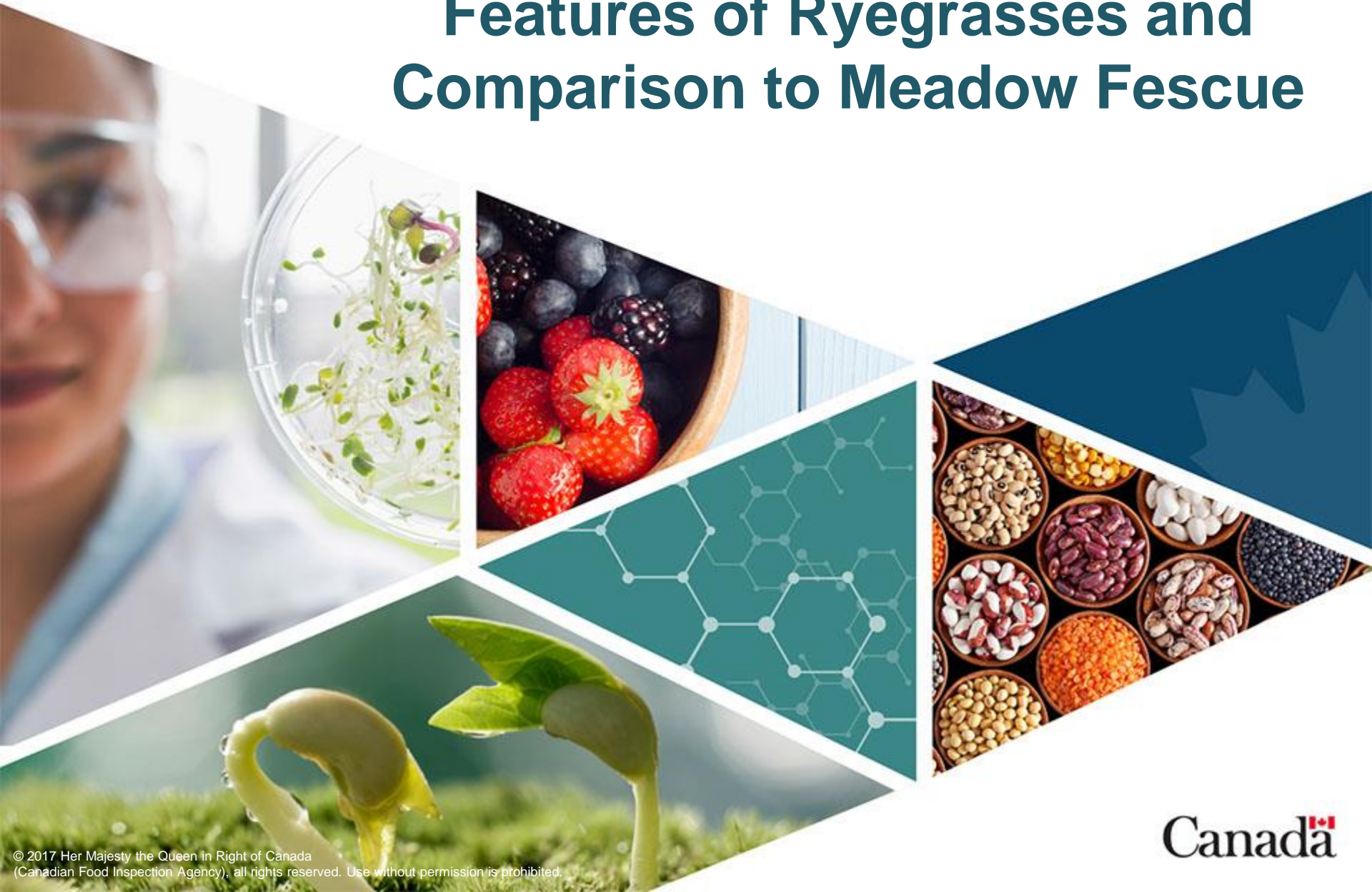
Callus: Flared at sides, flat base small space above

Comparison of Tall and Meadow Fescue

	<i>Festuca arundinacea</i> (Tall fescue)	<i>Festuca pratensis</i> (Meadow fescue)
Lemma	<ul style="list-style-type: none"> - Darker colour than meadow fescue - Generally awned - Granular texture, dull - Can have bristles on surface, concentrated on the nerves - Base wider than meadow fescue 	<ul style="list-style-type: none"> - Paler colour than tall fescue - Short or no awn - Fine granular texture - Shining near apex - Base more narrow than tall fescue
Palea	<ul style="list-style-type: none"> - Granular texture, dull - Teeth can extend to the base, small and fine - Palea curve inwards almost to the top - Top of palea sharp pointed 	<ul style="list-style-type: none"> - Finely granular, smoother towards top - Teeth concentrated near top of palea - Palea keels curve inwards in the lower half - Palea opens wider in the upper half than tall fescue
Rachilla	<ul style="list-style-type: none"> - Cylindrical, short hairy 	<ul style="list-style-type: none"> - Compressed, oval in cross-section, smooth - Often leans to one side
Callus	<ul style="list-style-type: none"> - Thick rim - Curved base - Flares out at the sides 	<ul style="list-style-type: none"> - Thick rim - Wider than bottom of the lemma - Fairly flat base



Features of Ryegrasses and Comparison to Meadow Fescue



Lolium spp. (ryegrass)

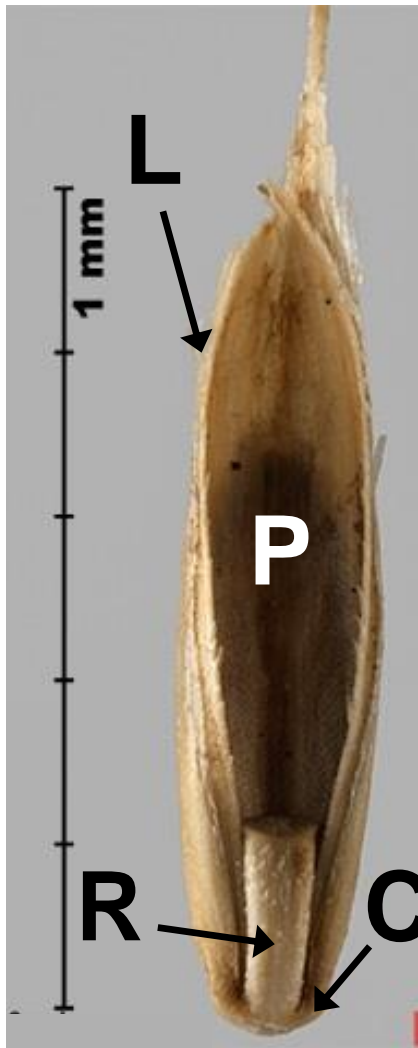


Lolium multiflorum



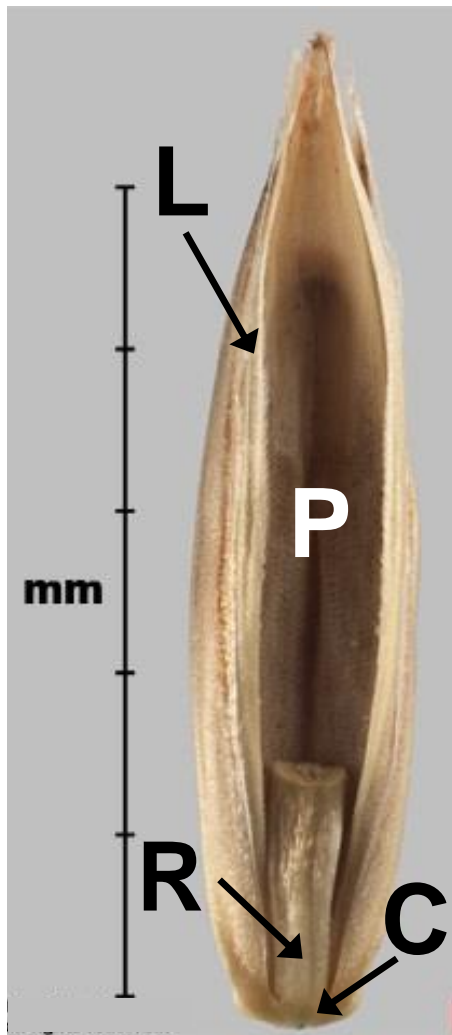
Lolium perenne

Lolium multiflorum (annual ryegrass)



- A. Lemma:** generally awned and curved backwards
- B. Palea:** shining above, granular close to rachilla, generally flared and open away from rachilla
- C. Rachilla:** flattened, straight-sided, can be curved outwards
- D. Callus:** flat base, not flared at sides, space above callus

Lolium perenne (perennial ryegrass)



Lemma: awn usually not present; stout appearance

Palea: shining above, can be gradually granular in bottom half

Rachilla: flattened; tapered at base; lies flat against palea

Callus: flat base; not flared; little to no space above

Comparison of Ryegrasses and Meadow Fescue

	<i>Lolium perenne</i> (perennial ryegrass)	<i>Lolium multiflorum</i> (annual ryegrass)	<i>Festuca pratensis</i> (meadow fescue)
Lemma	<ul style="list-style-type: none"> - Stout, neat appearance - Not awned, but sharp-pointed - Granular texture, dull 	<ul style="list-style-type: none"> - Thin, rough appearance, can be arched - Often awned - Granular texture, dull 	<ul style="list-style-type: none"> - Not awned, but sharp-pointed - Granular texture, shiny near tip - Rounded on back, narrow at base
Palea	<ul style="list-style-type: none"> - Granular texture, gradually shiny past rachilla - Teeth obvious - Pointed at top 	<ul style="list-style-type: none"> - Granular texture, abruptly shiny past rachilla - Teeth obvious - Flared at top 	<ul style="list-style-type: none"> - Finely granular, shining near top - Teeth not obvious - Inward-curving keels more developed past rachilla
Rachilla	<ul style="list-style-type: none"> - Flattened - Short-hairy - Pressed against palea 	<ul style="list-style-type: none"> - Flattened - Short-hairy - Curves away from palea 	<ul style="list-style-type: none"> - Compressed - Smooth - Often leans to one side
Callus	<ul style="list-style-type: none"> - Thin rim - Flat base - No space above 	<ul style="list-style-type: none"> - Thin rim - Flat base - No space above 	<ul style="list-style-type: none"> - Thick rim - Flat base - Space above

Question #2: Name the species





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Fine-leaved Fescues: Species Groups Introduction (subgenus *Festuca*)



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Broad-leaved fescues

(Subgenus *Schedonorus*)

- Florets longer and wider
- Lemma and palea appears thicker, roughly granular
- Rachilla more compressed (in *F. pratensis*)
- Callus flared at sides



Fine-leaved fescues

(Subgenus *Festuca*)

- Florets shorter and more narrow
- Lemma and palea appears thinner, smooth or finely granular
- Rachilla cylindrical
- Callus more narrow

Sheep fescue group

(Section *Festuca*)



- ***Festuca ovina***
(sheep fescue)
- ***Festuca filiformis***
(fine-leaved fescue)
- ***Festuca brevipila***
(hard fescue)

Red fescue group

(Section *Aulaxyper*)



- ***Festuca rubra* subsp. *rubra*** (red & creeping red fescue)
- ***Festuca rubra* subsp. *fallax*** (Chewing's fescue)
- ***Festuca heterophylla***
(various-leaved fescue)

Features of Fine-leaved Fescue Species Groups

	<i>Festuca ovina</i> (sheep fescue) group	<i>Festuca rubra</i> (red fescue) group
Lemma	<ul style="list-style-type: none"> - Colour straw yellow to golden brown, duller - More opaque, appears thicker - Lemma back more rounded - Sides more curved - Shorter, thicker awns 	<ul style="list-style-type: none"> - Colour pale to straw yellow colour (can darken in storage), shinier - More translucent, appears thinner - Lemma backs flatter - Straighter sides - Longer, thin awns
Palea	<ul style="list-style-type: none"> - Keels curved inwards, generally past lemma edges - Caryopsis colour reddish 	<ul style="list-style-type: none"> - Keels curved inwards, generally covered by lemma - Dark caryopsis colour
Rachilla	<ul style="list-style-type: none"> - Cylindrical rachilla - Flared or capped end 	<ul style="list-style-type: none"> - Cylindrical rachilla, - Rachilla end not as pronounced
Callus	<ul style="list-style-type: none"> - Callus wider, can be flared out 	<ul style="list-style-type: none"> - Callus more narrow

Question #3

For chat: What are 3 features that distinguish the fine-leaved from the broad-leaved fescue group?

- 1.
- 2.
- 3.

Question #3

What are 3 features that distinguish the fine-leaved from the broad-leaved fescue group?

- 1. Fine-leaved group florets are smaller**
- 2. Lemma and palea appear thinner and more smooth**
- 3. Rachilla is cylindrical in all species**



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Features of Fine-leaved Fescues: Sheep Fescue Group (section *Festuca*)



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Festuca ovina (sheep fescue)



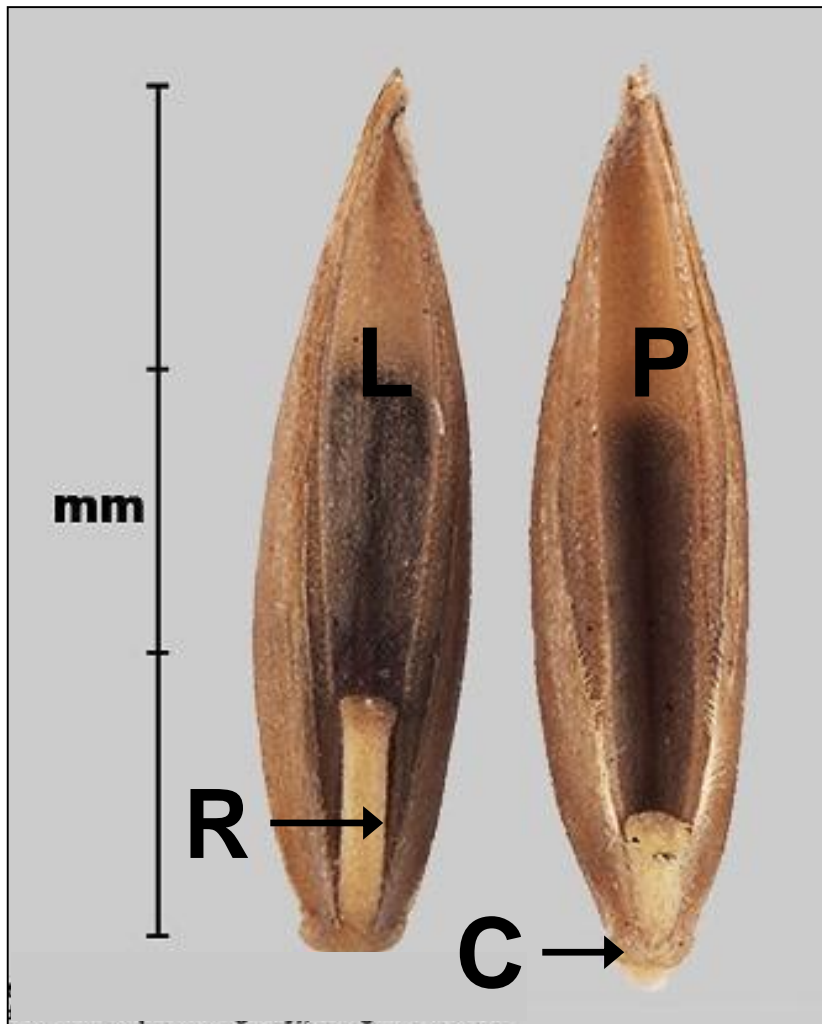
Lemma: firm, golden brown, granular texture, sharp pointed or short awn

Palea: granular & waxy texture, fine teeth near top, in-rolled & covered by lemma

Rachilla: protrudes, short hairy, often curved

Callus: thick rim, flat end

Festuca filiformis (fine-leaved fescue)



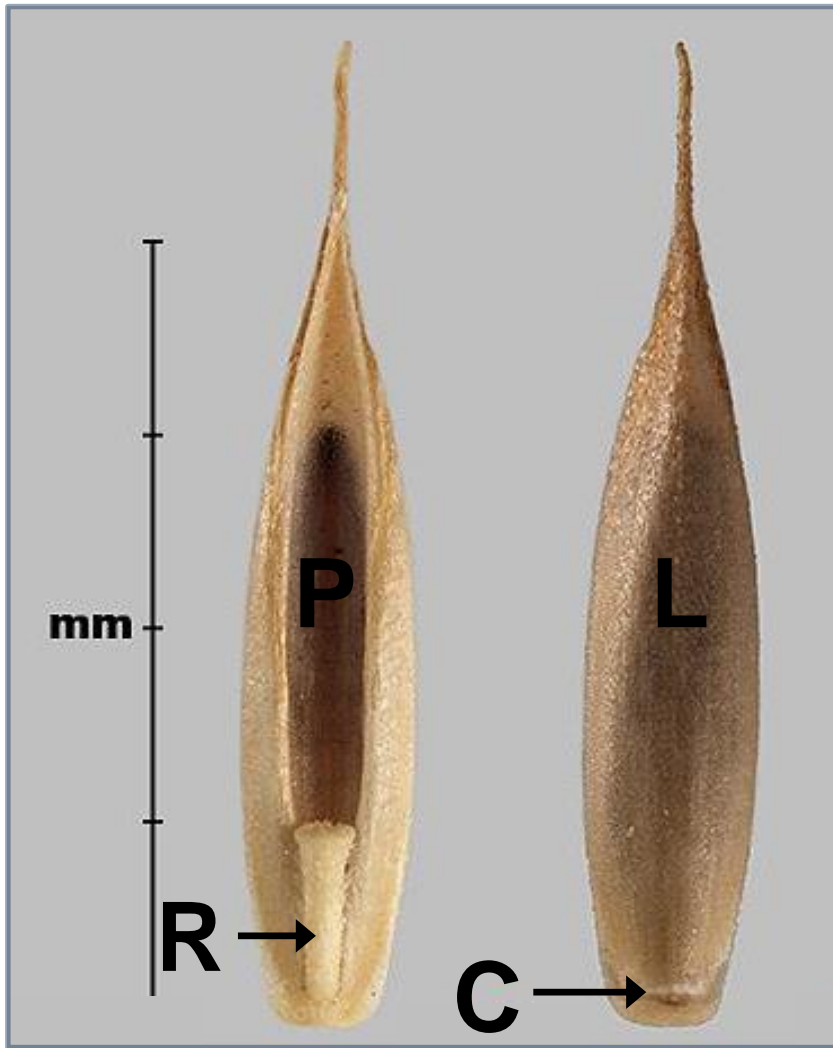
Lemma: firm, shiny, yellowish brown, no awn, smaller than other 2 species

Palea: smooth texture, shiny, teeth hard to see, in-rolled & exposed keels, more opaque than other 2 species

Rachilla: protruding, hairy or smooth

Callus: thin rim, slightly curved

Festuca brevipila (hard fescue)



Lemma: firm, light or golden brown, granular texture, shiny, hairy near top, generally has a short awn

Palea: more shallow than other 2 species, granular texture, in-rolled & generally exposed

Rachilla: short hairy, straight, protrudes

Callus: thick rim, flat end

Question #4

1.



2.



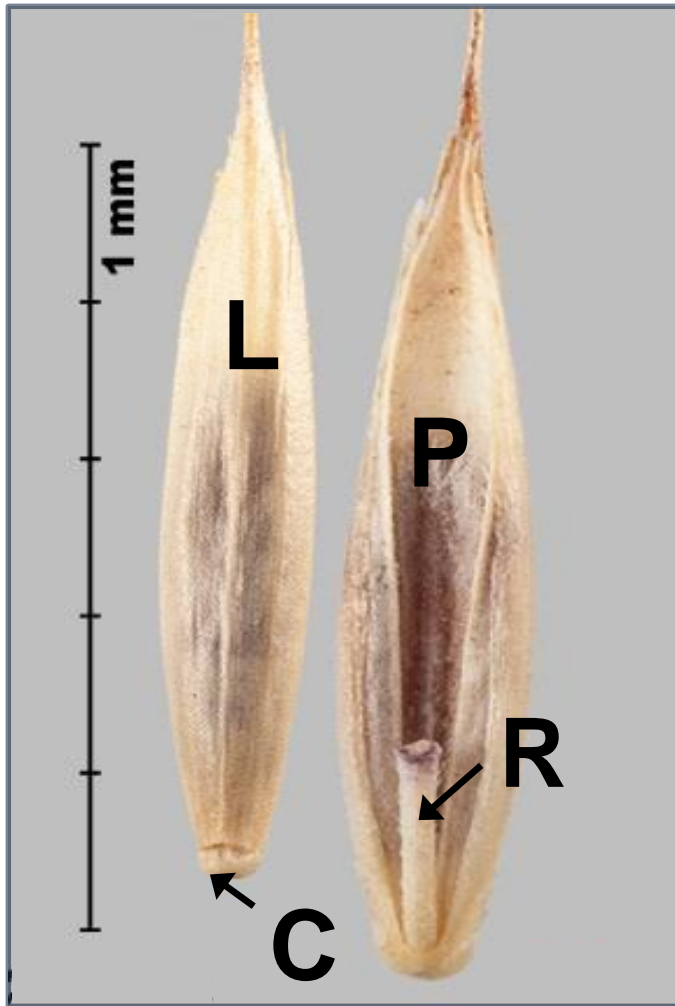
3.



Comparison of Sheep Fescue Group Species

	<i>Festuca ovina</i> (sheep fescue)	<i>Festuca filiformis</i> (fine-leaved fescue)	<i>Festuca brevipila</i> (hard fescue)
Lemma	<ul style="list-style-type: none"> - Pubescent near apex - Pointed, may have short awns - Floret length: 4.0-5.0 mm 	<ul style="list-style-type: none"> - Pubescent near apex - Generally has short awns - Floret length: 3.0-3.5 mm 	<ul style="list-style-type: none"> - Smooth, lustrous - Can be bristly near apex - Lemma pointed without awn - Yellowish wash - Floret size similar to sheep fescue
Palea	<ul style="list-style-type: none"> - Palea keels covered by lemma more frequently than other 2 species - Granular and waxy - Fine teeth near apex 	<ul style="list-style-type: none"> - More shallow than other 2 species, keels usually exposed - Surface smooth - Fine teeth near apex 	<ul style="list-style-type: none"> - Palea keels exposed - Smooth and lustrous - More opaque than other 2 species - Teeth difficult to see
Rachilla	<ul style="list-style-type: none"> - Strongly protruding, often curved, hairy 	<ul style="list-style-type: none"> - Strongly protruding, straight, hairy 	<ul style="list-style-type: none"> - Protruding, straight - Smooth or hairy
Callus	<ul style="list-style-type: none"> - Thick rim, flat 	<ul style="list-style-type: none"> - Thick rim, flat 	<ul style="list-style-type: none"> - Rim more narrow, slightly curved

Festuca rubra subsp. *rubra* (red & creeping red fescue)



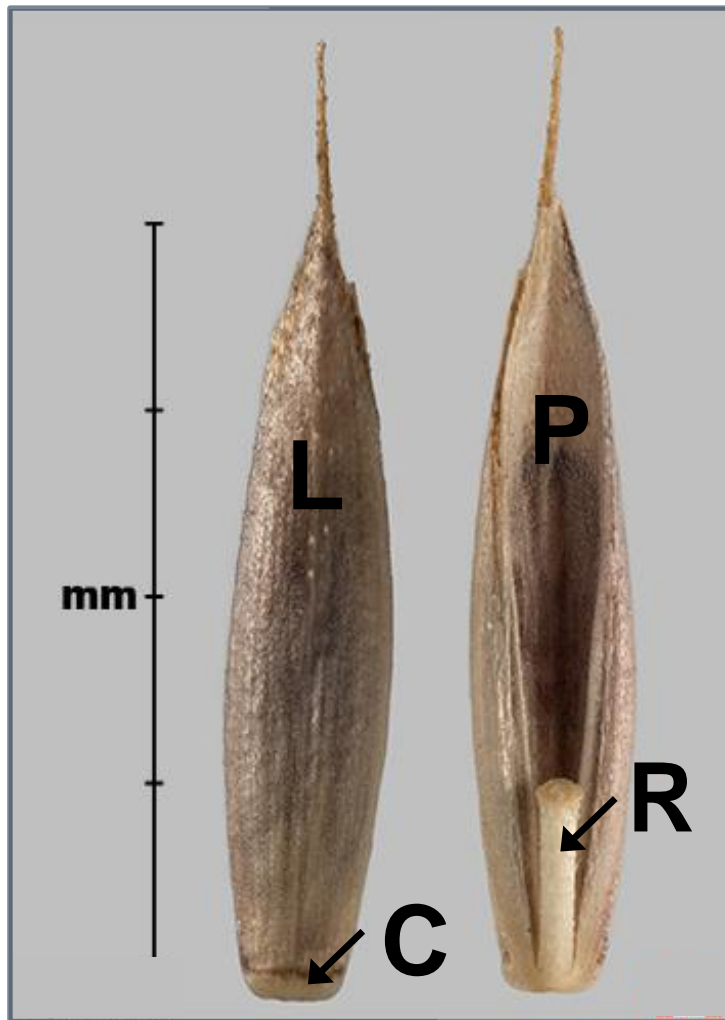
Lemma: pale colour, textured, shiny, awned, generally longest florets of the group

Palea: translucent, purple grain visible & appears shorter than Chewing's, grain widest at middle

Rachilla: thin, short-hairy, protrudes

Callus: thick lip, generally more narrow than Chewing's fescue

Festuca rubra subsp. *fallax* (Chewing's fescue)



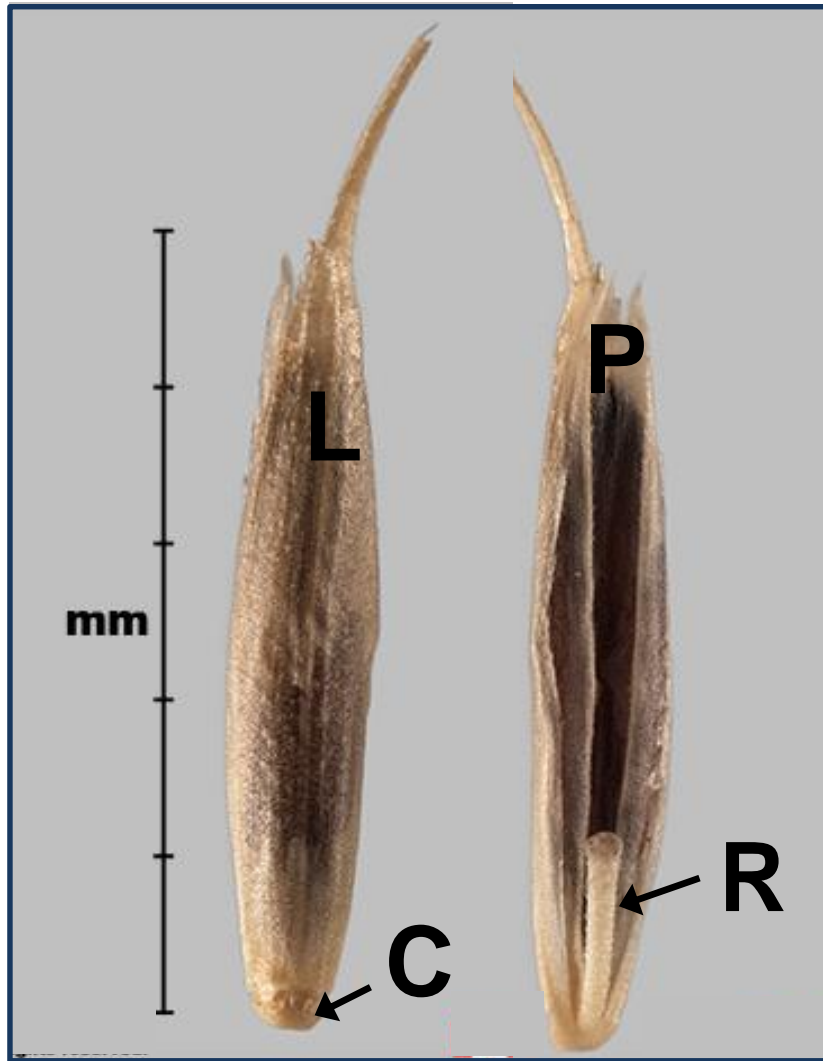
Lemma: pale colour, often darker than red fescue, shiny, awned

Palea: more opaque than other 2 species, grain appears longer than red fescue and widest at base, teeth more visible than other 2 species

Rachilla: straight, less protruding than other 2 species

Callus: thick lip, generally wider than red fescue

Festuca heterophylla (various-leaved fescue)



Lemma: pale colour with a greyish wash, long awned, grain visible through the lemma

Palea: caryopsis appears darker than the other 2 species, almost as long as palea, edges thin

Rachilla: protruding, narrow

Callus: smaller and more narrow than the other 2 species

Question #5



Question #6

What are 3 features that distinguish the red fescue from the sheep fescue group?

- 1.
- 2.
- 3.

Question #6

What are 3 features that distinguish the red fescue from the sheep fescue group?

- 1. Red fescue group florets generally paler in colour**
- 2. Florets appear thinner, caryopsis more visible and dark coloured**
- 3. Florets tend to be more shiny and smoother**

Comparison of Red Fescue Group Species

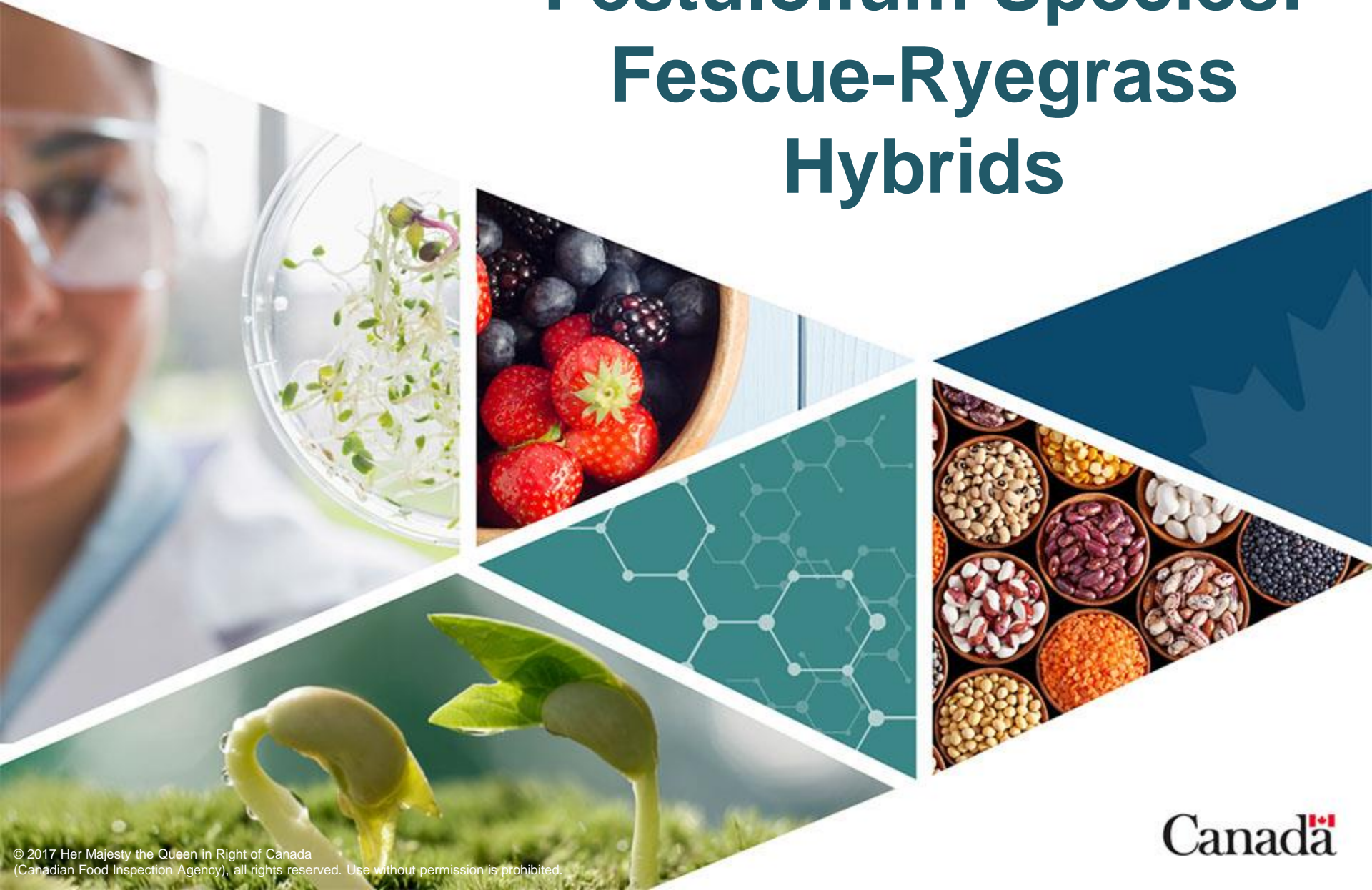
	<i>Festuca rubra</i> subsp. <i>rubra</i> (red & creeping red fescue)	<i>Festuca rubra</i> subsp. <i>fallax</i> (Chewing's fescue)	<i>Festuca heterophylla</i> (various-leaved fescue)
Lemma	<ul style="list-style-type: none"> - Length: 5.0 – 5.5 mm - Arched backwards - Scattered granular texture - Generally paler than Chewing's fescue 	<ul style="list-style-type: none"> - Length: 4.5 – 5.0 mm - Not generally arched - Can have scattered hairs - Generally darker than red fescue 	<ul style="list-style-type: none"> - Slender, fine appearance - Arched backwards - Long, prominent awn - Greyish wash - Caryopsis visible - Granular or hairy at awned end
Palea	<ul style="list-style-type: none"> - Transparent, purple grain visible, - Caryopsis fairly short, around ½- ¾ length of the palea 	<ul style="list-style-type: none"> - Palea less transparent than other 2 species - Caryopsis fairly long, around ¾ length of the palea - Teeth more noticeable than other 2 species 	<ul style="list-style-type: none"> - Transparent - Caryopsis fairly long, around ¾ length of the palea - Caryopsis appears darker than other 2 species
Rachilla	<ul style="list-style-type: none"> - Protruding, often arched outward 	<ul style="list-style-type: none"> - Less protruding, straight 	<ul style="list-style-type: none"> - Protruding, slender and straight
Callus	<ul style="list-style-type: none"> - Thick lip 	<ul style="list-style-type: none"> - Thick lip, generally wider than red fescue 	<ul style="list-style-type: none"> - Smaller and more narrow than other 2 species



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Festulolium Species: Fescue-Ryegrass Hybrids



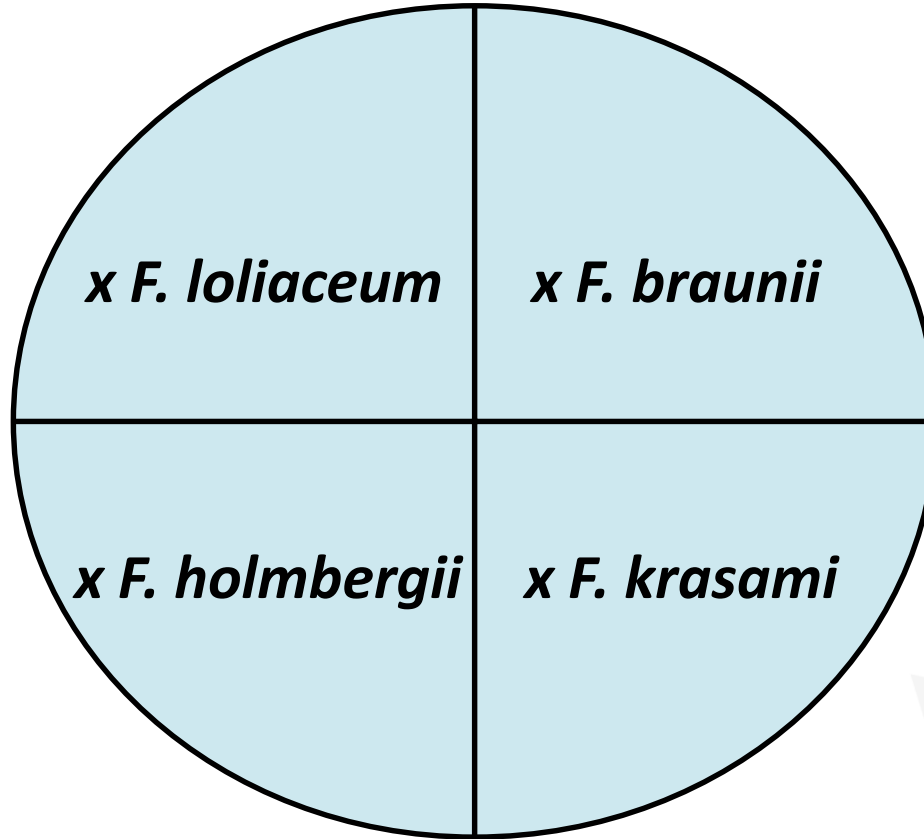
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For the chat:

Has your lab analysed Festulolium?

If so, what are some of the features you noticed?

F. pratensis
(meadow fescue)



F. arundinacea
(tall fescue)

L. perenne

(perennial ryegrass)

L. multiflorum

(annual ryegrass)

X Festulolium spp. (festulolium)



X Festulolium spp. (festulolium)



Lemma: light brown colour, granular textured, often hairy, shiny near top, generally flat, awned, appears wider than tall fescue

Palea: granular to about halfway, flat, opens up above rachilla

Rachilla: generally compressed, small cap on end

Callus: thick rim, small or no space above, generally narrow, some are flared on sides

Question #7 - Review

1. Which fescue species looks most like ryegrass florets?
2. What are the 2 species groups of fine-leaved fescues?
3. What are the 2 closest related fescue species to *F. brevipila* (hard fescue)?

Question #7 - Review

1. Which fescue species looks like ryegrass florets? ***Festuca pratensis* (meadow fescue)**
2. What are the 2 species groups of fine-leaved fescues? **Sheep and red fescue groups**
3. What are the 2 closest related fescue species to *F. brevipila* (hard fescue)? ***Festuca ovina* (sheep fescue) and *F. filiformis* (fine-leaved fescue)**

Thank you!

Acknowledgements:

Seed images from National Seed Herbarium

Questions/comments send to:

cfia.ssts-ssts.acia@canada.ca

More references:

International Seed Morphology Association (ISMA):
Seed Identification Guide: www.idseed.org

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Fescue Species: Seed Analysis Questions



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ROA Reporting (M&P)

How should we report a dehulled fescue sp?

Unidentifiable caryopsis: 1.3.2 b. the number present must be reported as "Poaceae sp." under Other Weed Seeds

Pure Seed:

3.2.2 c(i). Broken florets or free caryopses, provided they are larger than one-half the original size.

Inert matter:

3.2.5 b iii) Florets of *Lolium* and *Festuca* spp. with a caryopsis less than one-third the length of the palea, measured from the base of the rachilla

3.2.6 a(i). Florets or free caryopses, with more than one-half the radicle-plumule axis missing

radicle-plumule axis

