

- (1) Germination habit: Epigeal dicot.
- (2) Food reserves: Cotyledons which expand and become thin, leaf-like and photosynthetic. In *Brassica*, *Sinapis*, and *Raphanus*, the cotyledons are bilobed and folded, with the outer cotyledon being larger than the inner.
- (3) Shoot system: The hypocotyl elongates and carries the cotyledons above the soil surface; the epicotyl usually does not show any development within the test period.
- (4) Root system: A long primary root.
- (b) Abnormal seedling description.
  - (1) Cotyledons:
    - (i) Decayed at point of attachment.
    - (ii) Less than half of the original cotyledon tissue remaining attached.
    - (iii) Less than half of the original cotyledon tissue free of necrosis or decay.
  - (2) Epicotyl:
    - (i) Missing. (May be assumed to be present if the cotyledons are intact.)
    - (ii) [Reserved]
  - (3) Hypocotyl:
    - (i) Deep open cracks extending into the conducting tissue.
    - (ii) Malformed, such as markedly shortened, curled, or thickened.
    - (iii) Watery.
  - (4) Root:
    - (i) Weak, stubby, or missing primary root. (Secondary roots will not compensate for a defective root.)
  - (5) Seedling:
    - (i) One or more essential structures impaired as result of decay from primary infection.
    - (ii) Albino.

[59 FR 64501, Dec. 14, 1994]

**§ 201.56-4 Cucurbit family, (Cucurbitaceae).**

- Kinds of seed: Citron, cucumber, West India gherkin, melon, pumpkin, squash, and watermelon.
- (a) General description.
    - (1) Germination habit: Epigeal dicot.
    - (2) Food reserves: Cotyledons which are large and fleshy; they expand, become photosynthetic, and usually persist beyond the seedling stage.
    - (3) Shoot system: The hypocotyl elongates and the cotyledons are pulled free of the seed coat, which often adheres to a peg-like appendage at the base of the hypocotyl. The epicotyl

- usually does not show any development within the test period.
- (4) Root system: A long primary root with numerous secondary roots.
- (b) Abnormal seedling description.
  - (1) Cotyledons:
    - (i) Less than half of the original cotyledon tissue remaining attached.
    - (ii) Less than half of the original cotyledon tissue free of necrosis or decay. (Remove any attached seed coats at the end of the test period for evaluation of cotyledons.)
  - (2) Epicotyl:
    - (i) Missing. (May be assumed to be present if the cotyledons are intact.)
    - (ii) [Reserved]
  - (3) Hypocotyl:
    - (i) Deep open cracks extending into the conducting tissue.
    - (ii) Malformed, such as markedly shortened, curled, or thickened.
  - (4) Root:
    - (i) None.
    - (ii) Weak, stubby, or missing primary root, with less than two strong secondary or adventitious roots.
  - (5) Seedling:
    - (i) One or more essential structures impaired as a result of decay from primary infection.
    - (ii) Albino.

[59 FR 64501, Dec. 14, 1994]

**§ 201.56-5 Grass family, Poaceae (Gramineae).**

- Kinds of seed: Bentgrasses, bluegrasses, bluestems, bromes, cereals, fescues, millets, orchardgrass, redtop, ryegrasses, sorghums, timothy, turf timothy, wheatgrasses, and all other grasses listed in § 201.2(h).
- (a) Cereals: *Agrotricum*, barley, oat, rye, mountain rye, wheat, wheat×*agrotricum*, and triticale.
    - (1) General description.
      - (i) Germination habit: Hypogean monocot.
      - (ii) Food reserves: Endosperm. The scutellum is a modified cotyledon which is in direct contact with the endosperm. During germination the scutellum remains inside the seed to absorb nutrients from the endosperm and transfer them to the growing seedling.
      - (iii) Shoot system: The shoot consists of the coleoptile, leaves enclosed in the coleoptile, and the mesocotyl. The

coleoptile elongates and pushes through the soil surface; the mesocotyl may elongate depending on the variety and light intensity, but may not be discernible. Splitting of the coleoptile occurs naturally as a result of growth and emergence of the leaves.

(iv) Root system: A primary root and seminal roots. The primary root is not readily distinguishable from the seminal roots; therefore, all roots arising from the seed are referred to as seminal roots.

(2) Abnormal seedling description.

(i) Shoot:

(A) Missing.

(B) No leaf.

(C) Leaf extending less than halfway up into the coleoptile.

(D) Leaf extensively shredded or split.

(E) Spindly or watery.

(F) Grainy, spirally twisted, shredded, and weak.

(G) Deep open cracks in the mesocotyl.

(ii) Root:

(A) Less than one strong seminal root.

(B) [Reserved]

(iii) Seedling:

(A) Decayed at point of attachment to the scutellum.

(B) One or more essential structures impaired as a result of decay from primary infection.

(C) Albino.

(D) Endosperm obviously detached from the root-shoot axis (e.g. kernel lifted away by the growing shoot).

(E) Thickened and shortened roots and/or shoots.

(b) Rice.

(1) General description.

(i) Germination habit: Hypogeal monocot.

(ii) Food reserves: Endosperm. The scutellum is a modified cotyledon which is in direct contact with the endosperm. During germination the scutellum remains inside the seed to absorb nutrients from the endosperm and transfer them to the growing seedling.

(iii) Shoot system: The shoot consists of the coleoptile, leaves enclosed in the coleoptile, and the mesocotyl. The coleoptile elongates and pushes through the soil or water surface; the

mesocotyl may elongate depending on the variety and environmental conditions. Splitting of the coleoptile occurs naturally as a result of growth and emergence of the leaves.

(iv) Root system: Strong primary root and seminal roots. Adventitious roots may start to develop from the mesocotyl or coleoptilar node within the test period. If the mesocotyl elongates, the adventitious roots will be carried above the grain.

(2) Abnormal seedling description.

(i) Shoot:

(A) Missing.

(B) No leaf.

(C) Leaf extending less than halfway up into the coleoptile.

(D) Leaf extensively shredded or split.

(E) Spindly or watery.

(F) Deep open cracks in the mesocotyl.

(ii) Root:

(A) None.

(B) Weak primary root with insufficient seminal or adventitious roots.

(iii) Seedling:

(A) Decayed at point of attachment to the scutellum.

(B) One or more essential structures impaired as a result of decay from primary infection.

(C) Albino.

(c) Corn.

(1) General description.

(i) Germination habit: Hypogeal monocot.

(ii) Food reserves: Endosperm. The scutellum is a modified cotyledon which is in direct contact with the endosperm. During germination the scutellum remains inside the seed to absorb nutrients from the endosperm and transfer them to the growing seedling.

(iii) Shoot system: The shoot consists of the coleoptile, leaves enclosed in the coleoptile, and the mesocotyl. The coleoptile elongates and pushes through the soil surface. The mesocotyl usually elongates. Splitting of the coleoptile occurs naturally as a result of growth and emergence of the leaves. A twisted and curled shoot bound by a tough seed coat may be considered normal, provided the shoot is not decayed.

(iv) Root system: Strong primary root and seminal roots. Adventitious roots may start to develop from the mesocotyl or coleoptilar node within the test period.

(2) Abnormal seedling description.

(i) Shoot:

(A) Missing.

(B) Thickened and shortened.

(C) No leaf.

(D) Leaf extending less than halfway up into the coleoptile.

(E) Leaf extensively shredded or split.

(F) Spindly or watery.

(G) Deep open cracks in the mesocotyl.

(ii) Root:

(A) None.

(B) Weak, stubby, or missing primary root with weak seminal roots.

(iii) Seedling:

(A) Decayed at point of attachment to the scutellum.

(B) One or more essential structures impaired as a result of decay from primary infection.

(C) Albino.

(d) Johnsongrass, sorghum, sorgrass, sorghum alnum, sudangrass, and sorghum-sudangrass.

(1) General description.

(i) Germination habit: Hypogeal monocot.

(ii) Food reserves: Endosperm. The scutellum is a modified cotyledon which is in direct contact with endosperm. During germination the scutellum remains inside the seed to absorb nutrients from the endosperm and transfer them to the growing seedling.

(iii) Shoot system: The shoot consists of the coleoptile, leaves enclosed in the coleoptile, and the mesocotyl. The coleoptile elongates and pushes through the soil surface; the mesocotyl usually elongates. Areas of natural, reddish pigmentation may develop on the mesocotyl and coleoptile. Splitting of the coleoptile occurs naturally as a result of growth and emergence of the leaves.

(iv) Root system: A long primary root, usually with secondary roots developing within the test period. Adventitious roots may start to develop from the mesocotyl or coleoptilar node within the test period. Areas of natural,

reddish pigmentation may develop on the root.

(2) Abnormal seedling description.

(i) Shoot:

(A) Missing.

(B) Thickened and shortened.

(C) No leaf.

(D) Leaf extending less than halfway up into the coleoptile.

(E) Leaf extensively shredded or split.

(F) Spindly or watery.

(G) Deep open cracks in the mesocotyl.

(ii) Root:

(A) None.

(B) Damaged or weak primary root with less than two strong secondary roots.

(iii) Seedling:

(A) Decayed at point of attachment to the scutellum.

(B) One or more essential structures impaired as a result of decay from primary infection.

(C) Albino.

(e) Grasses and millets.

(1) General description.

(i) Germination habit: Hypogeal monocot.

(ii) Food reserves: Endosperm. The scutellum is a modified cotyledon which is in direct contact with the endosperm. During germination the scutellum remains inside the seed to absorb nutrients from the endosperm and transfer them to the growing seedling.

(iii) Shoot system: The shoot consists of the coleoptile, leaves enclosed in the coleoptile, and the mesocotyl. The coleoptile elongates and pushes through the soil surface. The mesocotyl may or may not elongate significantly, depending on the kind. Splitting of the coleoptile occurs naturally as a result of growth and emergence of the leaves.

(iv) Root system: A long primary root. Secondary or adventitious roots may develop within the test period. In certain kinds (e.g. bermudagrass) the primary root may not be readily visible because it is coiled inside the tightly fitting lemma and palea. At the time of evaluation, the glumes should be removed and the root observed. Such seedlings are classified as normal if the

primary root has developed. For Kentucky bluegrass, a primary root  $\frac{1}{16}$  inch (1.6 mm) or more in length is classified as normal.

(2) Abnormal seedling description.

(i) Shoot:

(A) Missing.

(B) Short, thick, and grainy.

(C) No leaf.

(D) Leaf extending less than halfway up into the coleoptile.

(E) Leaf extensively shredded or split.

(F) Spindly or watery.

(G) Deep open cracks in the mesocotyl.

(ii) Root:

(A) Missing or defective primary root even if other roots are present.

(B) Spindly, stubby, or watery primary root.

(iii) Seedling:

(A) Decayed at point of attachment to the scutellum.

(B) One or more essential structures impaired as a result of decay from primary infection.

(C) Albino.

(D) Yellow (when grown in light).

(E) Endosperm obviously detached from the root-shoot axis (e.g. kernel lifted away by the growing shoot).

[59 FR 64501, Dec. 14, 1994, as amended at 65 FR 1708, Jan. 11, 2000]

**§ 201.56-6 Legume or pea family, Fabaceae (Leguminosae).**

Kinds of seed: Alfalfa, alyceclover, asparagusbean, beans (*Phaseolus* spp.), Florida beggarweed, black medic, broadbean, burclovers, buttonclover, chickpea, clovers (*Trifolium* spp.), cowpea, crotalarias, crownvetch, guar, hairy indigo, kudzu, lentil, lespedezas, lupines, northern sweetvetch, peas, peanut, roughpea, sainfoin, sesbania, sourclover, soybean, sweetclovers, trefoils, velvetbean, and vetches.

(a) Field bean, garden bean, lima bean, mung bean, asparagusbean, and cowpea.

(1) General description.

(i) Germination habit: Epigeal dicot.

(ii) Food reserves: Cotyledons which are large and fleshy.

(iii) Shoot system: The hypocotyl elongates and carries the cotyledons above the soil surface. The epicotyl elongates, causing the terminal bud to

emerge from between the cotyledons; the primary leaves expand rapidly.

(iv) Root system: A long primary root with secondary roots.

(2) Abnormal seedling description.

(i) Cotyledons:

(A) For garden bean (*Phaseolus vulgaris* in part), remove any attached seed coats at the end of the test period for evaluation of cotyledons:

(1) Less than half of the original cotyledon tissue remaining attached.

(2) Less than half of the original cotyledon tissue free of necrosis or decay.

(B) All other kinds:

(1) Both missing and the seedling generally weak.

(2) [Reserved]

(ii) Epicotyl:

(A) Missing.

(B) Deep open cracks.

(C) Malformed, such as markedly curled or thickened.

(D) Less than one primary leaf.

(E) Primary leaves too small in proportion to the rest of the seedling, usually associated with visible defects of, or damage to, the main stem of the epicotyl.

(F) Terminal bud missing or damaged. (If a few seedlings with total or partial decay to the epicotyl are found, they may be classified as normal, provided the hypocotyl and root are normal. The epicotyl on such seedlings usually does not decay when grown in a fairly dry environment and exposed to light. A retest, preferably in soil or sand, will aid in interpretation of such seedlings.)

(iii) Hypocotyl:

(A) Deep open cracks extending into the conducting tissue. (A healed break, sometimes referred to as a "knee," is considered normal.)

(B) Malformed, such as markedly shortened, curled, or thickened. (Hypocotyl stunting or curling may be caused by seedling orientation or constriction on or in the substratum.) (Hypocotyl collar rot is the breakdown of hypocotyl tissue initially characterized by a watery appearance and collapse of the hypocotyl below the cotyledonary node. The area later becomes discolored, shrivelled, and necrotic. The condition is caused by insufficient calcium available to the