

ISTA Purity Committee

# Universal List of Species

## Species List



January 2014

# ISTA Purity Committee

	Species	Type	Family
1	<i>Abelmoschus esculentus</i> (L.) Moench	crop	Malvaceae
2	<a href="#"><u><i>Ageratum houstonianum</i> Mill.</u></a>	weed	Asteraceae
3	<a href="#"><u><i>Agrostis</i> spp.</u></a>	weed	Poaceae
4	<i>Allium cepa</i> L.	crop	Liliaceae
5	<a href="#"><u><i>Alopecurus geniculatus</i> L.</u></a>	weed	Poaceae
6	<a href="#"><u><i>Alopecurus myosuroides</i> Huds.</u></a>	weed	Poaceae
7	<a href="#"><u><i>Amaranthus</i> spp.</u></a>	weed	Amaranthaceae
8	<a href="#"><u><i>Ambrosia artemisiifolia</i> L.</u></a>	weed	Asteraceae
9	<a href="#"><u><i>Ammi majus</i> L.</u></a>	weed	Apiaceae
10	<a href="#"><u><i>Anthemis cotula</i> L.</u></a>	weed	Asteraceae
11	<a href="#"><u><i>Apera spica-venti</i> (L.) P. Beauv.</u></a>	weed	Poaceae
12	<i>Arachis hypogaea</i> L.	crop	Fabaceae
13	<i>Avena fatua</i> L.	weed	Poaceae
14	<i>Avena sativa</i> L.	crop	Poaceae
15	<i>Avena sterilis</i> L.	weed	Poaceae
16	<i>Beta vulgaris</i> L.	crop	Chenopodiaceae
17	<a href="#"><u><i>Bidens pilosa</i> L.</u></a>	weed	Asteraceae
18	<a href="#"><u><i>Bifora</i> spp.</u></a>	weed	Apiaceae
19	<a href="#"><u><i>Brassica napus</i> L.</u></a>	crop	Brassicaceae
20	<a href="#"><u><i>Brassica rapa</i> L.</u></a>	crop	Brassicaceae
21	<a href="#"><u><i>Brassica tournefortii</i> Gouan</u></a>	weed	Brassicaceae
22	<a href="#"><u><i>Bromus diandrus</i> Roth</u></a>	weed	Poaceae
23	<a href="#"><u><i>Bromus hordeaceus</i> L.</u></a>	weed	Poaceae
24	<a href="#"><u><i>Bromus sterilis</i> L.</u></a>	weed	Poaceae
25	<a href="#"><u><i>Capsella bursa-pastoris</i> (L.) Medik.</u></a>	weed	Brassicaceae
26	<a href="#"><u><i>Centaurea cyanus</i> L.</u></a>	weed	Asteraceae
27	<i>Chenopodium</i> spp.	weed	Chenopodiaceae
28	<a href="#"><u><i>Chloris gayana</i> Kunth</u></a>	weed	Poaceae
29	<a href="#"><u><i>Cichorium intybus</i> L.</u></a>	crop	Asteraceae
30	<a href="#"><u><i>Cirsium arvense</i> (L.) Scop.</u></a>	weed	Asteraceae
31	<a href="#"><u><i>Cirsium vulgare</i> (Savi) Ten.</u></a>	weed	Asteraceae
32	<i>Commelina benghalensis</i> L.	weed	Commelinaceae
33	<i>Convolvulus arvensis</i> L.	weed	Convolvulaceae
34	<i>Cuscuta</i> spp.	weed	Convolvulaceae
35	<a href="#"><u><i>Cynodon dactylon</i> (L.) Pers.</u></a>	weed	Poaceae
36	<a href="#"><u><i>Cynosurus echinatus</i> L.</u></a>	weed	Poaceae
37	<i>Cyperus</i> spp.	weed	Cyperaceae
38	<a href="#"><u><i>Dactylis glomerata</i> L.</u></a>	crop	Poaceae
39	<a href="#"><u><i>Dactyloctenium aegyptium</i> (L.) Willd.</u></a>	weed	Poaceae
40	<i>Datura stramonium</i> L.	weed	Solanaceae
41	<a href="#"><u><i>Daucus carota</i> L.</u></a>	crop	Apiaceae
42	<a href="#"><u><i>Digitaria sanguinalis</i> (L.) Scop.</u></a>	weed	Poaceae
43	<a href="#"><u><i>Echinochloa colona</i> (L.) Link</u></a>	weed	Poaceae
44	<a href="#"><u><i>Echinochloa crus-galli</i> (L.) P. Beauv.</u></a>	weed	Poaceae
45	<a href="#"><u><i>Echium plantagineum</i> L.</u></a>	weed	Boraginaceae
46	<a href="#"><u><i>Eleusine indica</i> (L.) Gaertn.</u></a>	weed	Poaceae
47	<a href="#"><u><i>Elytrigia repens</i> (L.) Desv. ex Nevski</u></a>	weed	Poaceae
48	<a href="#"><u><i>Eragrostis curvula</i> (Schrad.) Nees</u></a>	crop	Poaceae
49	<a href="#"><u><i>Eragrostis tef</i> (Zuccagni) Trotter</u></a>	crop	Poaceae
50	<i>Erodium cicutarium</i> (L.) L'Her.	weed	Geraniaceae

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	<b>Species</b>	<b>Type</b>	<b>Family</b>
51	<i>Fallopia convolvulus</i> (L.) A. Love	weed	Polygonaceae
52	<a href="#"><i>Festuca arundinacea</i> Schreb.</a>	crop	Poaceae
53	<a href="#"><i>Festuca pratensis</i> Huds.</a>	crop	Poaceae
54	<a href="#"><i>Festuca rubra</i> L.</a>	crop	Poaceae
55	<i>Galeopsis tetrahit</i> L.	weed	Lamiaceae
56	<i>Galium aparine</i> L.	weed	Rubiaceae
57	<i>Galium spurium</i> L.	weed	Rubiaceae
58	<i>Geranium</i> spp.	weed	Geraniaceae
59	<i>Glycine max</i> (L.) Merr.	crop	Fabaceae
60	<i>Gossypium</i> spp.	crop	Malvaceae
61	<a href="#"><i>Helianthus annuus</i> L.</a>	crop	Asteraceae
85	<a href="#"><i>Helminthotheca echioides</i> (L.) Holub</a>	weed	Asteraceae
62	<i>Hibiscus trionum</i> L.	weed	Malvaceae
63	<a href="#"><i>Holcus lanatus</i> L.</a>	weed	Poaceae
64	<i>Hordeum vulgare</i> L.	crop	Poaceae
65	<a href="#"><i>Hypochaeris radicata</i> L.</a>	weed	Asteraceae
66	<i>Ipomoea</i> spp.	weed	Convolvulaceae
67	<a href="#"><i>Lapsana communis</i> L.</a>	weed	Asteraceae
68	<i>Linum usitatissimum</i> L.	crop	Linaceae
69	<a href="#"><i>Lolium perenne</i> L.</a>	crop	Poaceae
70	<i>Lotus corniculatus</i> L.	crop	Fabaceae
71	<i>Lupinus angustifolius</i> L.	crop	Fabaceae
73	<i>Malva</i> spp.	weed	Malvaceae
74	<i>Medicago sativa</i> L.	crop	Fabaceae
75	<i>Melilotus albus</i> Medik.	weed	Fabaceae
76	<a href="#"><i>Myosotis arvensis</i> (L.) Hill</a>	weed	Boraginaceae
77	<i>Nicotiana tabacum</i> L.	crop	Solanaceae
78	<i>Oryza sativa</i> L.	crop	Poaceae
79	<a href="#"><i>Panicum capillare</i> L.</a>	weed	Poaceae
80	<a href="#"><i>Panicum maximum</i> Jacq.</a>	crop	Poaceae
81	<a href="#"><i>Pennisetum glaucum</i> (L.) R. Br.</a>	crop	Poaceae
82	<i>Persicaria maculosa</i> Gray.	weed	Polygonaceae
83	<i>Phaseolus vulgaris</i> L.	crop	Fabaceae
84	<a href="#"><i>Phleum pratense</i> L.</a>	crop	Poaceae
86	<i>Pisum sativum</i> L.	crop	Fabaceae
87	<i>Plantago lanceolata</i> L.	weed	Plantaginaceae
88	<i>Plantago major</i> L.	weed	Plantaginaceae
89	<a href="#"><i>Poa annua</i> L.</a>	weed	Poaceae
90	<a href="#"><i>Poa pratensis</i> L.</a>	crop	Poaceae
91	<a href="#"><i>Poa trivialis</i> L.</a>	weed	Poaceae
92	<i>Polygonum aviculare</i> L.	weed	Polygonaceae
93	<i>Portulaca oleracea</i> L.	weed	Portulacaceae
94	<a href="#"><i>Raphanus raphanistrum</i> L.</a>	weed	Brassicaceae
95	<a href="#"><i>Raphanus sativus</i> L.</a>	crop	Brassicaceae
96	<a href="#"><i>Rapistrum rugosum</i> (L.) All.</a>	weed	Brassicaceae
97	<i>Rumex acetosella</i> L.	weed	Polygonaceae
98	<i>Rumex crispus</i> L.	weed	Polygonaceae
99	<i>Secale cereale</i> L.	crop	Poaceae
100	<i>Setaria pumila</i> (Poir.) Roem. & Schult.	weed	Poaceae
101	<i>Setaria viridis</i> (L.) P. Beauv.	weed	Poaceae

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	<b>Species</b>	<b>Type</b>	<b>Family</b>
102	<i>Sida rhombifolia</i> L.	weed	Malvaceae
103	<i>Silene</i> spp.	weed	Caryophyllaceae
104	<a href="#"><u><i>Sinapis alba</i> L.</u></a>	crop	Brassicaceae
105	<a href="#"><u><i>Sinapis arvensis</i> L.</u></a>	weed	Brassicaceae
106	<a href="#"><u><i>Sisymbrium officinale</i> (L.) Scop.</u></a>	weed	Brassicaceae
72	<i>Solanum lycopersicum</i> L.	crop	Solanaceae
107	<i>Solanum nigrum</i> L.	weed	Solanaceae
108	<a href="#"><u><i>Sonchus asper</i> (L.) Hill</u></a>	weed	Asteraceae
109	<i>Sorghum bicolor</i> (L.) Moench	crop	Poaceae
110	<i>Sorghum halepense</i> (L.) Pers.	weed	Poaceae
111	<i>Spergula arvensis</i> L.	weed	Caryophyllaceae
112	<a href="#"><u><i>Sporobolus</i> spp.</u></a>	weed	Poaceae
113	<i>Stellaria media</i> (L.) Vill.	weed	Caryophyllaceae
114	<a href="#"><u><i>Tagetes minuta</i> L.</u></a>	weed	Asteraceae
115	<a href="#"><u><i>Thlaspi arvense</i> L.</u></a>	weed	Brassicaceae
116	<i>Trichosanthes cucumerina</i> L.	crop	Cucurbitaceae
117	<i>Trifolium pratense</i> L.	crop	Fabaceae
118	<i>Trifolium repens</i> L.	crop	Fabaceae
119	<i>Trifolium subterraneum</i> L.	crop	Fabaceae
120	<a href="#"><u><i>Tripleurospermum inodorum</i> (L.) Sch.Bip.</u></a>	weed	Asteraceae
121	× <i>Triticosecale</i> Wittm. ex A. Camus	crop	Poaceae
122	<i>Triticum aestivum</i> L.	crop	Poaceae
123	<i>Triticum durum</i> Desf.	crop	Poaceae
124	<i>Verbena officinalis</i> L.	weed	Verbenaceae
125	<i>Vicia faba</i> L.	crop	Fabaceae
126	<i>Vigna unguiculata</i> (L.) Walp.	crop	Fabaceae
127	<i>Viola</i> spp.	weed	Violaceae
128	<a href="#"><u><i>Vulpia bromoides</i> (L.) Gray</u></a>	weed	Poaceae
129	<a href="#"><u><i>Vulpia myuros</i> (L.) C.C. Gmel.</u></a>	weed	Poaceae
130	<i>Zea mays</i> L.	crop	Poaceae

*Ageratum houstonianum* Mill. (Asteraceae)

**General shape:** Sharply 5-sided oblong.

**Normal size:**

1.5-2 mm L x 0.2-0.5 mm W x 0.1 mm D

**Color:** Black or grey.

**Texture:** Longitudinal ribs with fine reticulations. Surface scattered with sparse, coarse hairs.

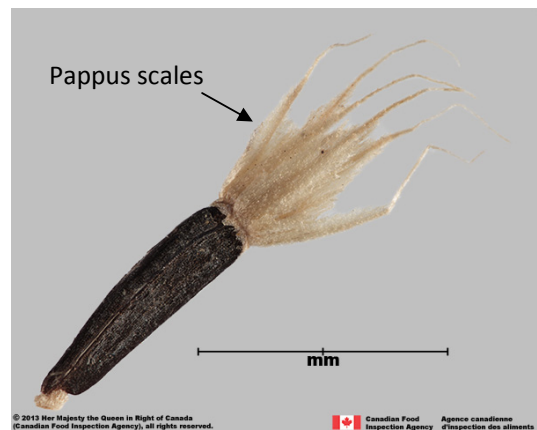
**Distinguishing features.** Base white, angled and enlarged. 5 or 6 wide, fringed chaffy pappus scales.

**Embryo:** Embryo with well-developed cotyledons and a broad stalk having a truncate top, no endosperm.

Authored by Susan Putz  
Canadian Food Inspection Agency, Canada



*Ageratum houstonianum* achenes with and without pappus scales



*Ageratum houstonianum* achene with pappus scales

Images by Jo Jones

*Agrostis sp. (Poaceae)*

**SPIKELET**

**General shape:** lanceolate  
**Normal size:** (1.0) 2.0 – 4.0 (7.0) mm long x +/- 0.5 mm wide depending on species  
**Color:** pale straw colored to tan, sometimes green to purple tinged  
**Texture:** usually thin and membranous, lustrous to dull  
**Distinguishing features:** glumes completely enclose a single floret (excluding the awn in some species), +/- keeled, +/- with short stiff hairs especially on keels, apices tapered to a +/- sharp point ((keel, hairs & apex characters species dependent).

**FLORET**

**General shape:** lanceolate, oblong, ovate  
**Normal size:** (0.5) 1.0 – 2.5 (4.0) mm long x +/- 0.5 mm wide depending on species  
**Color:** white to pale straw colored  
**Texture:** glabrous, membranous, +/- lustrous  
**Distinguishing features:** palea +/- present, if present the length and apex shape will vary depending on the species; lemma thin membranous to hyaline, usually smooth, glabrous, sometimes with short stiff hairs or pubescent; lemma awn +/- present, if present the length, shape (straight or bent), and attachment point (basal, mid-lemma, apical) will vary depending on the species; rachilla +/- present; callus hairs +/- present, short to nearly half the length of lemma (all features species dependent)

**CARYOPSIS**

**General shape:** oval, slightly dorsal-ventrally compressed  
**Normal size :** (0.6) 0.8 – 1.3 (2.0) mm long x 0.3 – 0.5 mm wide  
**Color :** reddish-brown to brown  
**Texture:** smooth to slight roughened  
**Embryo:** about ¼ - ⅓ the length of the caryopsis  
**Endosperm:** hard, soft or liquid depending on species  
**Hilum:** oval

Description by Deborah Meyer  
 California Department of Food & Agriculture



*Agrostis capillaris* spikelet (1) and florets showing long hairs (2) along the callus (3) and lemma (4) with awn. In this species the awn attachment point is basal (5) and the awn is bent near the mid-point (6).



*Agrostis capillaris* floret in palea view (left) - note palea (5) shorter than caryopsis (in this species); caryopsis in dorsal view (middle) showing the embryo (6) and ventral view (right) showing basal hilum (7).

Images by Jim Effenberger

*Alopecurus geniculatus* L. (Poaceae)

**SPIKELET**

Single floret spikelet, disarticulation below the glumes, falling as a unit from the plant

**General shape:** oval to ovate; laterally compressed

**Normal size:** 1.9 – 3.5 mm long x 1.0 – 1.5 mm wide

**Color:** pale straw colored to grayish brown

**Texture:** glumes usually thin and membranous, covered with long silky hairs

**Distinguishing features:** glumes strongly keeled, completely enclosing a single floret (excluding the awn)

**FLORET**

**General shape:** laterally compressed

**Normal size:** up to 3.0 mm long

**Color:** light grayish brown

**Texture:** thin and membranous

**Distinguishing features:** palea absent; lemma awn 3.0 – 5.0 (6.0) mm long, bent, attached slightly above base to near mid-point, extending out beyond the apex of the glumes by (1.2) 2.0 – 4.0 mm, bent slightly above apex of glumes

**CARYOPSIS**

**General shape:** laterally compressed, D- shaped

**Normal size :** 1.0 – 1.5 mm long

**Color :** greenish-brown to brown

**Texture:** smooth

**Embryo:** ¼ to ⅓ the length of the caryopsis, located along the dorsal edge of the caryopsis

**Endosperm:** semi-liquid

**Hilum:** basal, oval

**Distinguishing features:** style bases fused together and sometimes visible on free caryopses as a pointed appendage on the apex of the caryopsis

Description by Deborah Meyer  
California Department of Food & Agriculture



*Alopecurus geniculatus* spikelets and caryopses (above). Laterally compressed spikelet (left); the glumes (1) are strongly keeled. The floret is entirely enclosed within the glumes. The lemma awn (2) extends beyond the glumes.



Caryopses in side-view. The caryopsis is laterally compressed with basal oval hilum (3) and embryo (4) about ¼ to ⅓ the length of the caryopsis.

Images by Jim Effenberger

*Alopecurus myosuroides* Huds. (Poaceae)

**SPIKELET**

Single floret spikelet, disarticulation below the glumes, falling as a unit from the plant

**General shape:** oval to ovate; laterally compressed

**Normal size:** 4.5 – 7.5 mm long x 1.75 – 2.0 mm wide

**Color:** pale straw colored to grayish brown

**Texture:** glumes leathery, granular, mostly glabrous except for long soft to short stiff hairs on keels and lateral veins and above basal attachment scar

**Distinguishing features:** glumes strongly keeled and winged, completely enclosing a single floret (excluding awn); spikelet attachment scar basal, with prominent raised ring

**FLORET**

**General shape:** laterally compressed

**Normal size:** 4.0 – 7.0 mm long

**Color:** straw colored

**Texture:** thin and papery

**Distinguishing features:** palea absent; lemma awn to 12.0 mm long, attached slightly above base, bent, extending out beyond the apex of the glumes by 3.0 – 6.0 mm

**CARYOPSIS**

**General shape:** laterally compressed, narrowly elliptic

**Normal size :** 2.0 – 3.0 mm long x 1.0 – 1.5 mm wide

**Color :** greenish-brown to brown

**Texture:** smooth

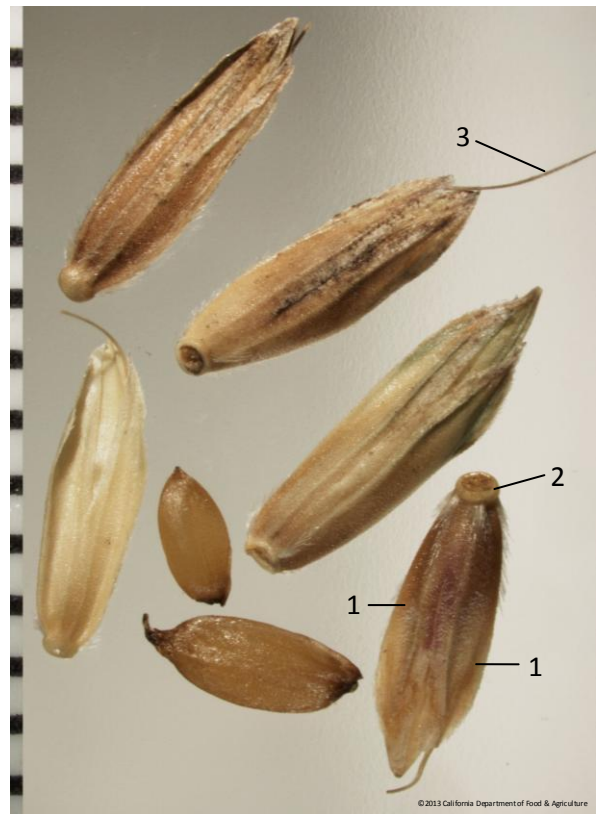
**Embryo:** 1/5 to 1/3 the length of the caryopsis, located along the dorsal edge of the caryopsis

**Endosperm:** semi-liquid

**Hilum:** oval

**Distinguishing features:** style bases fused together and sometimes visible on free caryopses as a pointed appendage on the apex of the caryopsis

Description by Deborah Meyer  
California Department of Food & Agriculture



Laterally compressed spikelet; glumes (1) strongly keeled. Basal spikelet attachment scar with prominent ring (2). Floret entirely enclosed within the glumes. Lemma awn (3) extends beyond the glumes.



Caryopses in side-view. The caryopsis is laterally compressed, with oval-shaped basal hilum (4), embryo about 1/4 to 1/3 the length of the caryopsis (5), and fused style bases that sometimes remain attached to the apex of a free caryopsis (6).

Images by Jim Effenberger



*Amaranthus* spp. (Amaranthaceae)

**General shape:** Lens-shaped, lenticular or slightly elongated disc.

**Normal size:**

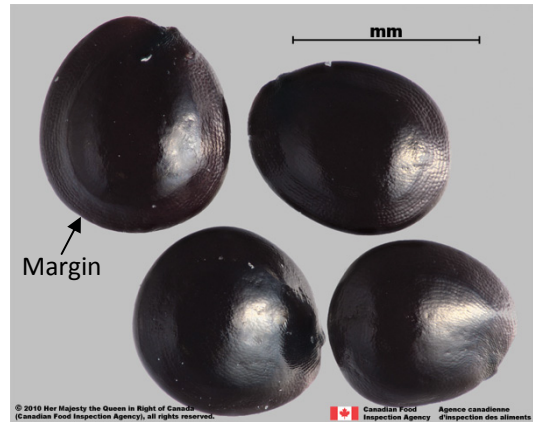
0.8-1.2 mm L x 0.8 -1.1 mm W x 0.3 -0.5 mm D

**Color:** Black to dark reddish brown testa

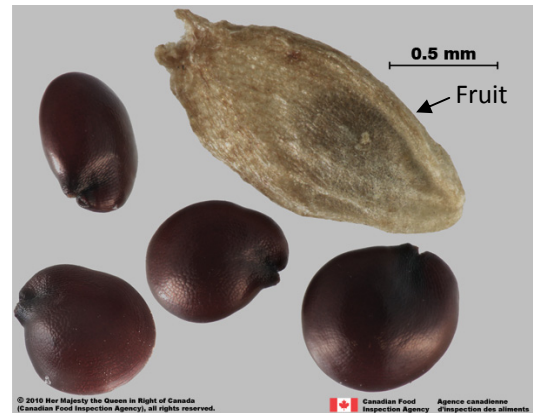
**Texture:** Shiny, smooth with minimal surface cellular structure evident.

**Distinguishing features:** Hilum on disc margin or basal end of elongated disc. Distinct marginal rim. Margins winged, wings minutely granular or striate. *Amaranthus* spp. are difficult to distinguish at the species level.

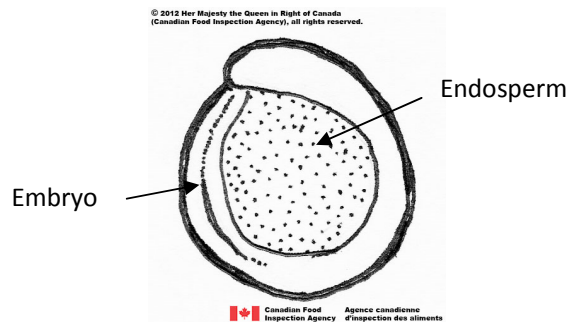
**Embryo:** Embryo lies around the entire margin of the seed and is detectable around the perimeter of the seed. The embryo is curved around firm, starchy white endosperm.



*Amaranthus powelli* seeds



*Amaranthus rudis* seeds and fruit



Cross-section of *Amaranthus blitoides* seed

Authored by Susan Putz  
Canadian Food Inspection Agency, Canada

Images by Jo Jones; drawing by Ken Allison

*Ambrosia artemisiifolia* L. (Asteraceae)

**General shape:** Obovoid to oblanceolate, with a ring of spines near the top, urn shaped.

**Normal size:**

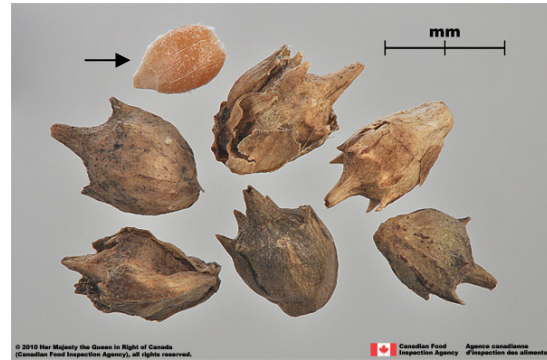
3.0–4.0 mm L x 1.8-2.5 mm W

**Color:** Yellowish-brown to reddish-brown sometimes with a purplish tinge near the crown.

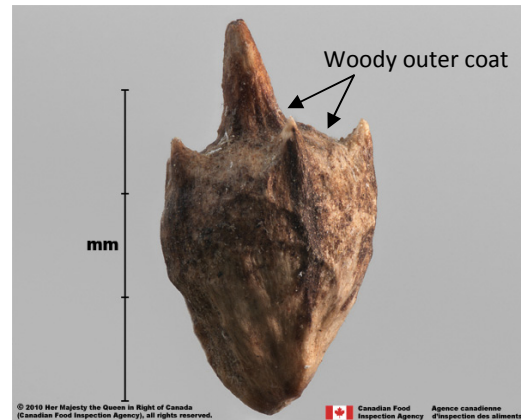
**Texture:** Woody outer coat (involucre) enclosing a shiny brown inner coat.

**Distinguishing features:** Outer coat has a central apical protuberance which is surrounded by a circle of 5 to 8 shorter, slender projections appearing like a crown. The inner achene is smooth and slightly lustrous and obovoid in shape.

**Embryo:** Embryo with well-developed cotyledons and a broad stalk having a truncate top, no endosperm.



*Ambrosia artemisiifolia* involucres (achenes) and inner achene (arrow)



*Ambrosia artemisiifolia* involucre (achene)

Authored by Susan Putz  
Canadian Food Inspection Agency, Canada

Images by Jo Jones

*Ammi majus* L. (Apiaceae)

**General shape:** Obovate with one flattened inner side and one curved outer side.

**Normal size:**

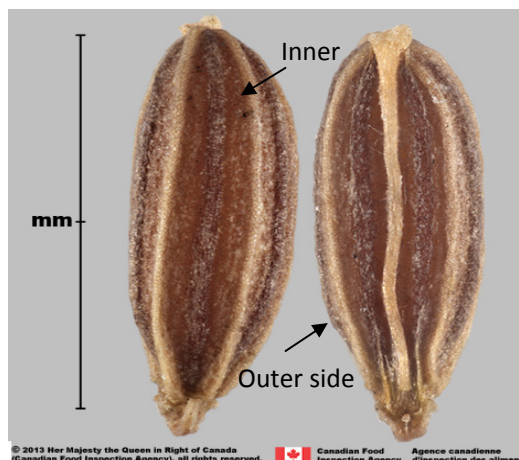
2.0 – 3.0 mm L x 0.8 – 1.0 mm W

**Color:** Dark brown with 3 prominent light brown ridges on the curved outer side.

**Texture:** Granular surface between the ridges.

**Distinguishing features:** 3 strong ridges with 2 weak intermediate ridges on the outer side. The inner side is flattened. The base is rounded and the apex is pointed.

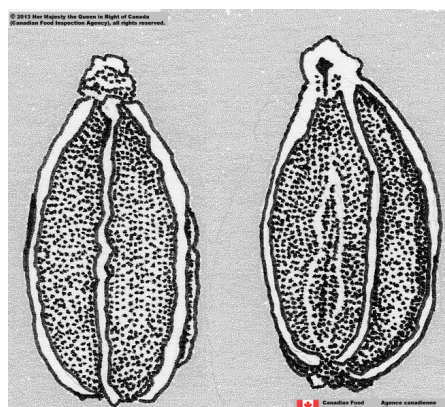
**Embryo:** Small, basal in fleshy, firm, abundant endosperm.



Inner and outer side views of *Ammi majus* mericarps



*Ammi majus* schizocarp and mericarps



*Ammi majus* mericarps

*Anthemis cotula* L. (Asteraceae)

**General shape:** Obovate, tapered from the apex to the base with knobby, longitudinal ridges. Circular in cross-section.

**Normal size:**

1.3 – 1.8 mm L x 0.8 – 1.0 mm W

**Color:** Yellowish-brown to greyish-brown.

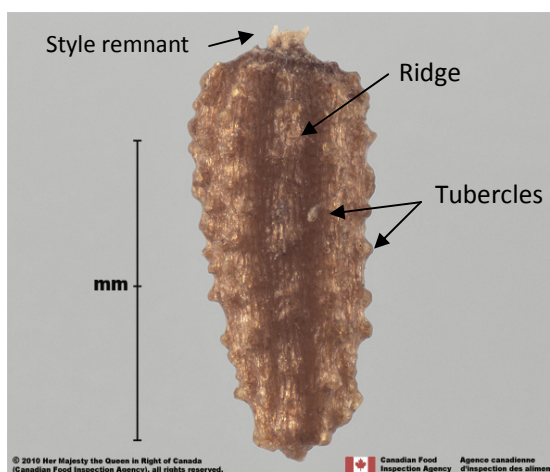
**Texture:** Longitudinal ridges with wart like tubercles.

**Distinguishing features:** Apex has a short, stout, style remnant. Basal scar is surrounded by a collar.

**Embryo:** Embryo with well-developed cotyledons and a broad stalk having a truncate top, no endosperm.



*Anthemis cotula* achenes



*Anthemis cotula* achene

Authored by Susan Putz  
Canadian Food Inspection Agency, Canada

Images by Jo Jones

*Apera spica-venti* (L.) P. Beauv. (*Poaceae*)

**SPIKELET**

Single floret spikelet that disarticulates below the floret (glumes remain attached to the plant)

**FLORET**

**General shape:** lanceolate

**Normal size:** (1.6) 2.0 – 2.5 (3.0) mm long x ca. 0.5 mm wide

**Color:** dark straw colored to brown

**Texture:** lemma with short stiff hairs in the upper half, especially near apex

**Distinguishing features:** lemma in-rolled, concealing the palea; callus blunt, glabrous or sparsely hairy; rachilla about 0.5 mm long; palea +/- equal in length to lemma; awn sub-apical, 5.0 – 12.0 mm long

**CARYOPSIS**

**General shape:** oblong, longitudinally grooved on ventral surface

**Normal size :** 1.0 – 1.5 mm long x ca. 0.5 mm wide

**Color :** reddish-yellow

**Texture:** smooth and glabrous; style base usually remaining attached at apex

**Embryo:** ca. 1/3 the length of caryopsis

**Endosperm:** soft to semi-liquid

**Hilum:** basal, ovate

Description by Deborah Meyer  
California Department of Food & Agriculture



*Apera spica-venti* florets and caryopses.



Floret in palea view (top) showing the rachilla (1) and lemma view (bottom) showing the callus (2).



Caryopsis in dorsal view (left) and ventral view (right). Embryo (3), hilum (4), style base (5), and piece of lemma attached at base of caryopsis (6).

Images by Jim Effenberger & Deborah Meyer

*Bidens pilosa* L. (Asteraceae)

**General shape:** Flattened, 4 angled with ridged edges, tapering at each end. Sometimes curved.

**Normal size:**  
6.0 -9.0 mm L x 0.5-1.0 mm W

**Color:** Black to blackish brown, lighter near the base and apex.

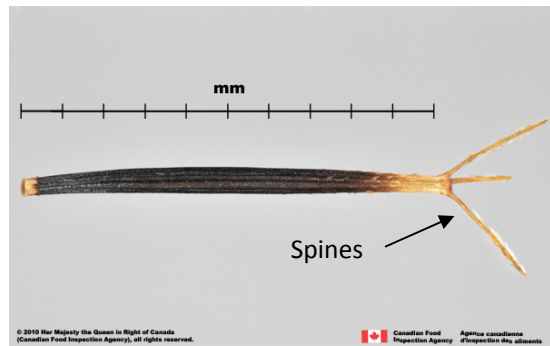
**Texture:** Slightly warty, tubercles on edges. Stiff, slightly curved hairs down length of seed.

**Distinguishing features:** Faces slightly depressed on one side. Obscure 2-grooved faces. Apex has 3 or 4 barbed, sharp spines. Base is enlarged, oblique and lighter in colour.

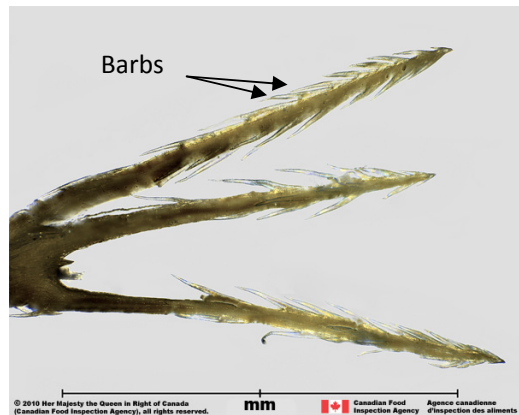
**Embryo:** Embryo with well-developed cotyledons and a broad stalk having a truncate top, no endosperm.



*Bidens pilosa* achenes with spines



*Bidens pilosa* achene



Close up of apical barbs on *Bidens pilosa* achene spines

*Bifora* spp. (Apiaceae)

**General shape:** Globose with a flat to deeply hollowed face where mericarps are joined.

**Normal size:**

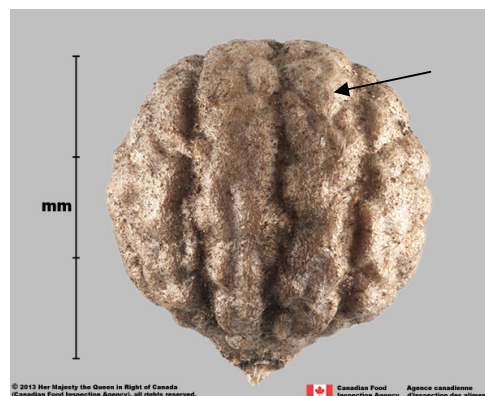
2.5-3.5 mm L x 4.5-7.0 mm W x 2.0 mm D

**Color:** Pale to yellow ochre.

**Texture:** Finely rugose to serrated ridges.

**Distinguishing features:** Sometimes purplish tinged; short beak present or absent depending upon species.

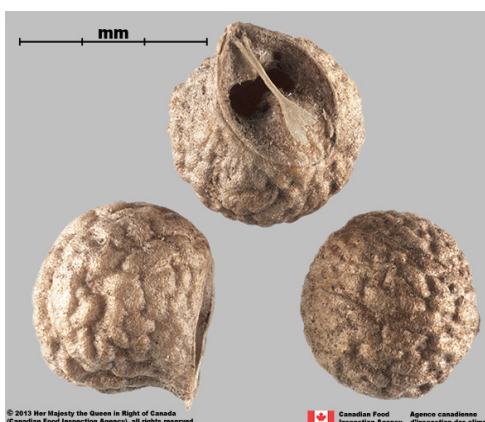
**Embryo:** Small, basal in firm endosperm.



Outer side view of *Bifora testiculata* mericarp showing serrated ridges (arrows)



Inner side view of *Bifora testiculata* mericarp showing the hollowed face (arrows)



*Bifora testiculata* mericarps

*Brassica napus* L. (*Brassicaceae*)

**General shape:** Wide slightly flattened sphere.

**Normal size:**  
2.0 mm W-3.0 mm L

**Color:** Reddish brown to grey-black.

**Texture:** Fine reticulations with stipples over complete surface appearing as pin-points of light.

**Distinguishing features:** Prominent embryo indentation in the seed coat. Scar area has a distinct dark circle resembling a horse shoe shape. Squared off look to the scar end when viewed from the side.

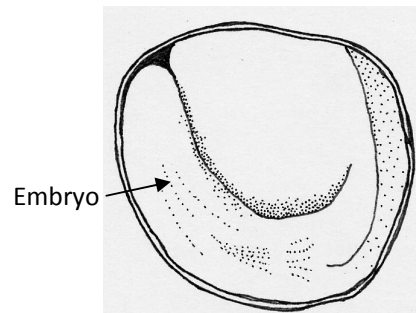
**Embryo:** Folded embryo with minimal endosperm present.



*Brassica napus* seeds



*Brassica napus* seed



Cross-section of *Brassica napus* seed

Authored by Susan Putz  
Canadian Food Inspection Agency, Canada

Images by Jo Jones; drawing by Ken Allison



*Brassica rapa* L. (*Brassicaceae*)

**General shape:** Flattened oval.

**Normal size:**

1.5 -2.0 mm, round

**Color:** Yellow to mottled yellow, dark reddish-brown to dark grey.

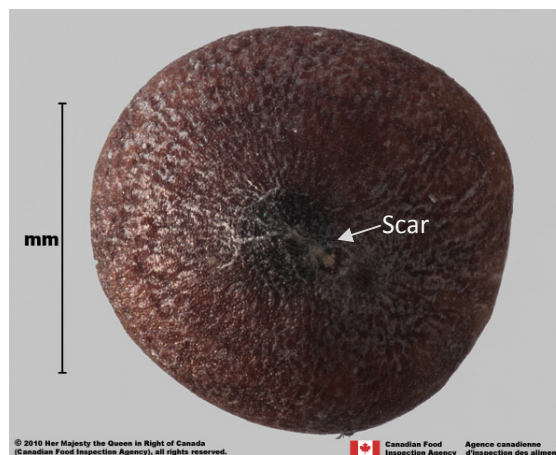
**Texture:** Distinct reticulations with small interspaces and small stipples.

**Distinguishing features:** Reticulations peter out towards the scar end. Reticulations are sometimes quite prominent. Scar and chalaza area sometimes appear blackened and raised with a distinct ring around them. Often a prominent embryo indentation in the seed coat.

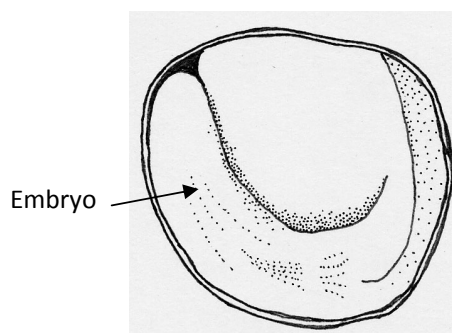
**Embryo:** Folded embryo with minimal endosperm present.



*Brassica rapa* seeds



*Brassica rapa* seed



Cross-section of *Brassica rapa* seed

Authored by Susan Putz  
Canadian Food Inspection Agency, Canada

Images by Jo Jones, drawing by Ken Allison

*Brassica tournefortii* Gouan (*Brassicaceae*)

**General shape:** Spherical.

**Normal size:**  
1.0 - 1.5 mm, round

**Color:** Light reddish-brown to black.

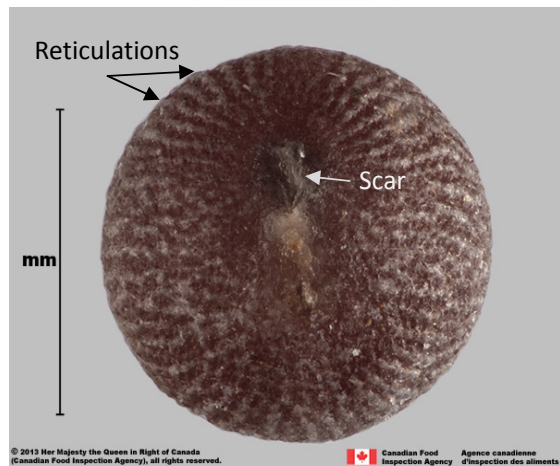
**Texture:** Deeply reticulated.

**Distinguishing features:** Interspaces very small, lines of reticulum whitish, minute stipples. The hilum, chalaza scar area is very neat and compact and often has a ridge of whitish tissue. Reticulum extends up to scar area.

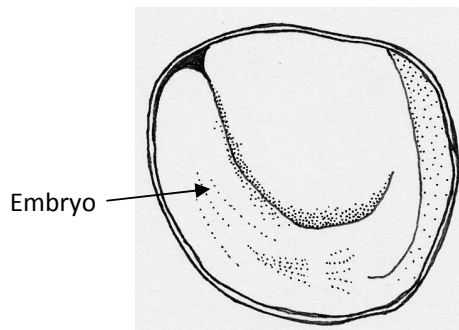
**Embryo:** Folded embryo with minimal endosperm present.



*Brassica tournefortii* seeds



*Brassica tournefortii* seed



Authored by Susan Putz  
Canadian Food Inspection Agency, Canada

Images by Jo Jones, drawing by Ken Allison

*Bromus diandrus* L. (Poaceae)

**SPIKELET**

Multiple floret spikelet with 4 – 11 similar looking florets with distal florets usually sterile and slightly smaller in size; disarticulation generally above glumes and between florets

**FLORET**

**General shape:** linear-lanceolate, slightly arched backwards

**Normal size:** 18.0 –35.0 (45.0) mm long x 1.5–2.8 mm wide; sub-apical awn 30.0 –75.0 mm

**Color:** straw-colored to light brown, margins of lemma lighter in color compared to main body

**Texture:** lemma surface covered with short stiff hairs that are rough to the touch; hairs above callus slightly longer than those on lemma back

**Distinguishing features:** lemma 7-veined, mid-vein more visible than others, back rounded, apex bifid, teeth 3.0 – 7.0 mm long, margins and teeth hyaline; callus sharply pointed and glabrous, attachment point oval; palea shorter than lemma, +/- glabrous between keels, keels with stiff, wide-spaced hairs; rachilla covered with short stiff hairs, round in cross-section and flattened at apex, attachment point +/-oval

**CARYOPSIS**

**General shape:** Linear, dorsal-ventrally compressed, flat to U-shaped in cross-section

**Normal size :** 11.0 –14.0 mm long x 1.0 – 2.8 mm wide.

**Color :** brown

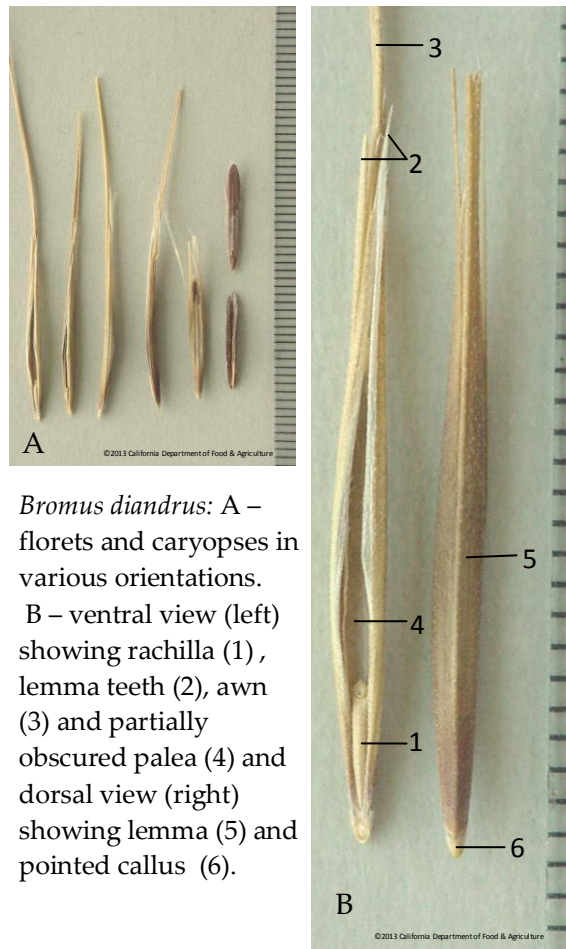
**Texture:** Smooth, apex fleshy and hairy, lemma and palea +/- adherent

**Embryo:** at base of caryopsis, about 1/8 the length of the caryopsis, small and slim root-shoot axis narrowing to a point at the base, scutellum outline visible

**Endosperm:** bulk of caryopsis filled with solid endosperm

**Hilum:** linear, extending nearly the full length of the caryopsis

Description by Deborah Meyer  
California Department of Food & Agriculture



*Bromus diandrus*: A – florets and caryopses in various orientations.

B – ventral view (left) showing rachilla (1), lemma teeth (2), awn (3) and partially obscured palea (4) and dorsal view (right) showing lemma (5) and pointed callus (6).



Caryopses: dorsal view (top) with portions of lemma adhering above the exposed embryo (7); ventral view (bottom) with attached palea, with stiff keel hairs (8), obscuring the view of the linear hilum (note embryo tip broken off).

Images by Deborah Meyer

*Bromus hordeaceus* L. (Poaceae)

**SPIKELET**

Multiple floret spikelet with 5 – 10 similar looking florets with distal florets usually sterile and slightly smaller in size; disarticulation generally above glumes and between florets

**FLORET**

**General shape:** elliptic to obovate; dorsal-ventrally compressed

**Normal size:** (6.5) 8.0 – 11.0 mm long x 2.5–5.0 mm wide; sub-apical awn 3.0 – 10.0 mm, straight to slightly curved

**Color:** pale straw-colored

**Texture:** lemma papery, +/- with transverse wrinkles, surface usually covered with soft hairs, especially in upper half; palea hyaline

**Distinguishing features:** lemma 7.0 – 9.0 veined, veins +/- visible, back rounded, apex bifid, teeth 0.5-1.5 mm long; callus short, blunt and glabrous, attachment point +/- circular; awn attached slightly below lemma apex, 3.0 – 10.0 mm long, straight or curved, scabrous; palea shorter than lemma, +/- hairy between keels, keels with long, wide-spaced hairs; rachilla covered with short stiff hairs, round in cross-section and flattened at apex, attachment point circular

**CARYOPSIS**

**General shape:** Fusiform to oblanceolate, dorsal-ventrally flattened to slightly U-shaped in cross-section

**Normal size:** 4.5 – 7.0 mm long x 1.5 – 2.0 mm wide

**Color:** light reddish-brown.

**Texture:** Smooth, lemma and palea +/- adherent.

**Embryo:** at base of caryopsis, about 1/8 the length of the caryopsis, small and slim root-shoot axis, scutellum outline visible.

**Endosperm:** bulk of caryopsis filled with solid endosperm.

**Hilum:** linear, as long as caryopsis.

Description by Deborah Meyer  
California Department of Food & Agriculture



*Bromus hordeaceus* florets and caryopses.



Floret in dorsal view (top) showing lemma (1), callus (2), lemma teeth (3) and awn (4). Ventral view (bottom) showing rachilla (5) and palea (6) with long, widely spaced hairs along the keels.



Caryopses: in ventral view (top) with portions of the palea adhering (7) obscuring the view of the linear hilum; dorsal view (bottom), with exposed embryo (8) and portion of lemma adhering (9).

Images by Jim Effenberger & Deborah Meyer

*Bromus sterilis* L. (Poaceae)

**SPIKELET**

Multiple floret spikelet with 5 – 9 similar looking florets with distal florets usually sterile and slightly smaller in size; disarticulation generally above glumes and between florets

**FLORET**

**General shape:** narrowly lanceolate, slightly arched backwards

**Normal size:** 14.0 –20.0 mm long x 1.0 –1.5 mm wide; sub-apical awn 15.0 –30.0 mm

**Color:** straw-colored to light brown with +/- purple tinge, margins of lemma lighter in color compared to main body

**Texture:** lemma surface covered with short stiff hairs that are rough to the touch, hairs near base slightly longer

**Distinguishing features:** lemma 7 (9)–veined, veins forming raised longitudinal ridges, back rounded, apex bifid, teeth 1.0 – 3.0 mm long, margins and teeth hyaline; callus pointed and glabrous, attachment point oval; palea slightly longer than caryopsis, +/- glabrous between keels, keels with stiff, wide-spaced hairs; rachilla covered with short stiff hairs, round in cross-section and flattened at apex, attachment point +/--oval

**CARYOPSIS**

**General shape:** Linear, dorsal-ventrally compressed, flat to U-shaped in cross-section

**Normal size :** 11.0 –14.0 mm long x 1.0 – 2.8 mm wide.

**Color :** brown

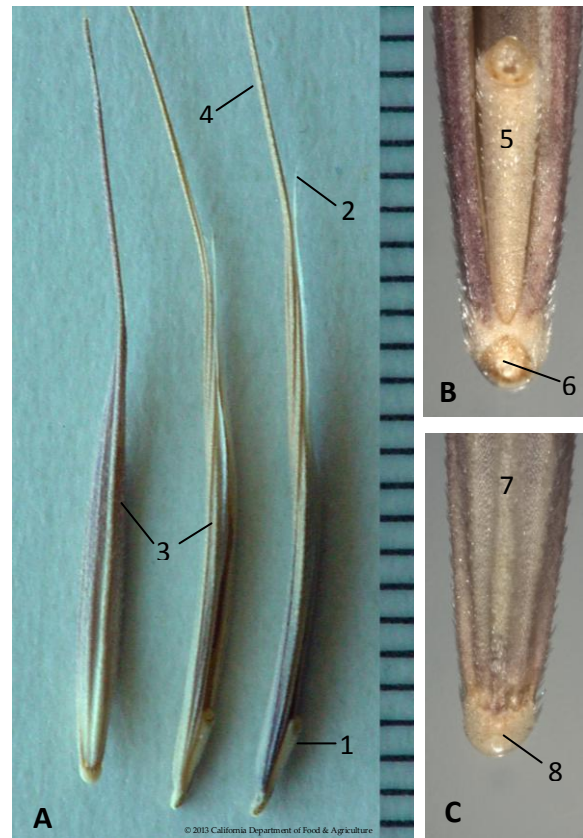
**Texture:** Smooth, apex fleshy and hairy, lemma and palea +/- adherent

**Embryo:** at base of caryopsis, small and slim root-shoot axis about 1/3 the length of the caryopsis narrowing to a point at the base; scutellum outline visible

**Endosperm:** bulk of caryopsis filled with solid endosperm

**Hilum:** linear, extending nearly the full length of the caryopsis

Description by Deborah Meyer  
California Department of Food & Agriculture



*Bromus sterilis*: A – florets in dorsal (left) and lateral views (middle and right), showing rachilla (1), lemma teeth (2), lemma (3) and awn (4). B – ventral view showing rachilla (5) with flattened apex and basal floret attachment scar (6). C – dorsal view showing lemma (7) and pointed callus (8).



Caryopses: dorsal view (top) showing embryo (9); ventral view (bottom) with palea fragments adhering (10), partially obscuring the view of the linear hilum (11).

Images by Deborah Meyer and Jim Effenberger

*Capsella bursa-pastoris* (L.) Medik. (*Brassicaceae*)

**General shape:** Compressed oval.

**Normal size:**

0.9-1.2 mm L x 0.4-0.6 mm W x 0.2 mm D

**Color:** Golden brown to reddish brown.

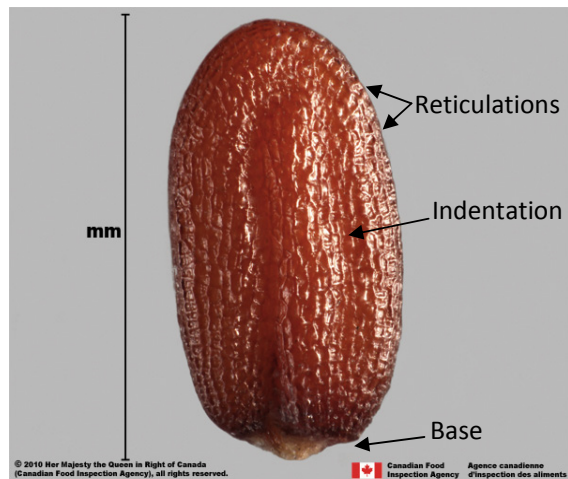
**Texture:** Fine, raised reticulations.

**Distinguishing features:** Distinct indentation separating radicle and cotyledon lobes. Darker at the base frequently with slight, white seed stalk remnant attached.

**Embryo:** Folded embryo with minimal endosperm present.



*Capsella bursa-pastoris* seeds



*Capsella bursa-pastoris* seed

Authored by Susan Putz  
Canadian Food Inspection Agency, Canada

Images by Jo Jones

*Centaurea cyanus* L. (Asteraceae)

**General shape:** Oblong with a notched large scar about 1/3 the length of the achene.

**Normal size:**

3.0-3.5 mm L x 1.5-2.0 mm W

**Color:** Bluish grey with a yellow collar and scar rim. Yellow longitudinal lines.

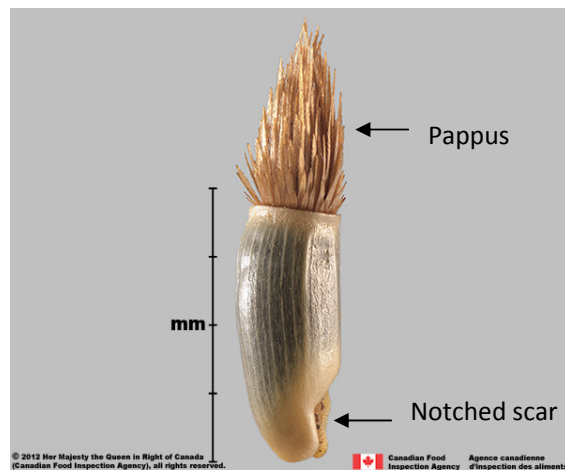
**Texture:** Glossy, smooth.

**Distinguishing features:** Pappus present and dense, brush-like. The bristles are uneven, stiff and light reddish brown. Notched scar slightly oblique.

**Embryo:** Embryo with well-developed cotyledons and a broad stalk having a truncate top, no endosperm.



*Centaurea cyanus* achenes with pappus



*Centaurea cyanus* achene

Authored by Susan Putz  
Canadian Food Inspection Agency, Canada

Images by Jo Jones

*Chloris gayana* Kunth (Poaceae)

**SPIKELET**

Multiple floret spikelet that disarticulates as a unit below the basal floret (glumes remain attached to the plant); basal floret fertile, upper florets sterile

**FERTILE FLORET**

**General shape:** laterally compressed; ovate, obovate, slightly bulged out along keel

**Normal size:** 2.5–4.2 mm long x 0.7–1.0 mm wide

**Color:** straw-colored to light brown

**Texture:** lemma cartilaginous, glabrous to +/- pubescent, when present, hairs usually longer along the margin especially near apex

**Distinguishing features:** lemma keeled, 3-veined, apex weakly bi-lobed, awn sub-apical 1.5-6.5 (10) mm long

**STERILE FLORETS**

First sterile floret similar in shape and color to fertile floret, 2.2-2.5 mm long x 0.3-1.0 mm wide, lemma keeled, awn sub-apical 0.8-3.2 mm long; other sterile florets progressively smaller, +/- awn tipped

**CARYOPSISIS**

**General shape:** narrowly oval in outline, three-sided in cross-section

**Normal size :** 1.0 – 1.5 mm long x ca. 0.5 mm wide

**Color :** amber to brown

**Texture:** smooth and glossy

**Embryo:** approximately one-half the length of the caryopsis, scutellum margin and root-shoot axis extending beyond the main body of the endosperm

**Endosperm:** solid

**Hilum:** round, basal

Description by Deborah Meyer

California Department of Food & Agriculture



*Chloris gayana* multiple florets.



The fertile and sterile florets usually remain attached together when they fall from the plant (glumes remain attached to the plant). The fertile floret (1) is the basal floret and two sterile florets (2, 3) are distally placed in the seed unit.



A – dorsal view of caryopsis showing embryo. B – lateral, dorsal, ventral, and cross-section view of caryopsis (left to right) highlighting the scutellum (4), root-shoot axis (5), and hilum (6).

Images and drawings by Deborah Meyer and Jim Effenberger



*Cichorium intybus* L. (Asteraceae)

**General shape:** Wedge-shaped, truncated at the base.

**Normal size:**  
2.0-2.7 mm L x 1.0-1.5 mm W x 1.0-1.5 mm D

**Color:** Pale brown often with darker mottling.

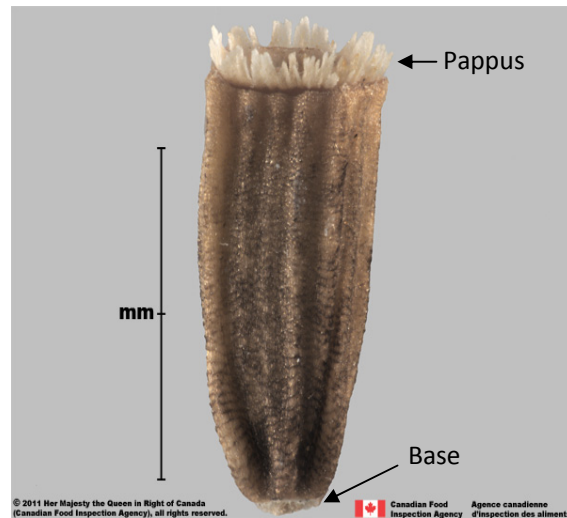
**Texture:** Minute lateral ridges with various longitudinal ribs.

**Distinguishing features:** Pappus of short scales in a single row. Centre of apex raised above the level of crown. Small apical rim.

**Embryo:** Embryo with well-developed cotyledons and a broad stalk having a truncate top, no endosperm.



*Cichorium intybus* achenes with pappus



*Cichorium intybus* achene with pappus

Authored by Susan Putz  
Canadian Food Inspection Agency, Canada

Images by Jo Jones

*Cirsium arvense* (L.) Scop. (Asteraceae)

**General shape:** Obovate, curved.

**Normal size:**

2.5-3.0 mm L x 0.8-1.0 mm W

**Color:** Brown with a yellow collar, some longitudinal yellow lines.

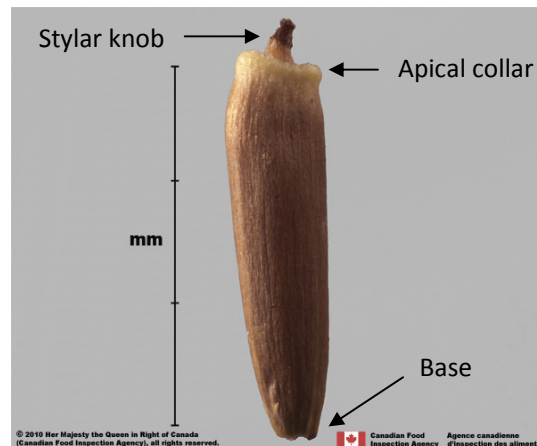
**Texture:** Dullish, fairly smooth surface.

**Distinguishing features:** Small stylar knob. Apical collar lighter in colour than the rest of the achene. Pappus is composed of long, plumose bristles but is readily detached. Narrow, truncated base.

**Embryo:** Embryo with well-developed cotyledons and a broad stalk having a truncate top, no endosperm.



*Cirsium arvense* achenes



*Cirsium arvense* achene

Authored by Susan Putz  
Canadian Food Inspection Agency, Canada

Images by Jo Jones

*Cirsium vulgare* (Savi) Ten. (Asteraceae)

**General shape:** Obovate, curved.

**Normal size:**

3.5-4.0 mm L x 1.2-1.7 mm W

**Color:** Yellowish-brown and streaked with black or purple. Apical collar a light yellow.

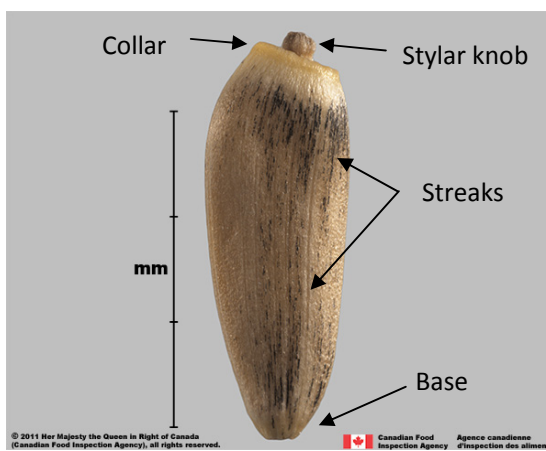
**Texture:** Dullish, fairly smooth surface.

**Distinguishing features:** Large stylar knob. Apical collar lighter in colour. Pappus is composed of long, plumose bristles but is readily detached. Narrow, truncated base. Broadest above the middle of the achene.

**Embryo:** Embryo with well-developed cotyledons and a broad stalk having a truncate top, no endosperm.



*Cirsium vulgare* achenes



*Cirsium vulgare* achene

Authored by Susan Putz  
Canadian Food Inspection Agency, Canada

Images by Jo Jones

*Cynodon dactylon* (L.) Pers. (Poaceae)

**SPIKELET**

Usually consisting of a single fertile floret and sometimes a sterile upper floret attached to the rachilla. Disarticulation usually below the fertile floret (glumes usually remain attached to the plant, but may occasionally remain attached to the fertile floret)

**FLORET**

**General shape:** ovate to D-shaped in outline; laterally compressed  
**Normal size:** 1.9 – 3.1 mm long x 0.75 – 1.2 mm wide  
**Color:** straw-colored, sometimes brown to purple tinged  
**Texture:** lemma cartilaginous, smooth and mostly glabrous  
**Distinguishing features:** lemma strongly keeled, +/- with hairs on keel in upper half, 3-veined; palea glabrous, keeled, 2-veined, +/- equal to lemma length; rachilla ca. ½ the length of the floret

**CARYOPSIS**

**General shape:** oval in outline, laterally compressed  
**Normal size:** 1.0 – 1.5 mm long x 0.5 – 0.7 mm wide  
**Color :** yellow to reddish-brown  
**Texture:** dull to lustrous, smooth to minutely striate  
**Embryo:** ca. ½ the length of caryopsis  
**Endosperm:** solid  
**Hilum:** round, basal

Description by Deborah Meyer  
 California Department of Food & Agriculture



*Cynodon dactylon* florets and spikelet. Fertile florets have a smooth cartilaginous lemma (1) and palea (2) that completely encloses the caryopsis. Occasionally fertile florets have sterile florets (3) attached to the tip of the rachilla and upper (4) and lower (5) glumes may also remain attached.



Caryopsis in lateral view (left) showing hilum (6), embryo (7), and style base (8). Variation in caryopsis color is shown at right.

Images by Jim Effenberger & Deborah Meyer

*Cynosurus echinatus* L. (Poaceae)

**SPIKELET**

Two types of spikelets – sterile spikelets remain attached to the plant, fertile spikelets with 1 – 5 florets that disarticulate below the basal floret (glumes remain attached to plant) and between florets

**FLORET**

**General shape:** lanceolate, slightly dorsal-ventrally compressed

**Normal size:** 5.0 – 7.0 mm long x 1.25 – 1.5 mm wide

**Color:** pale straw colored

**Texture:** lemma papery to leathery, lower half smooth and glabrous, upper half coarsely granular or with short stiff hairs

**Distinguishing features:** palea ca. equal to lemma (excluding awn); rachilla slender, 0.9 – 1.3 mm long; callus short, blunt, glabrous; awn extending from lemma apex, 5.0 – 18.0 (25.0) mm long, scabrous

**CARYOPSIS**

**General shape:** oblong-ellipsoid, nearly round to slightly dorsal-ventrally compressed, widely grooved on ventral surface

**Normal size:** 2.0 – 4.0 mm long x +/- 1.0 mm wide

**Color:** light brown

**Texture:** smooth, glabrous; palea +/- adhering to caryopsis

**Embryo:** 1/5 the length of as the caryopsis

**Endosperm:** solid

**Hilum:** oval



*Cynosurus echinatus* florets and caryopsis. Lemma (1), palea (2), rachilla (3), callus (4), and awn (5).



Caryopsis in dorsal view (left) showing the embryo (6) with well defined scutellum margin (7) and root-shoot axis (8). Ventral view (right) with palea remnant (9) obscuring the hilum.

Description by Deborah Meyer  
California Department of Food & Agriculture

Images by Jim Effenberger

*Dactylis glomerata* L. (Poaceae)

**SPIKELET**

Multiple floret spikelet with 2 – 6 florets that disarticulates above the glumes and +/- between florets (glumes may occasionally remain attached to basal floret); lower florets generally fertile, upper florets +/- empty (sterile)

**FLORET**

**General shape:** laterally compressed, strongly keeled, lanceolate in outline, three-sided in cross-section

**Normal size:** 4.0 – 8.0 mm long

**Color:** straw colored

**Texture:** lemma papery with short stiff hairs, sparsely pubescent or glabrous, usually with long hairs along keel; lemma margins hyaline

**Distinguishing features:** lemma tapering to a short awn, 0.2 – 1.5 mm long; palea 2-keeled, slightly shorter than lemma, +/- hairy; rachilla up to ¼ the length of floret, cylindrical, flared at apex; callus blunt and glabrous

**CARYOPSISIS**

**General shape:** elliptic or lanceolate to oblong, three-sided in cross-section, usually with broad longitudinal groove on ventral surface

**Normal size :** 1.0 – 3.2 mm long x 0.5 – 1.0 mm wide

**Color :** brown

**Texture:** glabrous

**Embryo:** ¼ the length of caryopsis

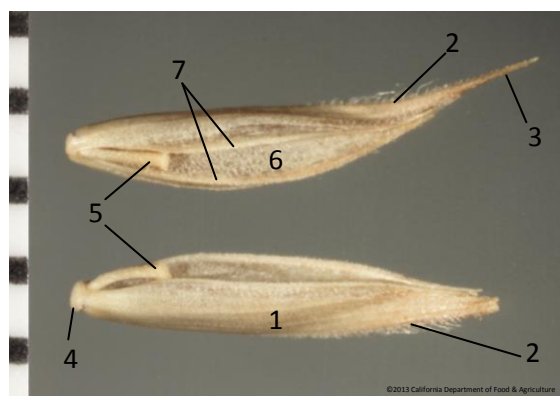
**Endosperm:** soft

**Hilum:** round, near base of ventral groove

Description by Deborah Meyer  
California Department of Food & Agriculture



*Dactylis glomerata* florets and caryopses.



Florets showing lemma (1) keel (2) with long hairs, awn (3), callus (4), rachilla with flared apex (5) and palea (6) with keels (7).

Caryopsis in dorsal view (left) showing embryo (5) and ventral view (right) showing round hilum (6) at base of broad ventral groove



Images by Deborah Meyer & Jim Effenberger

*Dactyloctenium aegyptium* ( L.) Willd. (Poaceae)

**SPIKELET**

Containing 3 – 7 florets, disarticulation above the glumes (glumes remain attached to plant), florets usually falling in groups

**FLORET**

**General shape:** laterally compressed, ovate in outline, apex tapering to a point  
**Normal size:** 2.5 – 3.5 (4.0) mm long x 1.5 – 2.5 mm wide,

**Color:** straw colored, +/- greenish tinged

**Texture:** thin and papery, glabrous

**Distinguishing features:** lemma strongly keeled, mid-vein extended into a curved awn, 0.5 – 0.8 mm long; callus blunt; palea nearly as long as lemma, glabrous

**FRUIT**

A utricle with thin papery pericarp from which the true seed usually falls free.

**SEED**

**General shape:** laterally compressed, somewhat squared in outline

**Normal size:** ca. 1.0 mm long and wide

**Color :** light tan to reddish-brown

**Texture:** transversely rugose

**Embryo:** nearly as long as seed

**Endosperm:** solid

**Hilum:** a knob-like protrusion in the center of the flattened bottom of seed

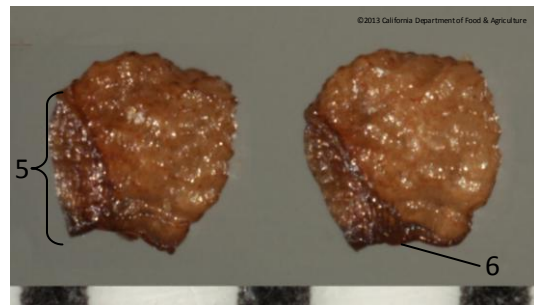
Description by Deborah Meyer  
 California Department of Food & Agriculture



*Dactyloctenium aegyptium* florets and seeds.



Lateral view of florets, basal floret fertile, distal floret sterile. Florets laterally compressed, lemma (1) with sharp keel (2), keel hairs short and stiff, awn (3) short, and callus blunt (4).



Laterally compressed true seeds that have fallen free of thin papery pericarp (fruit wall). Embryo (5) along edge of seed, nearly as long as seed. Hilum (6) a small knob-like protrusion in center of flattened bottom of seed.

Images by Jim Effenberger & Deborah Meyer

*Daucus carota* L. (Apiaceae)

**General shape:** Ovate to oval in outline, elliptic flattish plano-convex.

**Normal size:**

2.5 – 3.5 mm L x 1.3 – 2.0 mm W

**Color:** Greyish- yellow to yellow-brown.

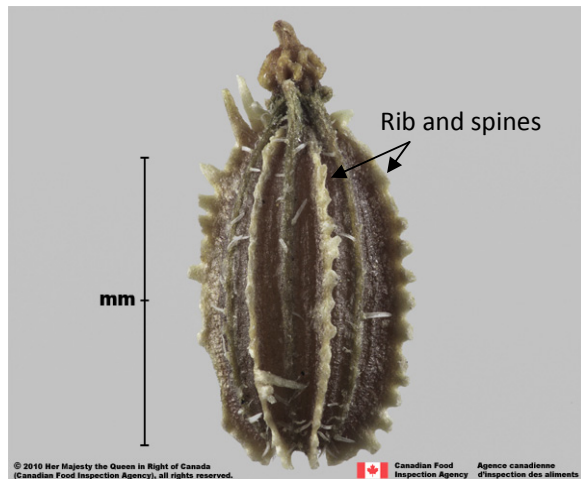
**Texture:** Longitudinal ridges or ribs with long, narrow spine-like hairs on outer convex side.

**Distinguishing features:** 4 prominent ribs with spines on the outer convex side with a lesser rib between each main rib which has smaller spines. The flattened inner side has a slight, central, spineless rib.

**Embryo:** Small, basal in fleshy, firm endosperm.



Inner and outer side views of *Daucus carota* mericarps



Outer side view of *Daucus carota* mericarp

Authored by Susan Putz  
Canadian Food Inspection Agency, Canada

Images by Jo Jones



*Digitaria sanguinalis* (L.) Willd. (Poaceae)

**SPIKELET**

One sterile floret and one fertile floret, disarticulation below the glumes, falling as a unit from the plant

**General shape:** Elliptic to lanceolate, dorsal-ventrally compressed

**Normal size:** 1.7 – 3.4 mm long x 0.7 – 1.1 mm wide

**Color:** Glumes and sterile floret straw-colored to light brown, +/- with purple tinge

**Texture:** Glumes and sterile floret membranous to papery

**Distinguishing features:** lower glume 0.2 – 0.4 mm long, triangular; upper glume lanceolate,  $\frac{1}{3}$  –  $\frac{1}{2}$  the length of the spikelet, 3-veined, covered with long hairs; sterile lemma equal in length to spikelet, 7-veined, the middle three veins forming wide spaced raised ridges, hairy along margins, short stiff hairs on veins in the upper half of the lemma

**FERTILE FLORET**

**General shape:** elliptic to lanceolate, dorsal-ventrally compressed

**Normal size:** 1.7 – 3.3 mm long x 1.0 mm wide

**Color:** yellow, grayish-green, light brown, +/- purple tinged

**Texture:** lemma cartilaginous (tough and firm, but flexible), thinning along margins, surface finely striate (covered with longitudinal rows of very minute tubercles); palea similar

**Distinguishing features:** lemma apex tapering to a point, lemma margins flat and overlapping the palea, both completely enclosing the caryopsis

**CARYOPSIS**

**General shape:** elliptic to oblong, dorsal-ventrally compressed

**Normal size :** 1.5 – 2.0 mm long x ca. 0.7 mm wide

**Color :** pale yellow, +/- transparent

**Texture:** smooth

**Embryo:**  $\frac{1}{3}$  -  $\frac{1}{2}$  the length of the caryopsis

**Endosperm:** solid

**Hilum:** oval

Description by Deborah Meyer

California Department of Food & Agriculture



*Digitaria sanguinalis* spikelets and caryopses.



Spikelets consist of a very short lower glume (1), an upper glume that is about  $\frac{1}{2}$  the length of the spikelet (2), sterile lemma (3), fertile lemma (4) and palea (not shown). Note the short stiff hairs along the veins of sterile lemma (5).



Caryopsis in dorsal view showing embryo (6) and ventral view showing hilum (7).

Images by Jim Effenberger & Deborah Meyer

*Echinochloa colona* (L.) Link (Poaceae)

**SPIKELET**

One sterile floret and one fertile floret, disarticulation below the glumes, falling as a unit from the plant

**General shape:** elliptic or ovate to round; dorsal-ventrally compressed, dorsal side arched and ventral side flat (D-shaped in profile view)

**Normal size:** 2.0 – 3.0 mm long x 1.0 – 1.5 mm wide

**Color:** Pale green to straw-colored, +/- with purple tinge

**Texture:** glumes and sterile floret membranous to papery, surface +/- with soft short hairs, veins +/- with short stiff hairs

**Distinguishing features:** lower glume +/- ½ the length of the spikelet, broadly triangular, the outer corners wrapping around the base of the upper glume; upper glume ovate, ca. equal to length of spikelet, apex tipped with a short, sharp point; sterile floret equal to length of spikelet, unawned; palea +/- equal in length to sterile lemma, hyaline, keels with short fine hairs

**FERTILE FLORET**

**General shape:** ovate to elliptic; dorsal-ventrally compressed, dorsal side arched and ventral side flat (D-shaped in profile view)

**Normal size:** 2.0 – 3.0 mm long

**Color:** straw-colored to grayish-brown, +/- dark speckled, veins +/- lighter in color; palea similar in color

**Texture:** lemma and palea hardened, glabrous, glossy; apex of lemma thinner and shriveled at maturity

**Distinguishing features:** lemma 5-veined, margins in-rolled over margin of palea, apex tapered to a point, at maturity the tip appears shriveled or laterally pinched

**CARYOPSISIS**

**General shape:** round to obovate, dorsal-ventrally compressed

**Normal size :** 1.2 – 1.6 mm long x 1.0 – 1.3 mm wide

**Color :** light yellow to whitish

**Texture:** smooth, glabrous

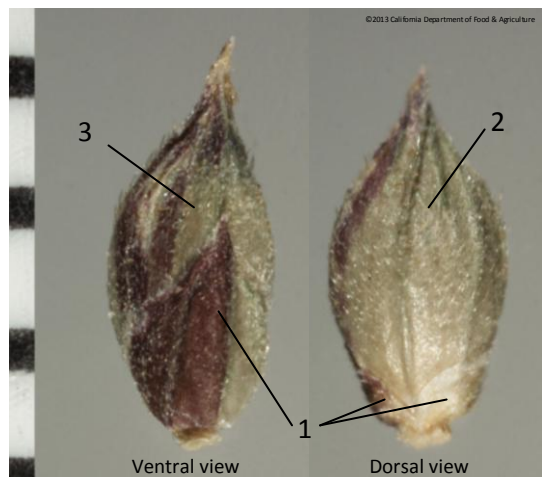
**Embryo:** ⅔ - ¼ the length of the caryopsis

**Endosperm:** solid

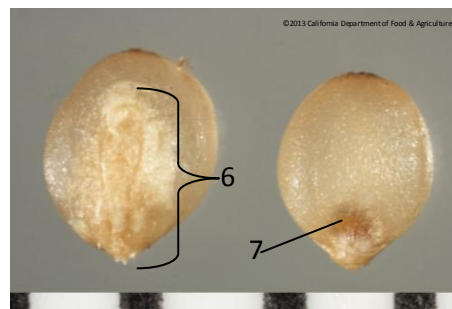
**Hilum:** +/- round

Description by Deborah Meyer

California Department of Food & Agriculture



*Echinochloa colona* spikelets consist of a triangular lower glume (1), upper glume (2) and sterile lemma (3) that are about equal in length, fertile lemma (4) and fertile palea (5).



Caryopsis in dorsal view showing embryo (6) and ventral view showing hilum (7).

Images by Jim Effenberger & Deborah Meyer

*Echinochloa crus-galli* (L.) P. Beauv. (Poaceae)**SPIKELET**

One sterile floret and one fertile floret, disarticulation below the glumes, falling as a unit from the plant

**General shape:** ovate to lanceolate or elliptic; dorsal-ventrally compressed, dorsal side arched and ventral side flat (D-shaped in profile view)

**Normal size:** 2.5–4.0 (5.0) mm long x 1.1–2.3 mm wide

**Color:** pale green to straw-colored, +/- with purple tinge

**Texture:** glumes and sterile floret membranous to papery, surface +/- with soft short hairs, veins +/- with short to long stiff hairs

**Distinguishing features:** lower glume ca.  $\frac{1}{3}$  - nearly  $\frac{1}{2}$  the length of the spikelet, broadly triangular, the outer corners wrapping around the base of the upper glume; upper glume ovate, ca. equal to length of spikelet, tapering to a pointed apex; sterile floret equal to length of spikelet, +/- with awn, up to 50 mm long; palea +/- equal in length to sterile lemma, hyaline, keels with short fine hairs

**FERTILE FLORET**

**General shape:** ovate to lanceolate or elliptic; dorsal-ventrally compressed, dorsal side arched and ventral side flat (D-shaped in profile view)

**Normal size:** 2.0 – 3.5 mm long

**Color:** straw-colored to grayish-brown, veins +/- lighter in color; palea similar in color

**Texture:** lemma and palea hardened, glabrous, glossy; apex of lemma thinner and shriveled at maturity

**Distinguishing features:** lemma 5-veined, margins in-rolled over margin of palea, apex tapered to a point, at maturity the tip appears shriveled or laterally pinched and is marked by a line of hairs

**CARYOPSIS**

**General shape:** round to oblong, dorsal-ventrally compressed

**Normal size :** 1.3 – 2.2 mm long x 1.0 – 1.8 mm wide

**Color :** light brown

**Texture:** smooth, glabrous

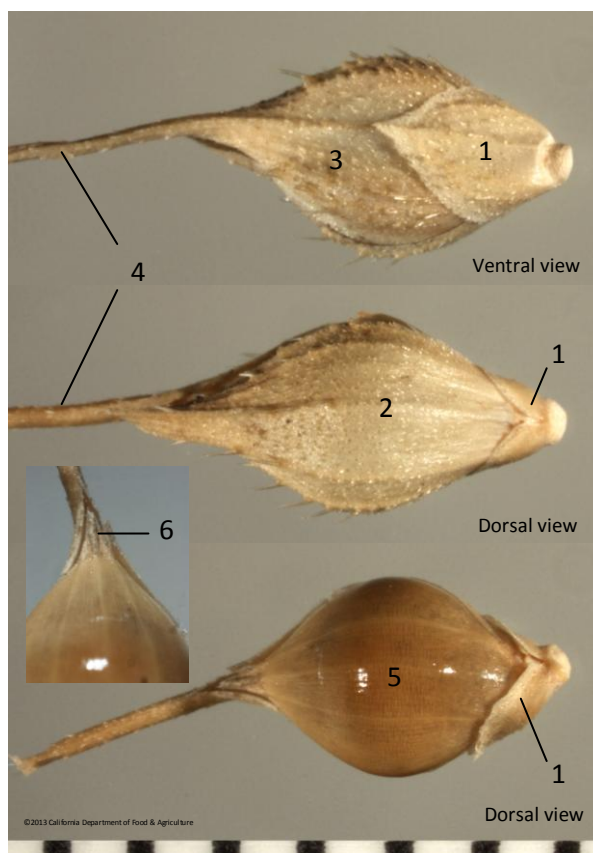
**Embryo:**  $\frac{3}{5}$  -  $\frac{7}{8}$  the length of the caryopsis

**Endosperm:** solid

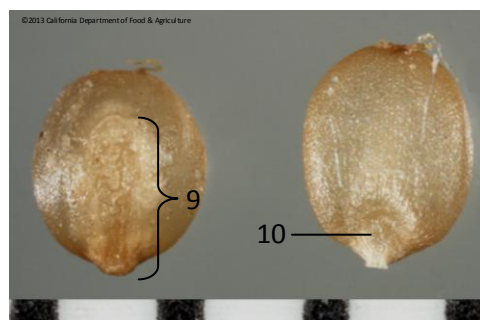
**Hilum:** +/- round

Description by Deborah Meyer

California Department of Food & Agriculture



*Echinochloa crus-galli* spikelets, fertile florets, and caryopses. Spikelets consist of a short lower glume (1), upper glume (2), sterile lemma (3) with awn (4), fertile lemma (5) with shriveled/pinched tip (6), sterile palea (7), and fertile palea (8).



Caryopsis in dorsal view showing embryo (9) and ventral view showing hilum (10).

Images by Deborah Meyer & Jim Effenberger

*Echium plantagineum* L. (*Boraginaceae*)

**General shape:** Ovoid-truncate.

**Normal size:**

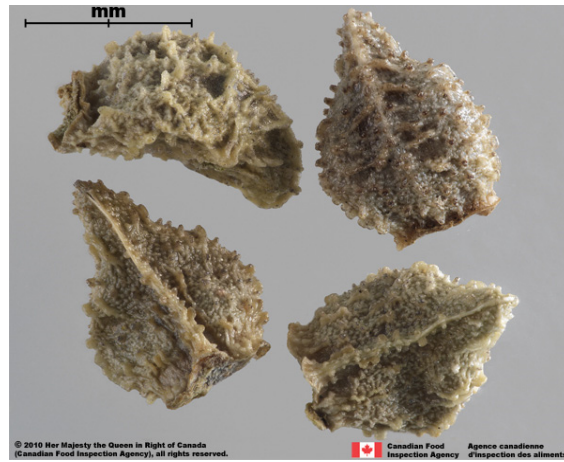
3.0-3.5 mm L x 2.0-3.0 mm W

**Color:** Pale ochre to light brown.

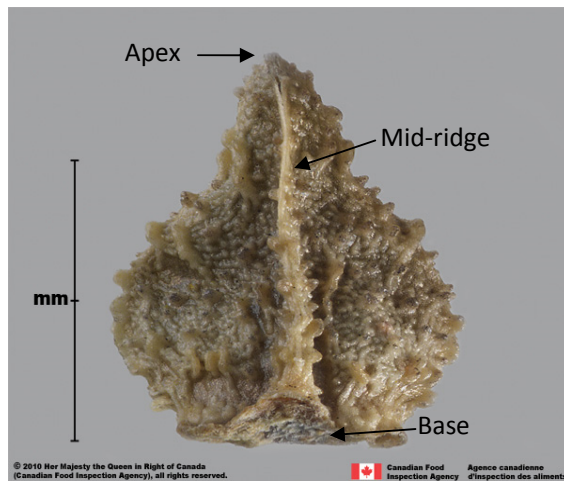
**Texture:** Very tubercled and warty.

**Distinguishing features:** Three sided with one convex outer face and two flat inner faces. Prominent mid-ridge extends around the entire seed. Flattened base and pointed apex.

**Embryo:** Slightly curved embryo with prominent radicle, scant endosperm.



*Echium plantagineum* nutlets



Inner side view of *Echium plantagineum* nutlet

Authored by Susan Putz  
Canadian Food Inspection Agency, Canada

Images by Jo Jones

*Eleusine indica* (L.) Gaertn. (Poaceae)

**SPIKELET**

Multiple floret spikelet with 5 – 7 florets that disarticulates above the glumes (glumes remain attached to plant) and between florets

**FLORET**

**General shape:** lanceolate

**Normal size:** 2.4 – 4(5) mm long

**Color:** straw colored

**Texture:** smooth, glabrous, papery

**Distinguishing features:** lemma strongly keeled along mid-vein and with short stiff hairs, somewhat keeled along two lateral veins, apex tapering to a point; callus blunt; awnless; rachilla short and stout; palea slightly shorter than lemma, strongly keeled along two veins, short stiff hairs along keels

**FRUIT**

Not technically a caryopsis because the seed coat is not fused to the pericarp

**General shape:** ovoid to ellipsoid

**Normal size :** ca. 2mm x 0.8 – 1.3 mm wide

**Color :** straw yellow to light brown

**Texture:** smooth, glabrous, thin, and papery pericarp

**SEED**

At maturity the seed easily separates from the papery pericarp

**General shape:** ovate to squarish in outline, dorsal side longitudinally ridged, ventral side +/- longitudinally grooved.

**Normal size:** 1 – 1.5 mm long x 0.7 – 1.1 mm wide

**Color:** purplish-black

**Texture:** transversely ridged

**Embryo:** nearly 1/3 the length of the caryopsis

**Endosperm:** solid

**Hilum:** round and located in a basal depression

Description by Deborah Meyer  
California Department of Food & Agriculture



*Eleusine indica* florets (1), fruits (2) and true seeds (3).



True seeds with rough seed coat (testa) in dorsal view (left) showing the embryo (4) and in lateral view showing the basal depression (5) in which the hilum is located.

Images by Jim Effenberger

*Elymus repens* (L.) Gould [*Elytrigia repens* (L.) Desv. ex Nevski] (Poaceae)

**SPIKELET**

Multiple floret spikelet with 4 – 7 similar looking florets with distal florets usually sterile and slightly smaller in size; disarticulation generally above glumes and between florets

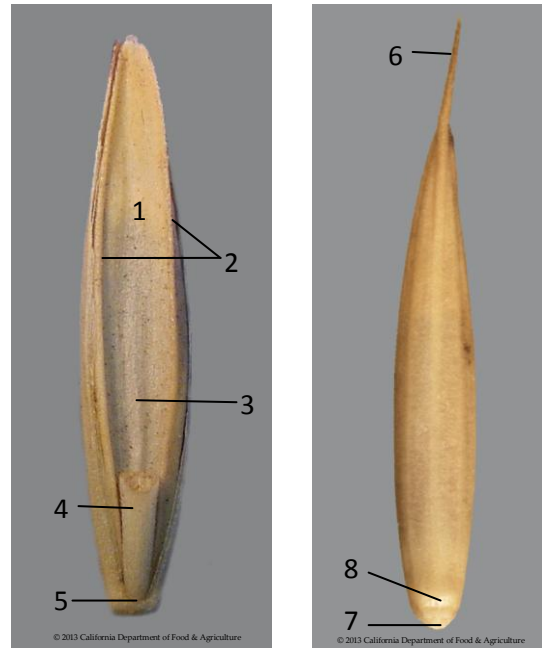
**FLORET**

**General shape:** lanceolate, dorsal-ventrally compressed; symmetrical in outline  
**Normal size:** 8.0 – 12.0 mm long x 1.25 – 1.75 mm wide  
**Color:** straw colored, +/- purplish-brown or green tinged  
**Texture:** lemma smooth, glabrous, lustrous, +/- short stiff hairy distally  
**Distinguishing features:** lemma with bulge above callus; awn, if present, straight, 0.2 – 4.0 (10.0) mm long; palea 7.0 – 9.5 mm long, concave or with longitudinal ridge in lower half, glabrous or sparsely hairy; hairs along palea keels broad based and short, +/- curved; palea apex blunt, slightly rounded, squarred off or with broad shallow notch, not folded at apex; palea margins +/- visible; sinus at base of rachilla U-shaped; rachilla sides parallel or only slightly divergent in basal florets, glabrous or with short stiff hairs

**CARYOPSISIS**

**General shape:** oblong, dorsal-ventrally compressed, with longitudinal depressions on lateral edges and ventral surface  
**Normal size :** 4.0 – 4.2 mm long x 1.0 – 1.2 mm wide  
**Color:** brown  
**Texture:** brush of hairs at apex  
**Embryo:** ¼ the length of caryopsis  
**Endosperm:** solid  
**Hilum:** linear, nearly as long as caryopsis, located in longitudinal depression

Description by Deborah Meyer  
 California Department of Food & Agriculture



*Elytrigia repens* florets in ventral view (left) showing palea (1) with keels (2), raised wrinkle along mid-line (3), rachilla (4) and U-shaped sinus (5) and dorsal view showing lemma with short awn (6), blunt callus (7) and buldge (8) above the callus.



Caryopsis, dorsal view (top) showing embryo (9) and ventral view (bottom) showing linear hilum (10) in longitudinal depression.

Images by Jim Effenberger

*Eragrostis curvula* ( Schrad.) Nees (Poaceae)

**SPIKELET**

Consisting of 4 – 10 florets that disarticulate above the glumes and between florets, disseminule falling from plant as a floret, free caryopsis, or caryopsis enclosed in lemma only

**FLORET**

**General shape:** narrowly ovate to oblong  
**Normal size:** 1.8 – 3.0 mm long  
**Color:** pale straw color  
**Texture:** membranous or hyaline  
**Distinguishing features:** lemma slightly keeled along mid-vein, apex tapering to a slight point; palea +/- equal in length to lemma, 2-veined, keels smooth or with short stiff hairs, apex rounded to slightly pointed

**CARYOPSIS**

**General shape:** narrowly oblong to ovate, dorsal-ventrally compressed, but three sided in cross-section with embryo lying along the slightly raised dorsal ridge, the ventral side either flat or with wide longitudinal depression  
**Normal size :** (0.7) 1.0 – 1.7 mm long x 0.6 – 0.8 mm wide  
**Color :** mostly translucent, light brown with +/- reddish tinge; scutellum +/- greenish black, root-shoot axis light brown to greenish black  
**Texture:** minutely striate, glabrous  
**Embryo:** +/- half the length of the caryopsis  
**Endosperm:** solid  
**Hilum:** +/- round, usually in a basal depression

Description by Deborah Meyer  
 California Department of Food & Agriculture



Florets and caryopses of *Eragrostis curvula*. Lemma (1) and palea (2) are thin and membranous. The caryopses (3) are usually translucent.



Caryopses in dorsal view (left) and ventral view (right). The scutellum (4) may or may not be darker in color than the root-shoot axis (5) of the embryo or both may be the same color as the main body of the caryopsis. The hilum (6) is located in a basal depression.

Images by Jim Effenberger

*Eragrostis tef* (Zuccagni) Trotter (Poaceae)

**SPIKELET**

Consisting of 4 – 16 florets that disarticulate above the glumes and between florets, disseminule falling from plant as a floret, free caryopsis, or caryopsis enclosed in lemma only

**FLORET**

**General shape:** lanceolate tapering to a slight point

**Normal size:** 1.6 – 3.0 mm long

**Color:** straw colored

**Texture:** membranous or hyaline, lemma with short stiff hairs along veins and near apex

**Distinguishing features:** palea 1.4 – 2.2 mm long, hyaline, keels with short stiff hairs, apex blunt or slightly rounded

**CARYOPSIS**

**General shape:** oval, ovate, or oblong, slightly compressed laterally

**Normal size :** 0.7 – 1.3 mm long x 0.2 – 0.5 mm wide

**Color :** light brown to whitish; scutellum may be slightly lighter in color than the main body of the caryopsis

**Texture:** smooth to minutely striate, glabrous

**Embryo:**  $\frac{2}{3}$  -  $\frac{3}{4}$  the length of the caryopsis

**Endosperm:** solid

**Hilum:** +/- round, usually in a basal depression



Florets and caryopses of *Eragrostis tef*. Lemma (1) and palea (2) are thin and membranous. The caryopses (3) are usually translucent.



Caryopses in dorsal view (left) and ventral view (right). The embryo (4) occupies  $\frac{2}{3}$  to  $\frac{3}{4}$  the length of the caryopsis.

Description by Deborah Meyer  
California Department of Food & Agriculture

Images by Jim Effenberger



*Festuca arundinacea* Schreb. (Poaceae)

**SPIKELET**

Multiple floret spikelet with 3-6 (9) similar looking florets with distal floret usually sterile and slightly smaller in size; disarticulation generally above the glumes and between the florets

**FLORET**

**General shape:** lanceolate, widest near mid-point, not dorsally keeled

**Normal size:** 5.0 – 9.0 (11.5) mm long x 1.5 – 1.75 mm wide

**Color:** straw color to light brown, sometimes green or purple tinged

**Texture:** lemma papery and coarsely granular with short stiff hairs near margins, veins, and near apex; palea papery and coarsely granular

**Distinguishing features:** callus blunt, thick, often with an indentation on upper edge; awn up to 4.0 mm long; palea +/- same length as lemma, keels two, with short stiff hairs along the keels; rachilla slender, round in cross-section with slightly flared disk at apex

**CARYOPSIS**

**General shape:** oblong, oval, or ovate, dorsal-ventrally compressed

**Normal size:** 2.0 – 4.0 mm long x 0.9 x 1.6 mm wide

**Color :** brown, sometimes with purplish tinge

**Texture:** smooth to slightly rough

**Embryo:** 1/5 - 1/3 the length of caryopsis

**Endosperm:** solid

**Hilum:** linear, located in a longitudinal depression

Description by Deborah Meyer  
California Department of Food & Agriculture



Florets and caryopses of *Festuca arundinacea*. A. Ventral view showing palea (1) and rachilla (2). B. Dorsal view showing lemma (3). C. Round, slender rachilla (4) with slightly flared apex. D. Thick callus (5) with slight indentation along upper edge. E. Granular palea texture (6). F. Caryopses, ventral view showing linear hilum (7) in the longitudinal depression and dorsal view showing embryo (8).

Images by Deborah Meyer & Jim Effenberger

*Festuca pratensis* Huds. (Poaceae)

**SPIKELET**

Multiple floret spikelet with 4 – 10 similar looking florets with distal floret usually sterile and slightly smaller in size; disarticulation generally above the glumes and between the florets

**FLORET**

**General shape:** dorsal-ventrally compressed; narrowly oval to lanceolate, widest near mid-point, not dorsally keeled

**Normal size:** 5.0 – 8.0 mm long x 1.5 mm wide

**Color:** straw color to light brown

**Texture:** lemma papery and smooth glabrous or with short stiff hairs near apex; palea papery, coarsely granular near base and smooth and lustrous in upper half

**Distinguishing features:** callus blunt, thick, often with an indentation on upper edge; awn zero or up to 0.2 mm long; palea +/- same length as lemma, keels two, with short stiff hairs along the keels; rachilla slender, round to slightly flattened in cross-section with slightly flared disk at apex

**CARYOPSIS**

**General shape:** oblong, oval, or ovate, dorsal-ventrally compressed

**Normal size:** 3.0 – 4.0 mm long x 1.0 x 1.5 mm wide

**Color :** brown, sometimes with purplish tinge

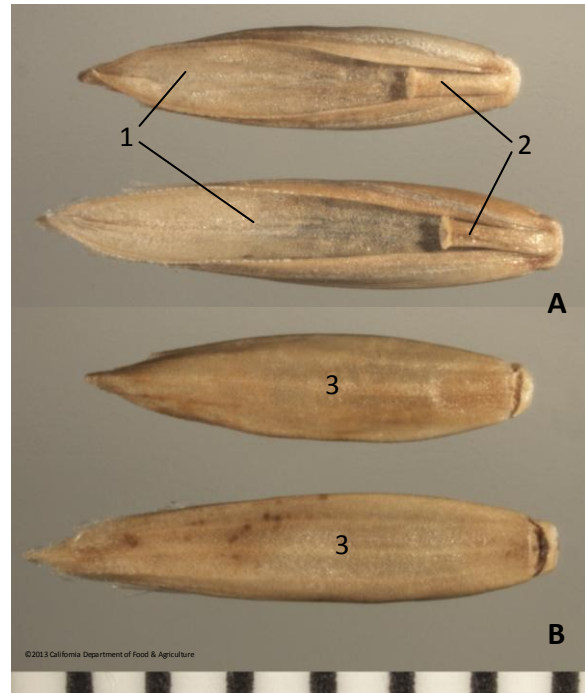
**Texture:** smooth to slightly rough, lemma and/or palea may be adherent

**Embryo:** 1/5 - 1/3 the length of caryopsis

**Endosperm:** solid

**Hilum:** linear, located in a longitudinal depression

Description by Deborah Meyer  
California Department of Food & Agriculture



Florets and caryopses of *Festuca pratensis*. A. Ventral view showing palea (1) and rachilla (2). B. Dorsal view showing lemma (3). C. Round, slender rachilla (4) with slightly flared apex. D. Thick callus (5) with slight indentation along upper edge. E. Basal granular palea texture grading into smooth lustrous texture toward apex (6). F. Caryopses, dorsal view showing embryo (7) and ventral view showing linear hilum in longitudinal depression partially concealed by persistent palea fragment (8).

Images by Deborah Meyer & Jim Effenberger

*Festuca rubra* L. (Poaceae)

**SPIKELET**

Multiple floret spikelet with 5 – 8 similar looking florets with distal floret usually sterile and slightly smaller in size; disarticulation generally above the glumes and between the florets

**FLORET**

**General shape:** dorsal-ventrally compressed; lanceolate, widest near mid-point, not dorsally keeled

**Normal size:** 4.0 – 9.0 mm long x 1.0 – 1.5 mm wide

**Color:** straw color to light brown with green or purple tinge

**Texture:** lemma papery and smooth glabrous or with short stiff or soft hairs near apex; palea papery, coarsely granular and with short hairs near apex

**Distinguishing features:** callus blunt and thick; awn up to 4.5 mm long; palea slightly shorter than lemma, keels two, with short stiff hairs along the keels and with short soft hairs near apex; rachilla slender, round in cross-section with flared disk at apex, +/- covered with short hairs

**CARYOPSISIS**

**General shape:** narrowly oblong, oval, or obovate, dorsal-ventrally compressed

**Normal size:** 2.5 – 4.0 mm long x 1.0 – 1.5 mm wide

**Color :** reddish-brown, sometimes with purplish tinge

**Texture:** smooth to slightly rough, lemma and/or palea may be adherent

**Embryo:** 1/5 - 1/3 the length of caryopsis

**Endosperm:** solid

**Hilum:** linear, nearly as long as caryopsis, located in longitudinal depression

Description by Deborah Meyer  
California Department of Food & Agriculture



Florets and caryopses of *Festuca rubra*. A. Ventral view showing palea (1) and rachilla (2). B. Dorsal view showing lemma (3). C. Round, slender rachilla (4) covered with hairs and with slightly flared apex. D. Thick, blunt callus (5). E. Short soft hairs (6) near palea apex. F. Granular palea texture between keels (7). G. Caryopses, dorsal view showing embryo (8) and ventral view showing linear hilum (9) in a longitudinal depression.

Images by Deborah Meyer & Jim Effenberger

*Helianthus annuus* L. (Asteraceae)

**General shape:** Flattish oblong, truncate at the apex with a narrowed base.

**Normal size:**

Wild type: 4.0-5.0 mm L x 2.0-3.0 mm W x 1.0-2.0 mm D

Cultivated type: 9.0-13.0 mm L x 7.0-9.0 mm W x 4.0-6.0 mm D

**Color:**

Wild type: Greyish to brown with dark lengthwise streaks and mottling.

Cultivated type: White to black with variable striping.

**Texture:**

Wild type: Smooth surface with appressed silky hairs and pubescence near the apex.

Cultivated type: Smooth surface.

**Distinguishing features:**

Wild type: Hairs at the apex are stiff and upward-directed. Small apical rim.

Attachment area notched and smooth.

Cultivated type: No obvious apical rim or obvious hairs. Attachment area has a small notch..

**Embryo:** Embryo with well-developed cotyledons and a broad stalk having a truncate top, no endosperm.



*Helianthus annuus* (wild type) achenes



*Helianthus annuus* (cultivated type) achenes

*Helminthotheca echioides* (L.) Holub (Asteraceae)

**General shape:** Narrowly obovate with a slender stalk.

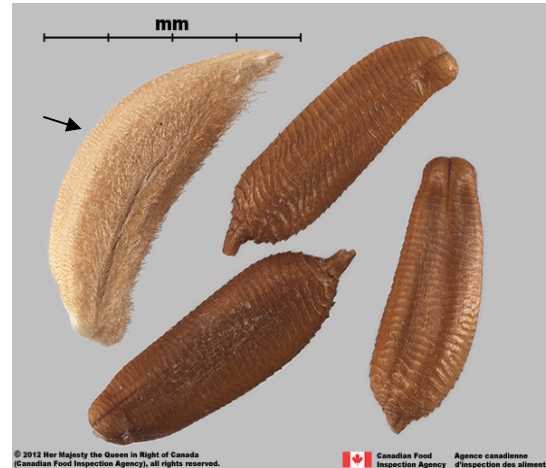
**Normal size:**  
2.5-3.5 mm L x 0.4-1.0 mm W x 0.8 mm D

**Color:** Yellowish brown to dark brown.

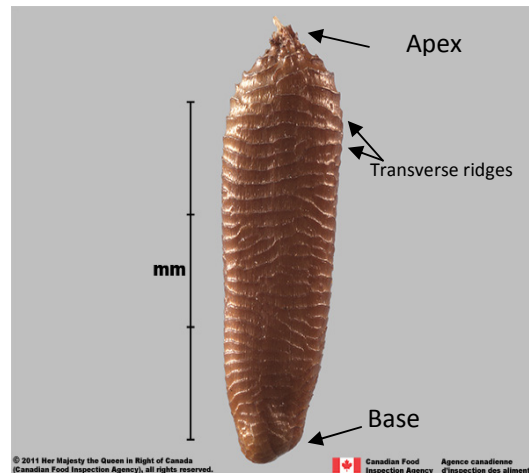
**Texture:** Glossy with irregular, transverse ridges.

**Distinguishing features:** Broadest near the rounded apex, gradually tapers to a rounded base. Sometimes curved. Transverse ridges are narrow and crowded at the base and become wider and deeper near the apex. Outer seeds may be enclosed in a hairy bract.

**Embryo:** Embryo with well-developed cotyledons and a broad stalk having a truncate top, no endosperm.



*Helminthotheca echioides* achenes with one enclosed in a hairy bract (arrow)



*Helminthotheca echioides* achene

Authored by Susan Putz  
Canadian Food Inspection Agency, Canada

Images by Jo Jones

*Holcus lanatus* L. (Poaceae)

**SPIKELET**

Multiple floret spikelet in which the florets are completely enclosed by the glumes. Disarticulation occurs below the glumes and the spikelet falls from the plant as a unit. The basal floret is fertile and the distal floret sterile

**General shape:** ovate to lanceolate, laterally compressed, strongly keeled, lower glume shorter and narrower than upper glume

**Normal size:** 3 – 6 mm long

**Color:** whitish-straw colored, very pale green, sometimes with purplish tinge near apex

**Texture:** glumes papery, generally covered with short hairs and with long hairs on keels

**Distinguishing features:** both glumes strongly keeled, upper glume with prominent lateral veins

**FLORET**

**General shape:** fertile floret laterally compressed and keeled, lanceolate in ventral view, in lateral view ventral edge nearly straight and dorsal edge arched at or slightly below mid-point

**Normal size:** fertile lemma 1.7 – 2.5 mm long x 0.5 – 0.75 mm wide, palea equal in length to lemma

**Color:** whitish-straw colored, sometimes darker near apex

**Texture:** fertile lemma cartilaginous, smooth and glossy, with short hairs along upper portion of keel

**Distinguishing features:** fertile floret awnless; rachilla of fertile floret long and thread-like, glabrous; palea with two keels; sterile lemma with hook-shaped awn

**CARYOPSISIS**

**General shape:** laterally compressed, ovate to lanceolate

**Normal size :** 1 – 1.5 mm long x 0.4 – 0.5 mm wide

**Color :** light brown

**Texture:** smooth

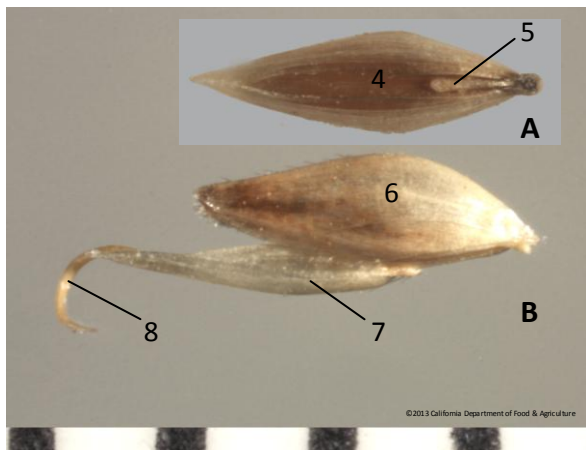
**Embryo:** ¼ – ⅓ the length of caryopsis

**Endosperm:** soft

**Hilum:** oval, in shallow longitudinal depression



*Holcus lanatus* spikelet showing lower glume (1), upper glume (2), and awn of sterile floret (3).



A – Fertile floret in ventral view showing palea (4) and rachilla (5). B – lateral view of fertile floret showing glossy lemma (6) and sterile floret (7) with hook-shaped awn (8).



Caryopses in dorsal view (left) showing embryo (9) and ventral view (right) showing hilum (10) in shallow longitudinal depression.

Description by Deborah Meyer  
California Department of Food & Agriculture

Images by Deborah Meyer

*Hypochoeris radicata* L. (Asteraceae)

**General shape:** Elongated, narrowly elliptical with a long, roughened awn.

**Normal size:**

4.5-5.5 mm L x 0.5-0.7 mm W

**Color:** Dark brown to reddish brown.

**Texture:** Many longitudinal vertical, toothed or warty ribs.

**Distinguishing features:** Tapers to a long, spiny awn at the apex. Tapers to a truncate base with a rimmed collar.

**Embryo:** Embryo with well-developed cotyledons and a broad stalk having a truncate top, no endosperm.

Authored by Susan Putz  
Canadian Food Inspection Agency, Canada



*Hypochoeris radicata* achenes with and without spiny awn



*Hypochoeris radicata* achene with spiny awn

Images by Jo Jones

*Lapsana communis* L. (Asteraceae)

**General shape:** Obliquely obovate, curved.

**Normal size:**

3.5-4.0 mm L x 0.8 – 1.0 mm W x 0.8 mm D

**Color:** Silvery brown to light brown.

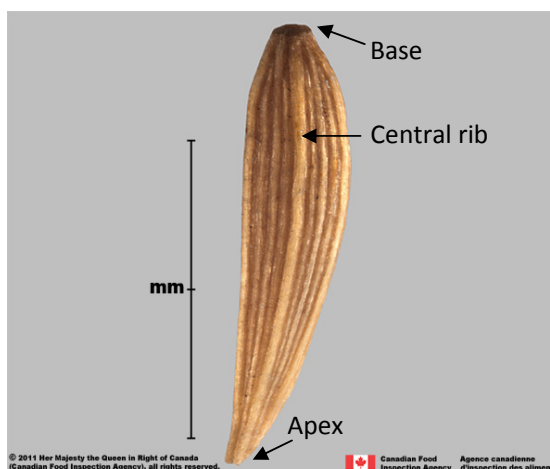
**Texture:** Glossy with large longitudinal ribs with smaller ribs in between.

**Distinguishing features:** Prominent central and marginal ribs. Tapered apex and a broad, rimmed base.

**Embryo:** Embryo with well-developed cotyledons and a broad stalk having a truncate top, no endosperm.



*Lapsana communis* achenes



*Lapsana communis* achene

Authored by Susan Putz  
Canadian Food Inspection Agency, Canada

Images by Jo Jones



*Lolium perenne* L. (Poaceae)

**SPIKELET**

Multiple floret spikelet with (2) 5 – 9 (10+) similar looking florets with distal florets usually sterile and slightly smaller in size; disarticulation generally above the glumes and between the florets

**FLORET**

**General shape:** dorsal-ventrally compressed; oblong (sides mostly parallel the entire length) to lanceolate, not dorsally keeled

**Normal size:** 3.5 – 9.0 mm long x 0.8 – 2.0 mm wide

**Color:** straw color, sometimes with greenish tinge

**Texture:** lemma papery and smooth, glabrous or with short stiff hairs near margins and apex; palea papery, coarsely granular in lower half transitioning to smooth and lustrous in upper half

**Distinguishing features:** callus blunt, narrow, glabrous; awn, if present, short, straight and attached slightly below apex; palea +/- equal in length to lemma, keels two, with short stiff hairs along keels; rachilla glabrous or with short hairs, flat, wide, strap-like, apex usually not expanded

**CARYOPSIS**

**General shape:** dorsal-ventrally compressed, mostly oblong or elliptic

**Normal size :** (2.0) 3.0 – 5.5 mm long x 0.7 – 1.5 mm wide

**Color :** light to reddish-brown

**Texture:** smooth to slightly rough

**Embryo:** 1/5 - 1/3 the length of caryopsis

**Endosperm:** solid

**Hilum:** linear, nearly as long as caryopsis

Description by Deborah Meyer  
California Department of Food & Agriculture



Florets and caryopses of *Lolium perenne*. A. Ventral view showing palea (1) and rachilla (2). B. Dorsal view showing lemma (3). C. Flat, strap-like rachilla (4). D. Thin, blunt callus (5). E. Granular palea texture in lower half and smooth lustrous texture in upper half (6). F. Caryopses, dorsal view showing embryo (7) and dorsal view showing linear hilum (8).

Images by Deborah Meyer & Jim Effenberger

***Myosotis arvensis* (L.) Hill (Boraginaceae)**

**General shape:** Ovate.

**Normal size:**

1.7-2.0 mm L x 1.0-1.5 mm W x 0.5-0.7 mm D

**Color:** Dark brown to black.

**Texture:** Smooth and glossy. Finely reticulate.

**Distinguishing features:** Tear dropped shape with pointed apex. Rimmed margin. Three sided with outer side curved and a mid-ridge between the two inner sides. Whitish oval, basal scar.

**Embryo:** Prominent radicle, endosperm scant.



*Myosotis arvensis* nutlets



Inner side view of *Myosotis arvensis* nutlet

Authored by Susan Putz  
Canadian Food Inspection Agency, Canada

Images by Jo Jones

*Panicum capillare* L. (Poaceae)

**SPIKELET**

One sterile floret and one fertile floret, disarticulation below the glumes, falling as a unit from the plant or the fertile floret falls separately from the glumes

**General shape:** Elliptic or oblong; dorsal-ventrally compressed, dorsal side arched and ventral side flat, thickest near the mid-point

**Normal size:** 1.9 – 4 mm long x 1.0 – 1.5 mm wide

**Color:** Pale green to straw-colored, +/- with purple tinge

**Texture:** Glumes and sterile floret membranous to papery, surface +/- with soft short hairs, veins +/- with short stiff hairs

**Distinguishing features:** Lower glume +/- ½ the length of the spikelet, broadly triangular, the outer corners wrapping around the base of the upper glume; upper glume ovate, ca. equal to length of spikelet, apex tipped with a short, sharp point; sterile floret equal to length of spikelet, unawned; palea +/- equal in length to sterile lemma, hyaline, keels with short fine hairs

**FERTILE FLORET**

**General shape:** elliptic to oblong, dorsal-ventrally compressed, thickest at midpoint

**Normal size:** 1.0 – 1.75 mm long x 0.5 – 1.0 mm wide

**Color:** straw-colored to dark brown with prominent light-colored veins

**Texture:** hardened, smooth, glossy

**Distinguishing features:** : lemma 5-veined, margins in-rolled over margin of palea, apex tapering to a slight point

**CARYOPSIS**

**General shape:** broadly elliptic to oblong

**Normal size :** 1.0 – 1.5 mm long x 0.8 – 1.0 mm wide

**Color :** straw-colored

**Texture:** smooth, glabrous

**Embryo:** ca. ½ the length of caryopsis

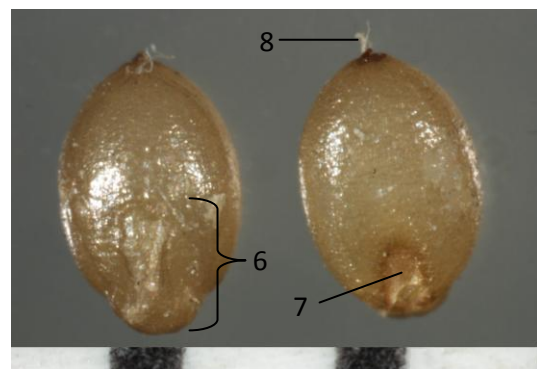
**Endosperm:** solid

**Hilum:** round to elliptic

Description by Deborah Meyer  
California Department of Food & Agriculture



*Panicum capillare* spikelets, fertile florets and caryopsis. Spikelets consist of a triangular lower glume (1) that wraps around the base of the upper glume, the papery upper glume (2) and sterile lemma (3) that are about equal in length, and a hardened fertile lemma (4) and fertile palea (5.)



Caryopsis in dorsal view showing embryo (6) and ventral view showing hilum (7). The remnants of the style bases (8) can remain attached at the caryopsis apex.

Images by Jim Effenberger

***Urochloa maxima* (Jacq.) R. D. Webster [*Panicum maximum* L.] (Poaceae)**

**SPIKELET**

One sterile floret and one fertile floret, disarticulation below the glumes, falling as a unit from the plant

**General shape:** narrowly elliptic or obovate, dorsal-ventrally compressed

**Normal size:** 2.7 – 3.6 mm long x 0.9 – 1.1 mm wide

**Color:** pale green to straw-colored, +/- with purple tinge

**Texture:** glumes and sterile floret membranous to papery, glabrous in var. *maxima*, hairy in var. *trichoglumis*. Fertile lemma hardened, transversely wrinkled

**Distinguishing features:** lower glume ¼ - ½ the length of the spikelet, broadly triangular, apex blunt to slightly pointed, the outer corners wrapping around the base of the upper glume; upper glume narrowly elliptic to obovate, ca. equal to length of spikelet, apex tapered to a point; sterile floret equal to length of spikelet, unawned; palea +/- equal in length to sterile lemma, hyaline, keels with short fine hairs

**FERTILE FLORET**

**General shape:** narrowly elliptic to obovate, dorsal-ventrally compressed

**Normal size:** 2.1 – 3.5 mm long x 0.9 – 1.0 mm wide

**Color:** straw-colored

**Texture:** lemma hardened, transversely wrinkled; palea ca. same length as fertile lemma

**Distinguishing features:** lemma margins in-rolled over margin of palea, apex tapering to a slight point

**CARYOPSIS**

**General shape:** elliptic to obovate

**Normal size :** 1.5 – 1.7 mm long x +/-1.0 mm wide

**Color :** pale straw-colored

**Texture:** smooth, glabrous

**Embryo:** ca. ⅔ the length of caryopsis

**Endosperm:** solid

**Hilum:** elliptic

Description by Deborah Meyer  
California Department of Food & Agriculture



*Urochloa maxima* spikelets, fertile florets and caryopsis. A spikelet consist of a triangular lower glume (1) that wraps around the base of the papery upper glume (2), a sterile lemma (3) that is nearly equal in length to the upper glume, and a hardened fertile lemma (4) and palea (5.)



Caryopsis in dorsal view showing embryo (6) and ventral view showing hilum (7).

Images by Jim Effenberger

*Pennisetum glaucum* ( L.) R. Br. (Poaceae)

**SPIKELET**

Multiple floret spikelet, the upper floret fertile and the lower floret sterile or staminate.

Clusters of two or more spikelets subtended by two whorles of bristles forming a fascicle.

At maturity the fascicles disarticulate as a unit.

**General shape:** obovate

**Normal size:** 3 – 7 mm

**Color:** grey to light brown

**Texture:** fascicle with numerous persistent bristles

**Distinguishing features:** outer bristles 0.5 – 6 mm; inner bristles 4 – 6 mm; rachis densely hairy; lower glume absent or to 1.5 mm long, upper glume 0.5 – 3.5 mm long; lower (sterile) lemma 1.5 – 6 mm long, margins ciliate; lower palea vestigial or fully developed, margins ciliate

**FERTILE FLORET**

**General shape:** obovate

**Normal size:** lemma 4.3 – 7 mm long, palea 3.4 – 3.9 mm long

**Color:** light brown

**Texture:** firm, shiny, margins ciliate

**Distinguishing features:** caryopses +/- protruding from the tip of the fascicle; milled samples usually have all outer structures removed

**CARYOPSIS**

**General shape:** obovate; protruding from the lemma and palea at maturity

**Normal size :** 2.0 – 5.5 mm long, 1.6 – 3.2 mm wide

**Color :** grey to light brown

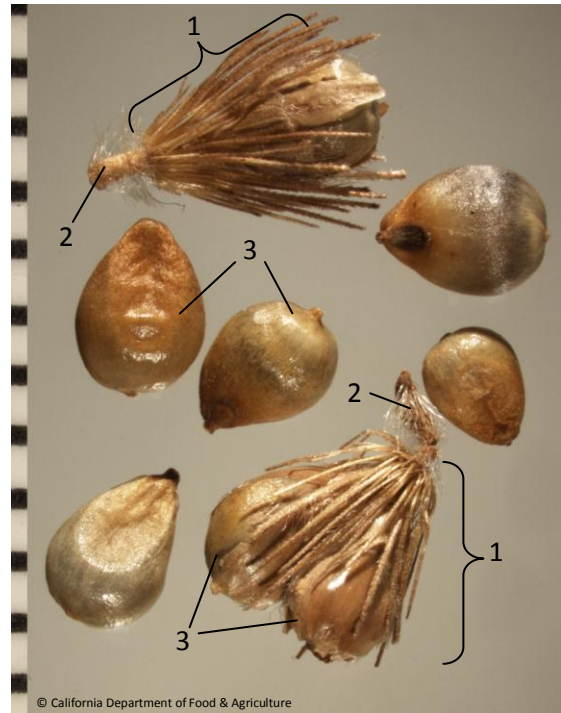
**Texture:** smooth and shiny

**Embryo:** 2/3 the length

**Endosperm:** firm to chalky

**Hilum:** oval

Description by Deborah Meyer  
California Department of Food & Agriculture



*Pennisetum glaucum* fascicles (1) with persistent rachises (2) attached and free caryopses (3).



Caryopsis in dorsal view showing embryo (4) and ventral view showing hilum (5).

Images by Jim Effenberger

*Phleum pratense* L. (Poaceae)

**SPIKELET**

Single floret spikelet, disarticulation generally above the glumes.

**General shape:** U-shaped in lateral view, strongly laterally compressed

**Normal size:** glumes +/- equal in length, 3 – 4 mm long; both glumes awned, awns 1.0 – 1.5 (2) mm long

**Color:** straw-colored, +/- green tinged

**Texture:** papery, keel with numerous long hairs

**Distinguishing features:** glumes strongly keeled, completely enclosing the single floret, but usually remaining attached to the plant at maturity

**FLORET**

**General shape:** elliptic to obovate, not compressed

**Normal size:** lemma (1.2) 1.7 – 2.0 mm x 0.8 – 0.9 mm wide, ca. ½ as long as glumes

**Color:** whitish, translucent

**Texture:** thin papery

**Distinguishing features:** lemma not keeled, veins 5 – 7 veined; palea +/- equal to lemma length, with two closely spaced veins; callus blunt

**CARYOPSIS**

**General shape:** elliptic to obovate, round in cross-section; style base +/- evident as a rounded knob at apex

**Normal size:** 1.3 – 1.5 mm long x 0.6 – 0.8 mm wide

**Color:** straw-colored to brown

**Texture:** reticulate, dull

**Embryo:** ⅓ the length of the caryopsis

**Endosperm:** solid

**Hilum:** dark oval spot

Description by Deborah Meyer  
California Department of Food & Agriculture



*Phleum pratense* caryopses (1) and florets with papery lemmas (2) and paleas (3). Hilum visible as dark spot on ventral caryopsis surface (4).



Caryopses in dorsal view showing the embryo (5) and style base (6).

Images by Jim Effenberger

*Poa annua* L. (Poaceae)

**SPIKELET**

Multiple floret spikelet with 2 – 6 similar looking florets with distal florets usually sterile and slightly smaller in size; disarticulation generally above glumes and between florets

**FLORET**

**General shape:** lanceolate, laterally compressed, dorsally keeled

**Normal size:** 2.5 – 4.0 mm long

**Color:** straw colored, +/- lighter in color near apex

**Texture:** lemma papery, +/- hairy

**Distinguishing features:** lemma strongly keeled and prominently 5-veined, veins +/- densely hairy in lower half, apex blunt or tapered to a point, awnless; palea slightly shorter than lemma, keels usually with long, dense hairs along lower  $\frac{2}{3}$  of keel and glabrous in upper  $\frac{1}{3}$  of keel; rachilla  $\frac{1}{3}$  –  $\frac{1}{2}$  the length of the floret, smooth and glabrous; callus blunt, usually glabrous

**CARYOPSIS**

**General shape:** broadly ovate, slightly laterally compressed

**Normal size:** ca. 1.5 mm long x 0.5 – 0.9 mm wide

**Color:** brown

**Texture:** smooth, longitudinally striate

**Embryo:**  $\frac{1}{4}$  the length of caryopsis

**Endosperm:** solid

**Hilum:** round, basal

Description by Deborah Meyer  
California Department of Food & Agriculture



*Poa annua* caryopsis and florets showing lemma (1), palea (2), and rachilla (3).



Caryopsis in dorsal view (left) showing embryo (4) and lateral view (right) showing hilum (5).

Images by Jim Effenberger

*Poa pratensis* L. (Poaceae)

**SPIKELET**

Multiple floret spikelet with 2 – 5 similar looking florets with distal florets usually sterile and slightly smaller in size; disarticulation generally above glumes and between florets

**FLORET**

**General shape:** ovate to lanceolate, laterally compressed, dorsally keeled  
**Normal size:** 2 – 4.3 mm long x 0.8 mm wide  
**Color:** light to dark straw colored, usually darker near the base  
**Texture:** papery, +/- hairy  
**Distinguishing features:** lemma 5 (7)-veined, keel and marginal veins with short hairs, lateral veins prominent, lemma hairy at base in un-milled samples, apex tapering to a point, awnless; palea slightly shorter than lemma, keels with widely spaced coarse hairs, except near apex; rachilla ca. 1/3 the length of the floret (shorter in basal florets and longer in distal florets), glabrous; callus blunt

**CARYOPSIS**

**General shape:** narrowly ovate to lanceolate, laterally compressed, triangular in cross-section  
**Normal size:** ca. 1.5 – 1.8 mm long x 0.5 – 0.8 mm wide  
**Color:** brown  
**Texture:** smooth  
**Embryo:** ca. 1/4 the length of caryopsis  
**Endosperm:** solid  
**Hilum:** round, basal

Description by Deborah Meyer  
 California Department of Food & Agriculture



*Poa pratensis* caryopses and florets showing lemma (1), palea (2), and rachilla (3).



Caryopsis in dorsal view (left) showing embryo (4) and lateral view (right) showing hilum (5).

Images by Jim Effenbeger



*Poa trivialis* L. (Poaceae)

**SPIKELET**

Multiple floret spikelet with 2 – 4 similar looking florets; disarticulation generally above glumes and between florets

**FLORET**

**General shape:** lanceolate, sharply keeled, dorsally arched

**Normal size:** 2.3 – 3.5 mm long x 0.6 – 0.8 mm wide

**Color:** light brown

**Texture:** papery

**Distinguishing features:** lemma strongly keeled, tightly adhering to the caryopsis, glabrous between veins, keels sparsely hairy  $\frac{3}{5}$  of length, marginal veins with soft hairs in lower  $\frac{1}{4}$ , lateral veins prominent, apex tapered to a point, awnless; palea with deep longitudinal crease, keels smooth or with minute hairs; rachilla slender,  $\frac{1}{8}$  –  $\frac{1}{3}$  the length of the floret; callus blunt, with long cobwebbed hairs on un-milled florets

**CARYOPSIS**

**General shape:** oval, laterally compressed and triangular in cross-section, dorsal side with longitudinal depression

**Normal size:** 1.5 – 1.8 mm long x 0.5 mm wide

**Color :** brown

**Texture:** smooth

**Embryo:** ca.  $\frac{1}{4}$  the length of caryopsis

**Endosperm:** solid

**Hilum:** round, basal

Description by Deborah Meyer  
California Department of Food & Agriculture



*Poa trivialis* caryopsis and florets showing lemma (1), lemma keel (2), and rachilla (3).



Caryopsis in dorsal view (left) showing embryo (4) and lateral view (right) showing hilum position (5).

Images by Jim Effenberger

*Raphanus raphanistrum* L. (*Brassicaceae*)

**General shape:** Pod segment: long, cylindrical.

Seed: ovate.

**Normal size:**

Segment: 4.0-6.0 mm L x 3.0-4.0 mm W

Seed: 2.0-4.0 mm L x 1.7-2.3 mm W

**Color:** Pod segment: Light straw colour to tan.

Seed: Brown to reddish brown.

**Texture:** Pod segment: Longitudinal ridges or ribs, woody appearance.

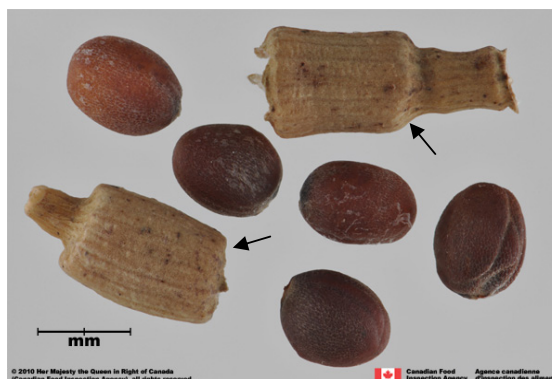
Seed: Fine reticulations with shallow interspaces.

**Distinguishing features:** Pods are long and constricted between seeds, splitting readily into one-seeded segments. Seed can be slightly flattened. Scar is darker than the rest of the seed often with white tissue present. Scar can have a slightly pinched appearance. Fine reticulations cover the entire seed surface. Prominent embryo indentation.

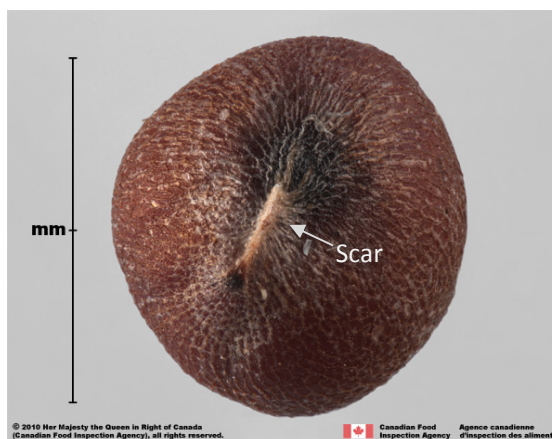
**Embryo:** Folded embryo with minimal endosperm present.

Authored by Susan Putz

Canadian Food Inspection Agency, Canada



*Raphanus raphanistrum* seeds and pod segments (arrows)



*Raphanus raphanistrum* seed

Images by Jo Jones

*Raphanus sativus* L. (*Brassicaceae*)

**General shape:** Ovate.

**Normal size:**

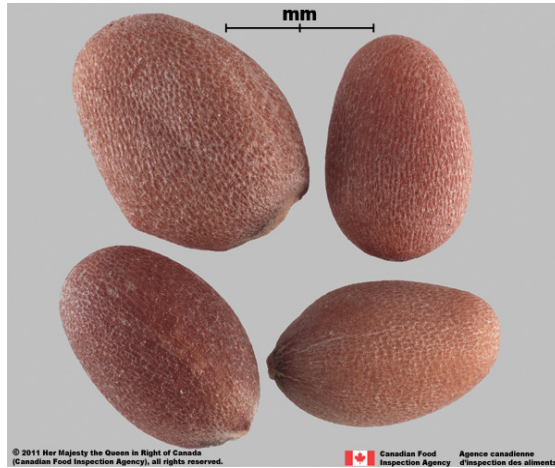
3.0-4.5 mm L x 2.5-3.0 mm W x 2.5-3.5 mm D

**Color:** Light brown to reddish brown.

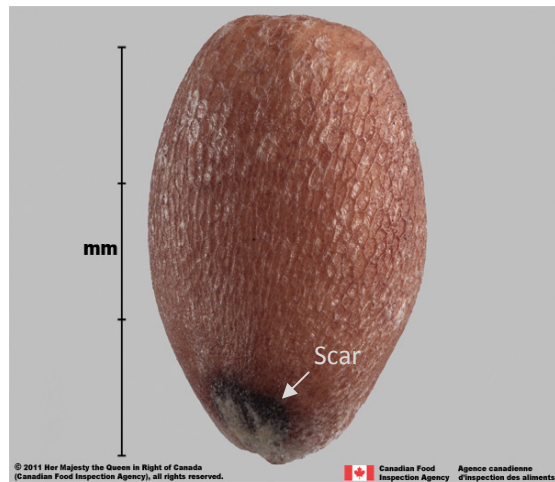
**Texture:** Fine reticulations with shallow interspaces.

**Distinguishing features:** Slightly flattened. Often a silvery glaze over seed surface. Scar area darker and has a pinched appearance. Pods are not ribbed and readily break open during processing.

**Embryo:** Folded embryo with minimal endosperm present.



*Raphanus sativus* seeds



*Raphanus sativus* seed

Authored by Susan Putz  
Canadian Food Inspection Agency, Canada

Images by Jo Jones

*Rapistrum rugosum* (L.) All. (*Brassicaceae*)

**General shape:**

Pod: Globose.

Seed: Obovate.

**Normal size:**

Pod: 3.0-4.0 mm L x 2.5-2.7 mm W

Seed: 1.7-2.0 mm L x 0.8-1.1 mm W

**Color:** Pod: Light yellow to straw colour.

Seed: Light brown to reddish brown.

**Texture:** Pod: Strong cross-wrinkled longitudinal ribs.

Seed: Fine stippling with no definite reticulations.

**Distinguishing features:** Pod is one-seeded.

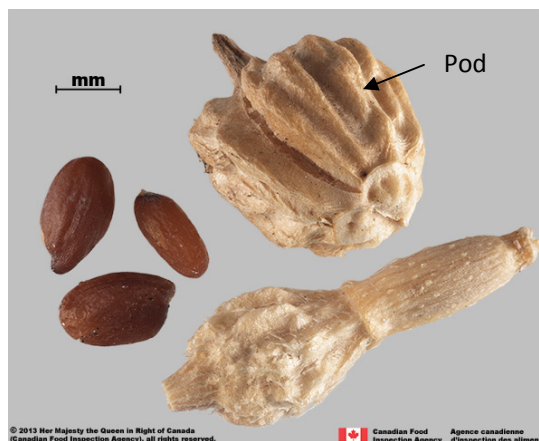
Whitish tissue remnant at the seed scar.

Radicle lobe extends beyond the cotyledon lobes.

**Embryo:** Folded embryo with minimal endosperm present.

Authored by Susan Putz

Canadian Food Inspection Agency, Canada



*Rapistrum rugosum* seeds and pod segments



*Rapistrum rugosum* seeds (arrows indicate radicle lobes)

Images by Jo Jones

*Sinapis alba* L. (*Brassicaceae*)

**General shape:** Spherical to flat-sided oval.

**Normal size:**

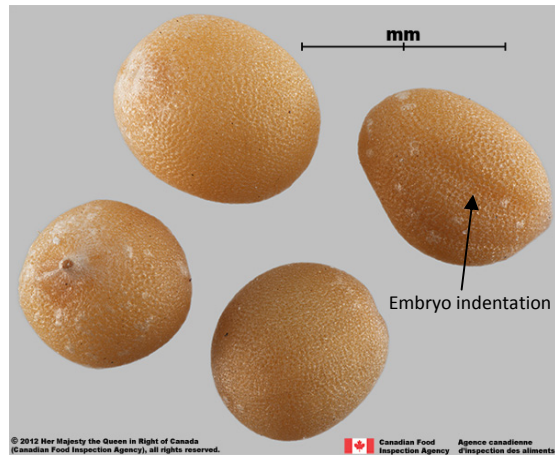
2.0-3.0 mm L x 2.0-2.5 mm W

**Color:** Yellow, creamy or pale straw colour.

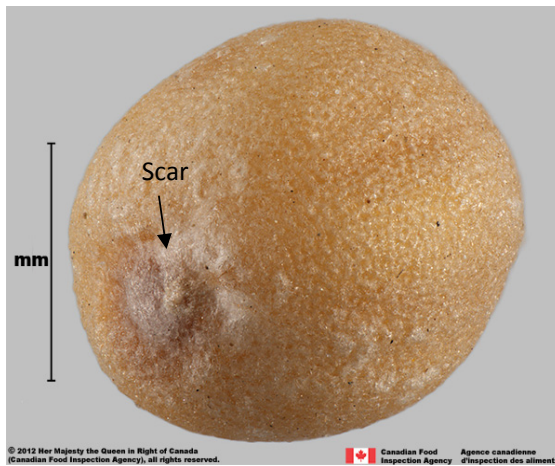
**Texture:** Fine reticulum with very small interspaces obscured by a waxy layer. Stipples not evident.

**Distinguishing features:** Scar area a small whitish hilum with a small, deep yellow or tan circle. Often a prominent embryo indentation in the seed coat. When moistened exudes a sticky mucilage.

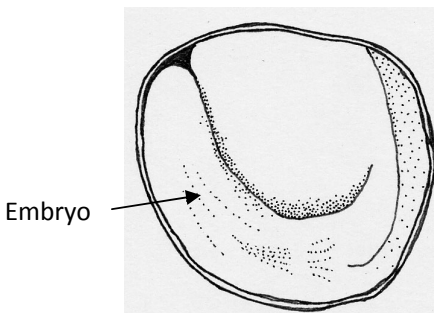
**Embryo:** Folded embryo with minimal endosperm present.



*Sinapis alba* seeds



*Sinapis alba* seed



Cross-section of *Sinapis alba* seed

Authored by Susan Putz  
Canadian Food Inspection Agency, Canada

Images by Jo Jones; drawing by Ken Allison

*Sinapis arvensis* L. (*Brassicaceae*)

**General shape:** Spherical.

**Normal size:**

1.5-2.0 mm, round

**Color:** Black, reddish black to tan.

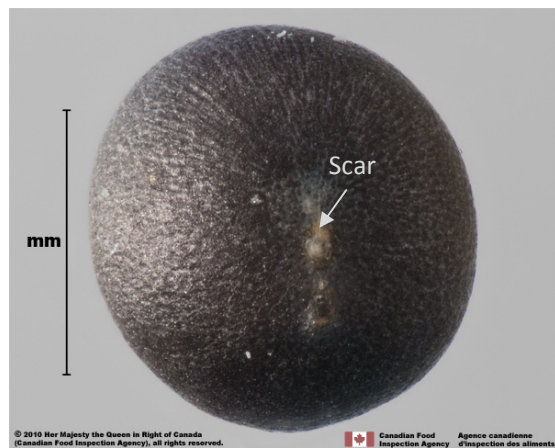
**Texture:** Reticulum fine, indistinct, interspaces very small. Smooth and velvety appearing like orange peel. Sometimes obscured by a waxy layer.

**Distinguishing features:** Scar very neat and small with a sunburst affect from the hilum. A short raised line indicates the position of the chalaza. When moistened exudes a sticky mucilage. If rubbed the surface becomes quite shiny. Usually no embryo indentation in the seed coat.

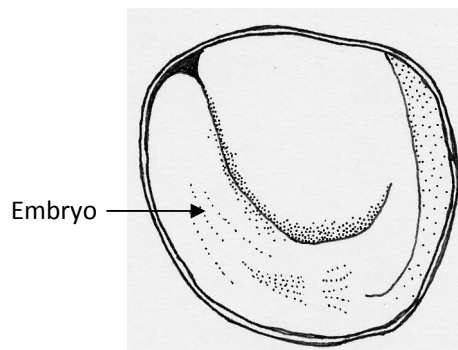
**Embryo:** Folded embryo with minimal endosperm present.



*Sinapis arvensis* seeds



*Sinapis arvensis* seed



Cross-section of *Sinapis arvensis* seed

*Sisymbrium officinale* (L.) Scop. (*Brassicaceae*)

**General shape:** Oblong to ovate.

**Normal size:**

1.3 – 1.5 mm L x 0.7 mm W x 0.3-0.5 mm D

**Color:** Reddish brown to dark greenish brown.

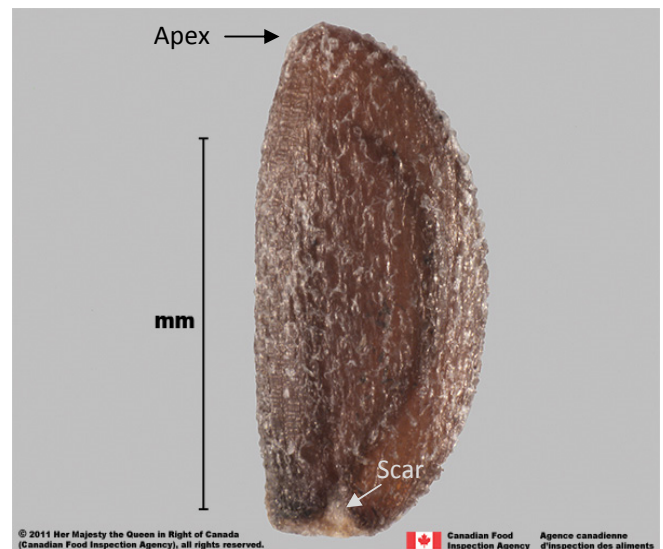
**Texture:** Reticulations small and irregular.

**Distinguishing features:** Fine groove between radicle and cotyledon lobes. Seed flattened on one side. In side view ventral side humped. Apex usually rounded. Scar area often has a whitish seed stalk remnant.

**Embryo:** Folded embryo with minimal endosperm present.



*Sisymbrium officinale* seeds



*Sisymbrium officinale* seed

Authored by Susan Putz  
Canadian Food Inspection Agency, Canada

Images by Jo Jones

*Sonchus asper* (L.) Hill (Asteraceae)

**General shape:** Obovate, compressed with one edge often more curved.

**Normal size:**  
2.5-3.0 mm L x 1.0-1.5 mm W x 0.4-0.5 mm D

**Color:** Yellowish-brown to light reddish-brown.

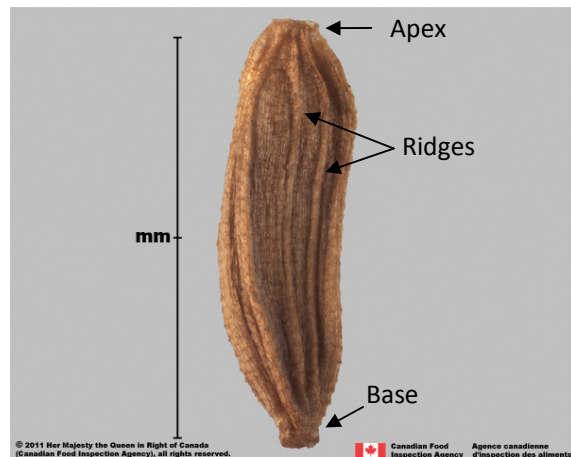
**Texture:** Wide marginal ridges and three longitudinal ridges with very slightly roughened interspaces.

**Distinguishing features:** Flat areas between ridges. Ridges are not transversely rugulose. Seed wider towards the apex.

**Embryo:** Embryo with well-developed cotyledons and a broad stalk having a truncate top, no endosperm.



*Sonchus asper* achenes



*Sonchus asper* achene

Authored by Susan Putz  
Canadian Food Inspection Agency, Canada

Images by Jo Jones



*Sporobolus* spp. (Poaceae)

**SPIKELET**

Typically single floret spikelet, up to 3 florets per spikelet, disarticulation above the glumes (glumes remain attached to plant). Size, shape, color, texture, and distinguishing features of all parts of the spikelet differ depending on species. The descriptions included here the extremes of the genus.

**FLORET**

**General shape:** elliptic to lanceolate; round in cross-section or laterally compressed

**Normal size:** lemma 0.7 – 6.5 (10) mm long; palea 0.7 – 6.7 (10) mm long; palea +/- equal to or longer than lemma

**Color:** straw-colored to green and/or purple tinged  
**Texture:** lemma and palea +/- membranous, +/- translucent, glabrous or with short stiff hairs depending on species

**Distinguishing features:** palea 2- veined and often splitting open between veins at maturity; callus blunt

**FRUIT**

Not technically a caryopsis because the seed coat is not fused to the pericarp.

**General shape:** globose, ellipsoid, obovoid, fusiform or quadangular

**Normal size:** 0.4 – 2.3 mm long x 0.5 – 1.0 mm wide

**Color :** white, yellow, orange-brown, red-brown, black

**Texture:** pericarp thin and transparent to hard and opaque, smooth or striate, +/- loose fitting, fruit of some species become mucilaginous if wet and the seed may slip out of the pericarp under these conditions

**SEED**

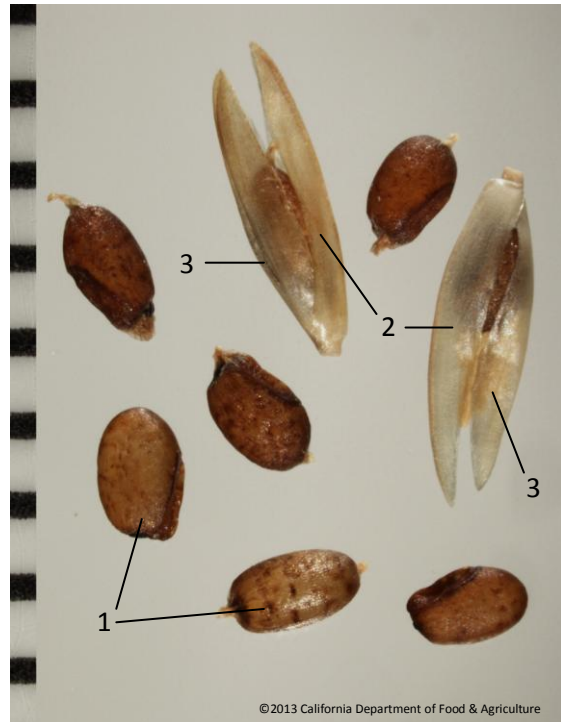
**General shape, size and color:** same as fruit

**Embryo:** scutellum and/or root-shoot axis same color as pericarp or dark brown to black; 1/2 - 3/4 the length of the seed

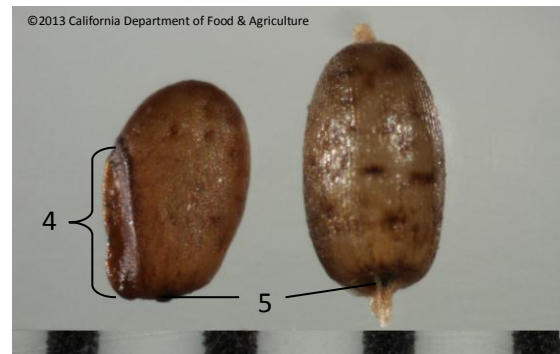
**Endosperm:** solid, +/- transparent

**Hilum:** basal

Description by Deborah Meyer  
 California Department of Food & Agriculture



*Sporogolus compositus* fruits (1) and florets showing lemmas (2) and paleas (3).



*Sporogolus compositus* fruits in lateral view (left) showing embryo (4) and ventral view showing hilum area (5).

Images by Jim Effenberger

*Tagetes minuta* L. (Asteraceae)

**General shape:** Linear.

**Normal size:** 8.0-9.0 mm L x 0.4-0.7 mm W x 0.4-0.7 mm D

**Color:** Dark grey to black.

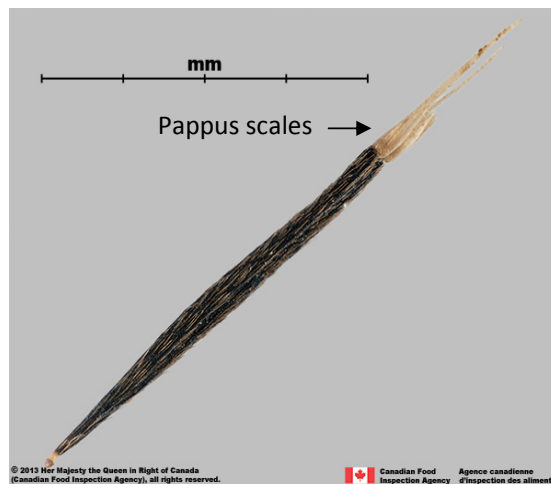
**Texture:** Covered with appressed short, light yellow coloured hairs and angular longitudinal ridges.

**Distinguishing features:** Achenes are very long and thin. Remnants of pappus scales often present. The basal scar is pointed, light yellow, angled and has a thick collar.

**Embryo:** Embryo with well-developed cotyledons and a broad stalk having a truncate top, no endosperm.



*Tagetes minuta* achenes with pappus scales



*Tagetes minuta* achene with pappus scales

Authored by Susan Putz  
Canadian Food Inspection Agency, Canada

Images by Jo Jones

*Thlaspi arvense* L. (*Brassicaceae*)

**General shape:** Oval to ovate.

**Normal size:**

1.6-2.0 mm L x 1.1-1.4 mm W

**Color:** Dark reddish-brown to shiny purple-black.

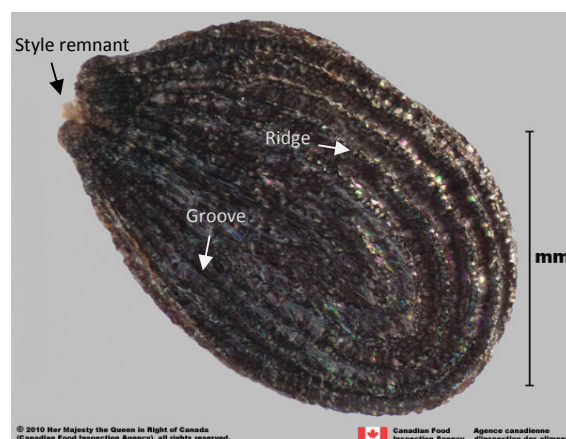
**Texture:** Roughened ridges which are transversely grooved.

**Distinguishing features:** Surface has concentric ridges similar to a human fingerprint. Each face has a groove which runs from the hilum to the middle of the seed. Slightly elongated, blunt base which often has a white, seed stalk remnant at the scar.

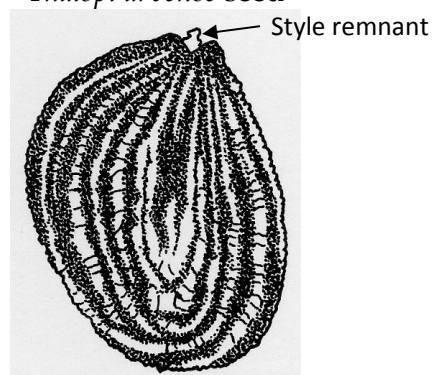
**Embryo:** Folded embryo with minimal endosperm present.



*Thlaspi arvense* seed



*Thlaspi arvense* seed



Drawing of *Thlaspi arvense* seed

*Tripleurospermum inodorum* (L.) Sch. Bip. (*Asteraceae*).

**General shape:** Oblong.

**Normal size:**

1.5-2.0 mm L x 0.5-1.0 mm W x 0.5-1.0 mm D

**Color:** Brown with pale yellow ribs.

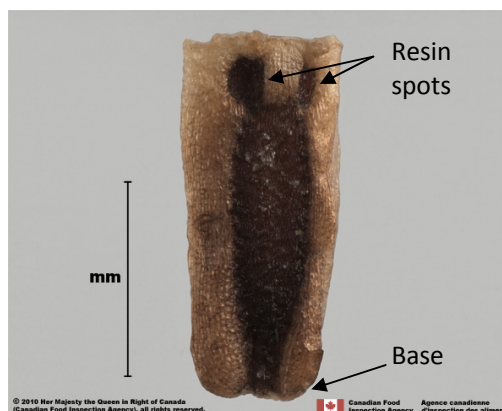
**Texture:** Strong longitudinal raised ribs with wrinkled interspaces.

**Distinguishing features:** Central rib on one side only and two small dark eye-like resin spots visible on the other flatter side at the apex. Strong marginal ribs. Base slightly rounded and apex quite blunt.

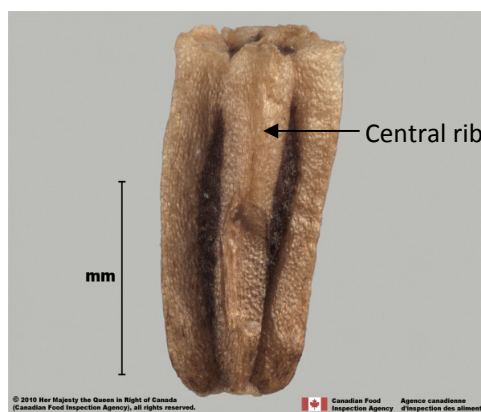
**Embryo:** Embryo with well-developed cotyledons and a broad stalk having a truncate top, no endosperm.



*Tripleurospermum inodorum* achenes



Flatter side view of *Tripleurospermum inodorum* achene



Ribbed side view of *Tripleurospermum perforatum* achene

*Vulpia bromoides* ( L.) Gray (*Poaceae*)

**SPIKELET**

Multiple floret spikelet with 4 – 8 similar looking florets with distal floret usually sterile and slightly smaller in size; disarticulation generally above the glumes and between the florets

**FLORET**

**General shape:** narrowly lanceolate, dorsal-ventrally compressed, +/- arched backward

**Normal size:** 4.0 – 8.0 mm long x 0.5 – 0.8 mm wide

**Color:** pale straw colored to light brown

**Texture:** lemma thin and papery with short stiff hairs near margins and apex; palea membranous and +/- translucent

**Distinguishing features:** lemma 5-veined, tapered into terminal awn; awn 2.0 – 13.0 mm long; callus pointed and glabrous; palea equal to or slightly shorter than lemma, 2-veined; rachilla thin cylindrical, 0.6 – 1.1 mm long

**CARYOPSIS**

**General shape:** narrowly linear to spindle-shaped, dorsal-ventrally compressed, with deep longitudinal depression, +/- arched backward

**Normal size :** 3.5 – 5.0 mm long x 0.5 – 0.8 mm wide

**Color :** brown

**Texture:** smooth and glabrous, the lemma and palea +/- adherent

**Embryo:** 1/8 the length of the caryopsis

**Endosperm:** solid

**Hilum:** linear, 2/3 - 3/4 as long as caryopsis, located in a longitudinal depression

Description by Deborah Meyer  
California Department of Food & Agriculture



*Vulpia bromoides* florets in ventral view (left) showing the rachilla (1), palea (2) and dorsal view showing the callus (3), lemma (4) and awn (5).



Caryopses: dorsal view (top) showing the embryo (6) and ventral view (bottom) showing the linear hilum in a longitudinal depression (7).

Images by Deborah Meyer & Jim Effenberger

*Vulpia myuros* ( L.) C. C. Gmel. (*Poaceae*)

**SPIKELET**

Multiple floret spikelet with 3 – 7 similar looking florets with distal floret usually sterile and slightly smaller in size; disarticulation generally above the glumes and between the florets

**FLORET**

**General shape:** narrowly lanceolate

**Normal size:** 4.5 – 7.5 mm long x 0.4 – 0.6 (0.8) mm wide

**Color:** pale straw colored, +/- with purple tinge

**Texture:** lemma thin and papery with short stiff hairs and +/- with long hairs along margins on upper half; palea membranous, +/- translucent with short stiff hairs

**Distinguishing features:** lemma 5-veined, tapered into terminal awn; awn 5.0 – 22.0 mm long; callus pointed and glabrous; palea +/- equal in length to lemma, 2-veined; rachilla thin cylindrical, generally 0.75 – 1.0 mm long, covered with very short stiff hairs

**CARYOPSIS**

**General shape:** narrowly linear or spindle-shaped, dorsal-ventrally compressed, with deep longitudinal depression on ventral side

**Normal size :** 3.0 – 5.0 mm long x 0.4 – 0.6 (0.8) mm wide

**Color :** brown

**Texture:** smooth and glabrous, the lemma and palea +/- adherent

**Embryo:** 1/8 the length of the caryopsis

**Endosperm:** solid

**Hilum:** linear, 2/3 – 3/4 as long as caryopsis, located in a longitudinal depression

Description by Deborah Meyer  
California Department of Food & Agriculture



*Vulpia myuros* florets in ventral view (left and center) showing the rachilla (1), palea (2), long hairs (3) along upper lemma margins and dorsal view showing the callus (4), lemma (5) and awn (6).



Caryopses: dorsal view (top) showing the embryo (7) and ventral view (bottom) showing the linear hilum in a longitudinal depression (8).

Images by Deborah Meyer and Jim Effenberger