

Rules Proposal No. 9

AOSA RULES CHANGE PROPOSAL

KIND OF SEED

All kinds for which seedling descriptions appear in the Seedling Evaluation Handbook.

PRESENT RULE

New.

PROPOSED RULE

Add drawings of normal and abnormal seedlings to the seedling descriptions of Chapter 4 of the Seedling Evaluation Handbook. The drawings are attached (note that the labeling is temporary, and will be improved in quality on final printing).

REASONS FOR THE RULE

The drawings are elaborations of the seedling descriptions. Their purpose is to increase uniformity in evaluation between analysts and laboratories.

SUBMITTED BY:

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DATE:

November 27, 1990

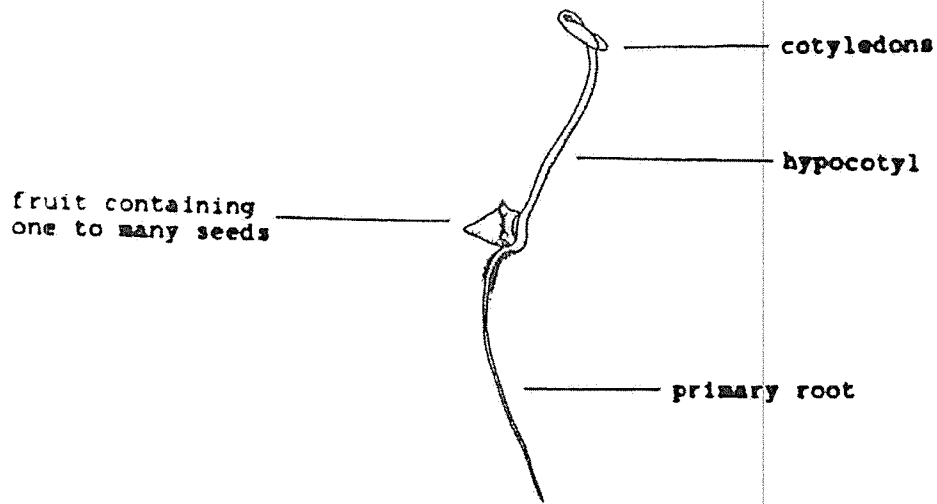
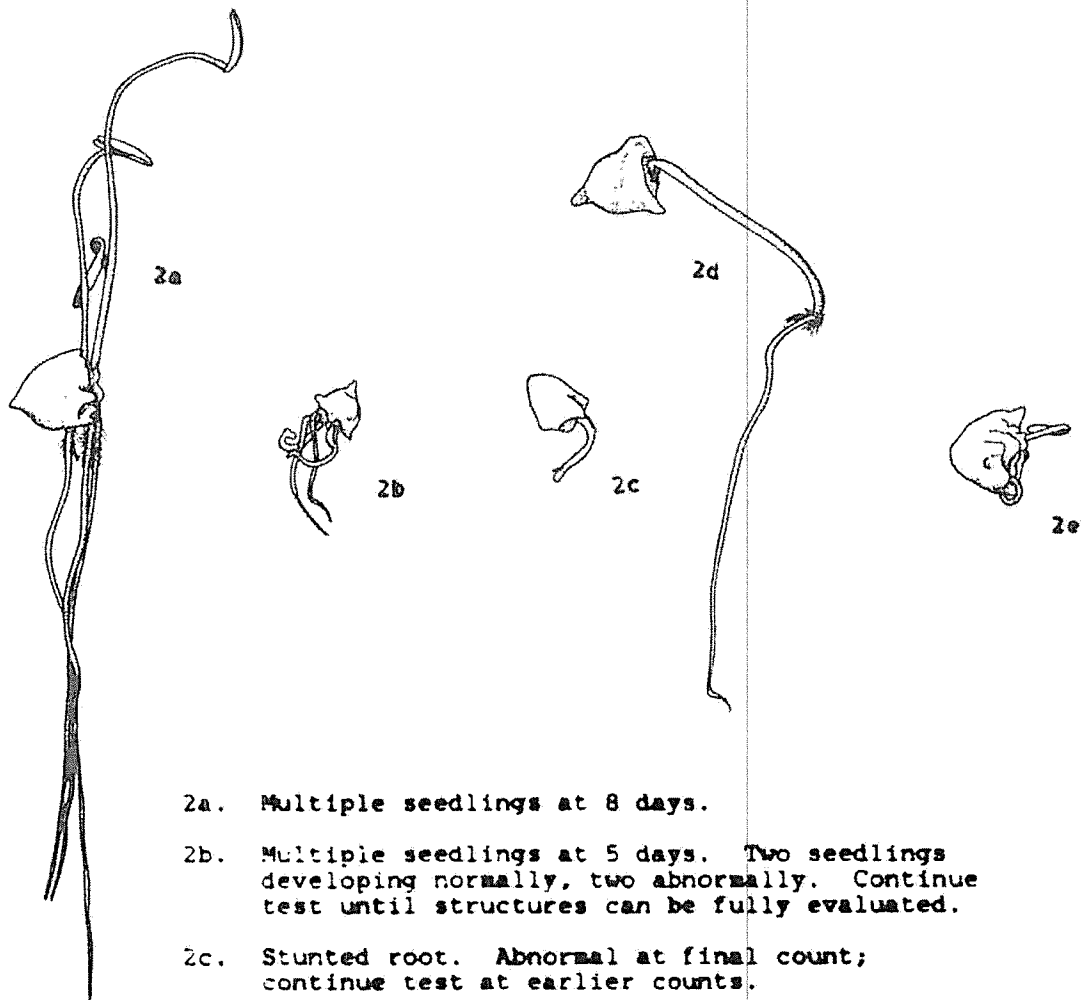


Fig. 1. New Zealand Spinach 5-day seedling.

Fig. 2. New Zealand spinach.



- 2a. Multiple seedlings at 8 days.
- 2b. Multiple seedlings at 5 days. Two seedlings developing normally, two abnormally. Continue test until structures can be fully evaluated.
- 2c. Stunted root. Abnormal at final count; continue test at earlier counts.
- 2d. Embedded cotyledons. Normal after confirming cotyledons are normal.
- 2e. Seedling just emerging. Continue or extend test until structures can be fully evaluated.

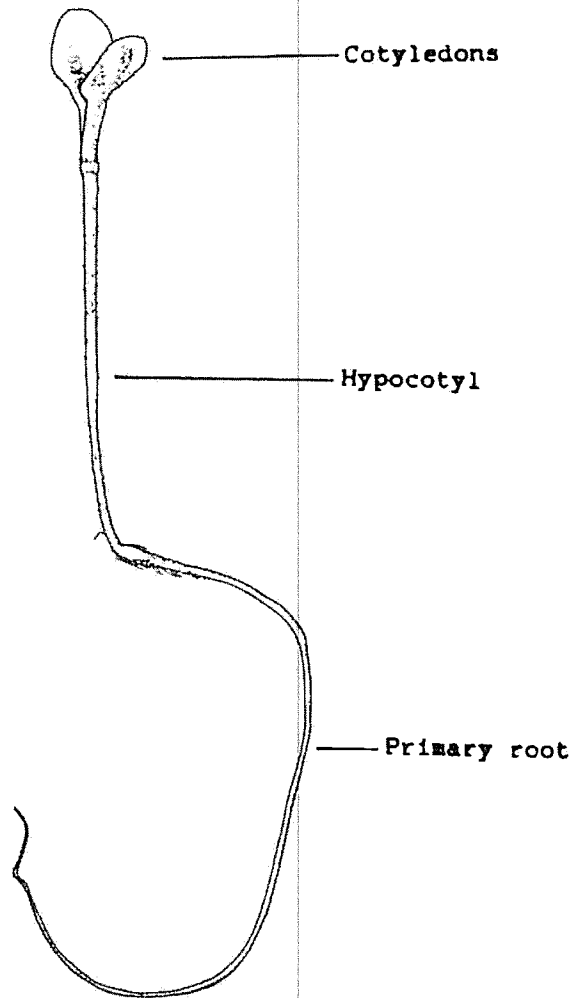


Fig. 1. 7-day lettuce seedling

- 2a. Grainy hypocotyl.
- 2b. Shortened hypocotyl.
- 2c. No hypocotyl development, stubby root.
- 2d. Physiological necrosis. See Figure 3.

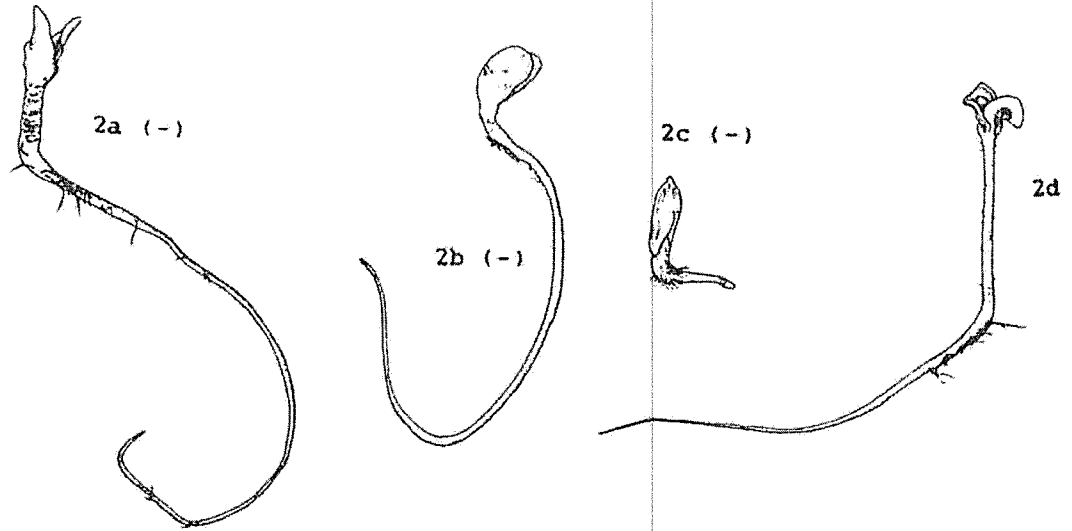
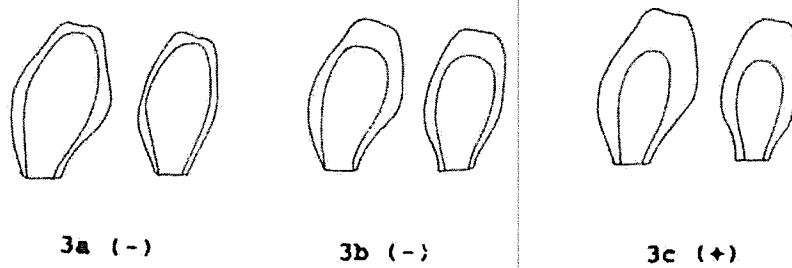


Fig. 2. Seedling defects

Fig. 3. Physiological necrosis of lettuce cotyledons.



- 3a. Cotyledons 65% necrotic.
- 3b. Cotyledons 50% necrotic.
- 3c. Cotyledons 35% necrotic.

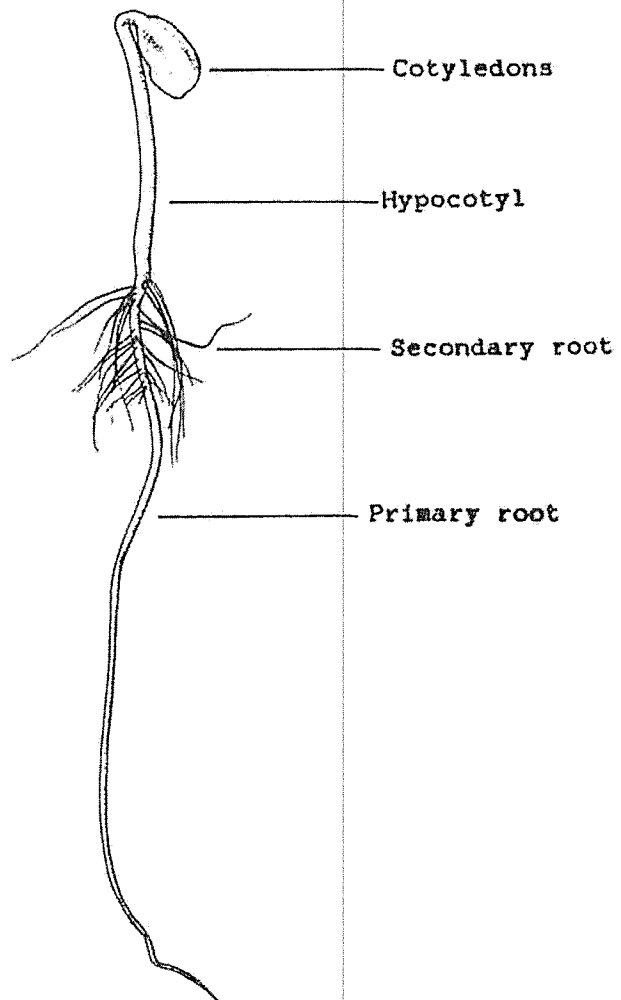


Fig. 1. Sunflower 7-day seedling.

- 2a. Normal seedling.
- 2b. Stubby primary root, sufficient secondary roots.
- 2c. Stubby primary root, insufficient secondary roots.

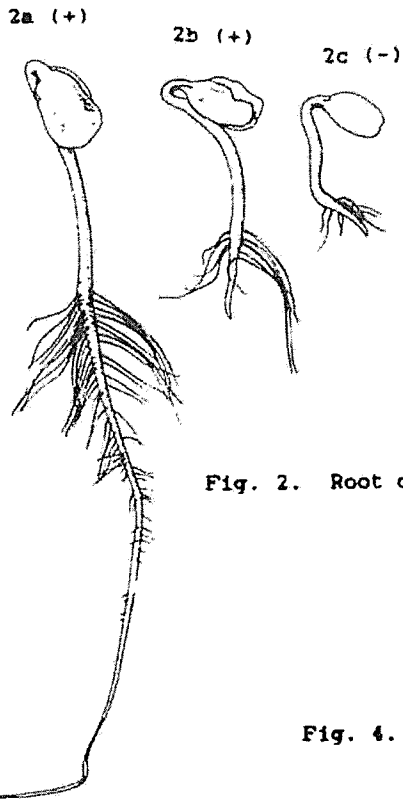
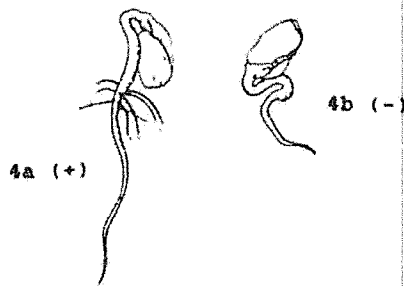


Fig. 2. Root defects.

Fig. 4. Small seedlings.



- 4a. Late-germinating seedling (at final count; see 3.5.1.b).
- 4b. Small weak seedling.

- 3a. Deep hypocoty lesion (see 3.5.9).
- 3b. Primary infection of hypocotyl.

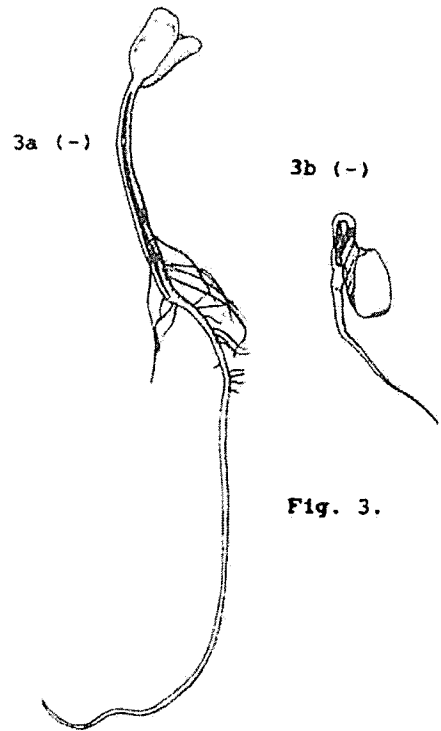


Fig. 3.

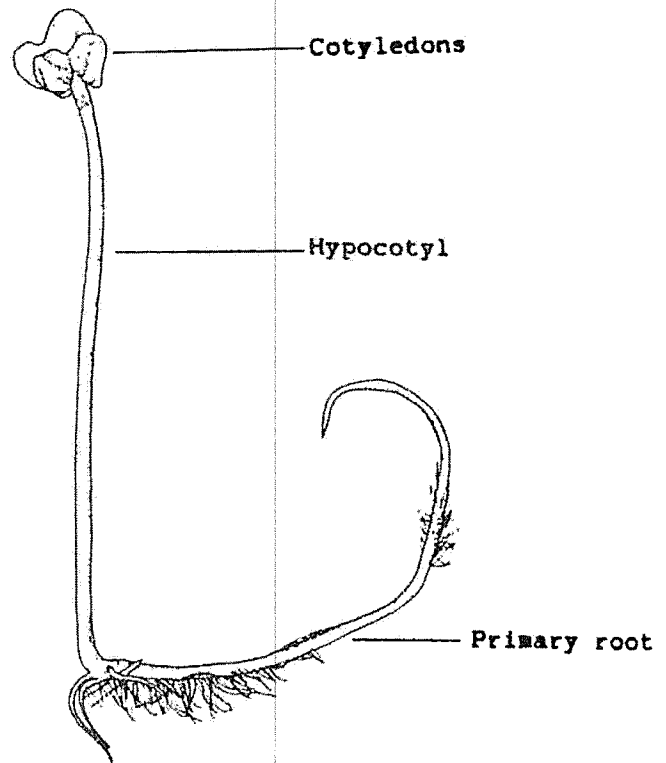
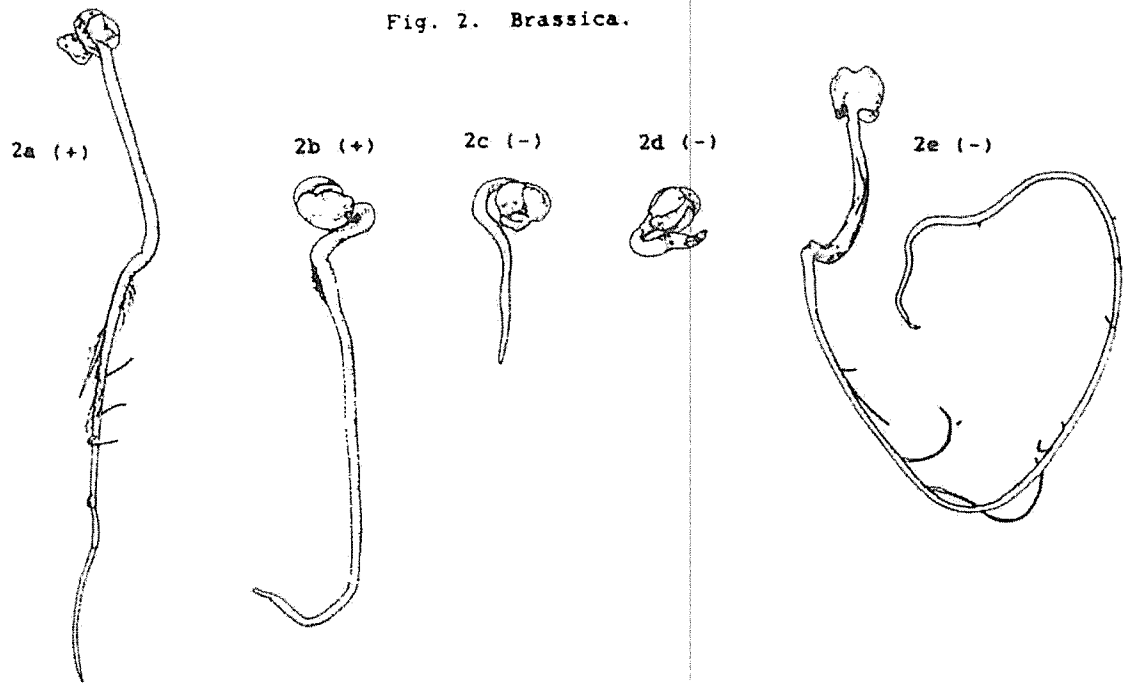


Fig. 1. Brassica 7-day seedling.

Fig. 2. Brassica.



- 2a. Necrotic spots covering less than 50% of cotyledon area.
- 2b. Hypocotyl short but developing normally.
- 2c. Small weak seedling.
- 2d. Stubby primary root, poor hypocotyl development.
- 2e. Hypocotyl lesions.

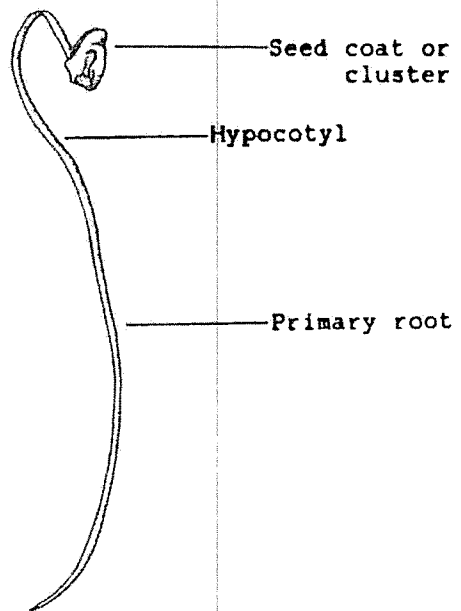
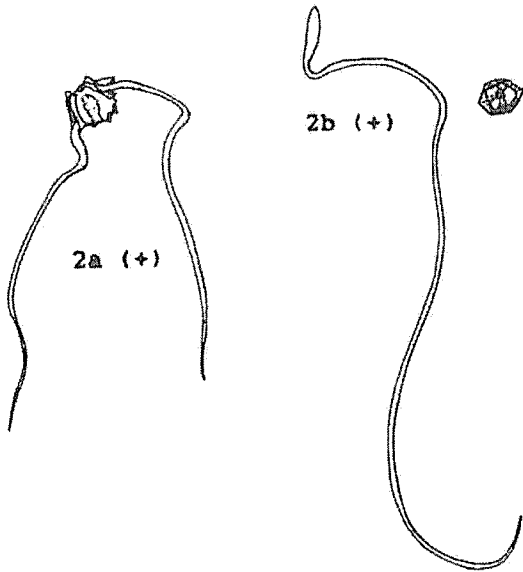


Fig. 1. Beet 7-day seedling.

Fig. 2.

- 2a. Multiple seedlings.
 2b. Seedling separated from cluster.



- 3a. Late-germinating seedling (at final count; see 3.5.1.b).
 3b. Small weak seedling.
 3c. Stubby root.
 3d. No root development.

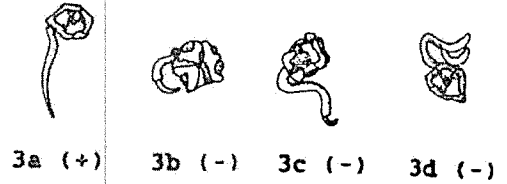


Fig. 3. Small seedlings.

Note: Cotyledons must be examined

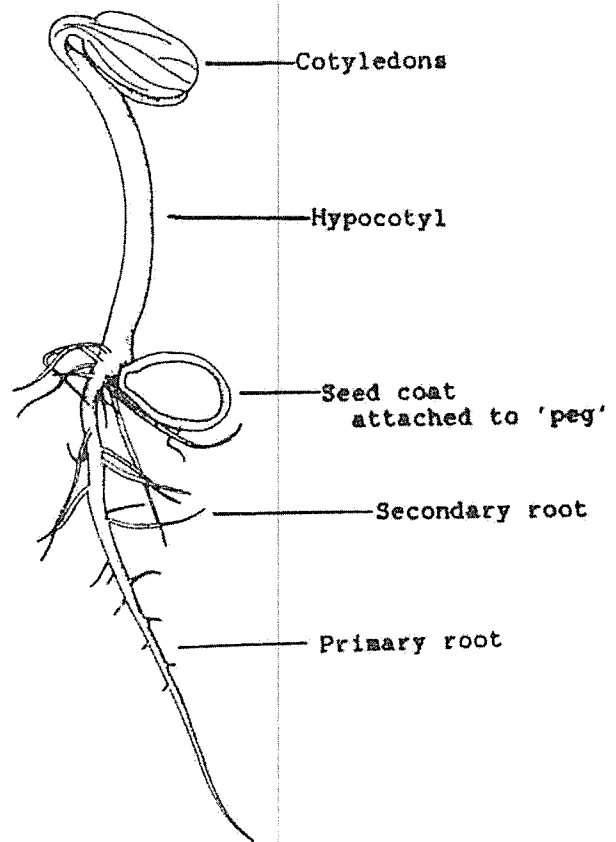
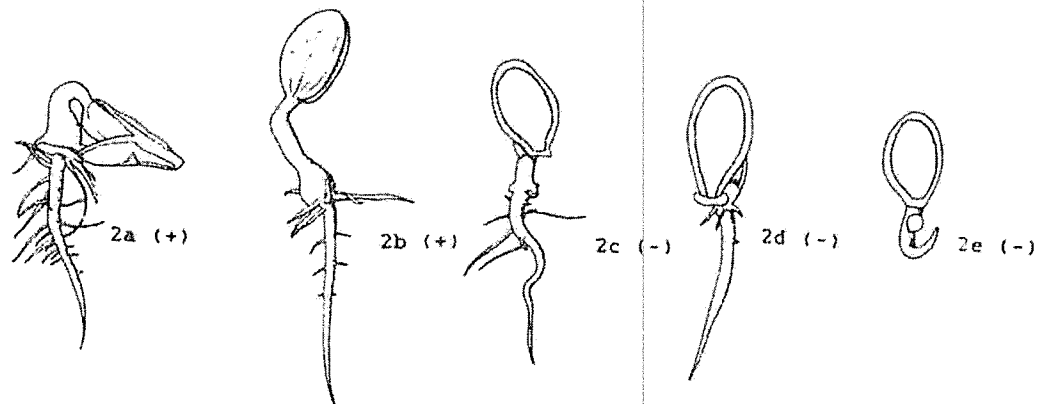


Fig. 1. 7-day Pumpkin Seedling



2a. Late-germinating seedling
(at final count; see 3.5.1b).

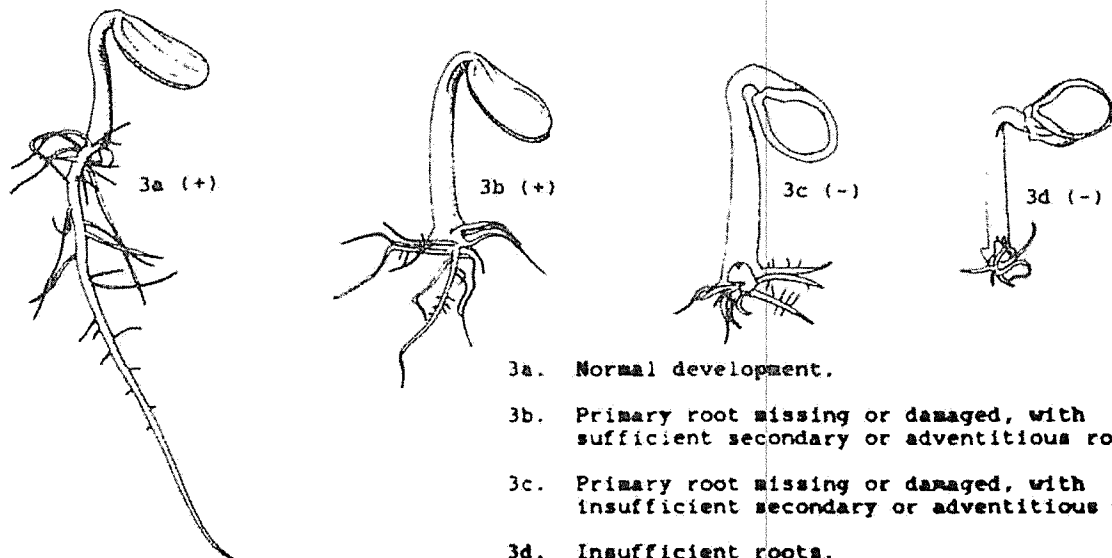
2b. Hypocotyl just long enough.

2c. Hypocotyl too short.

2d. No hypocotyl development.

2e. No-hypocotyl, stubby root.

Fig. 2. Small seedlings



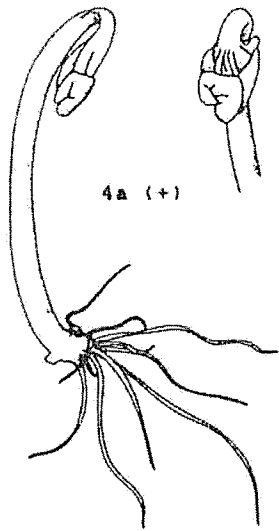
3a. Normal development.

3b. Primary root missing or damaged, with
sufficient secondary or adventitious roots.

3c. Primary root missing or damaged, with
insufficient secondary or adventitious roots.

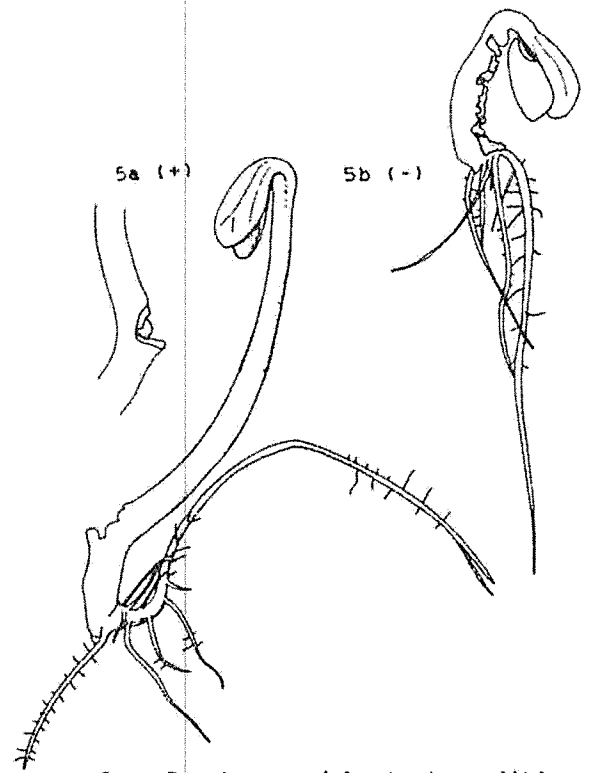
3d. Insufficient roots.

Fig. 3. Root defects.



4a. Cotyledons present but convoluted.

Fig. 4. Deformed cotyledons.



5a. Break caused by test conditions.

5b. Deep lesion.

Fig. 5. Hypocotyl lesions.

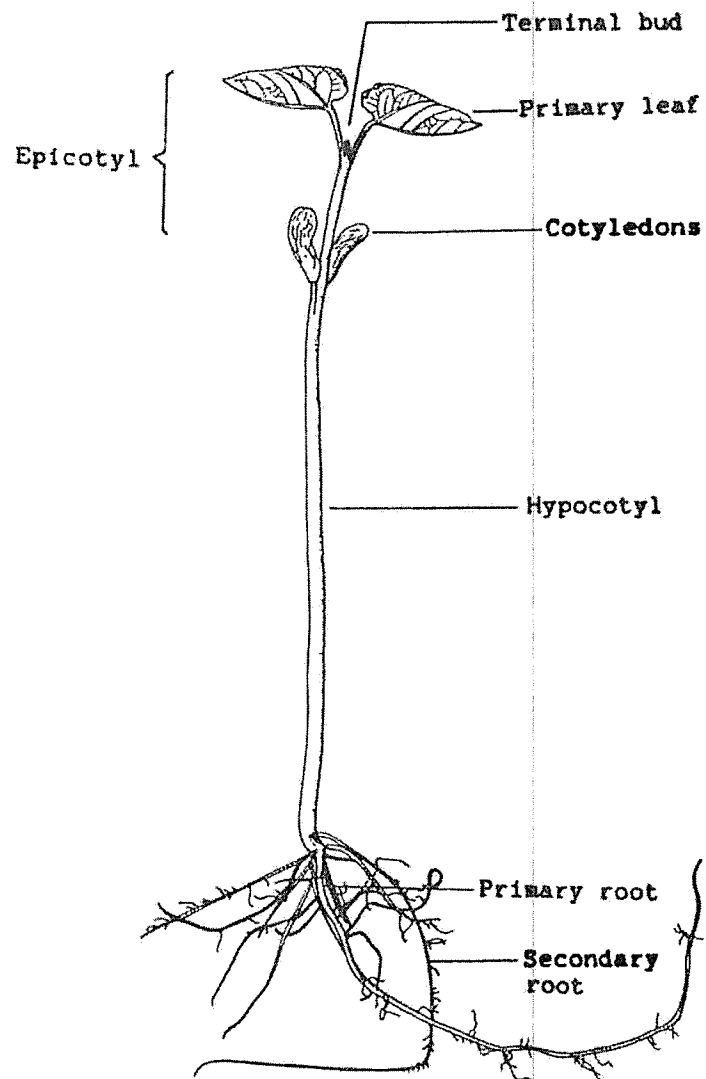
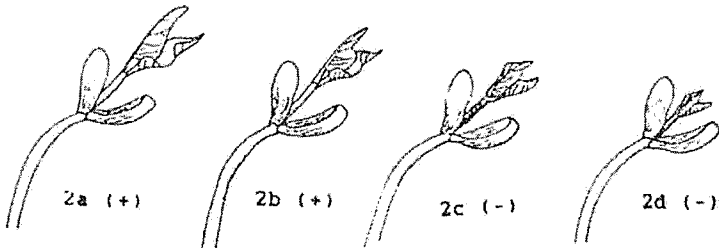


Fig. 1. Bean 7-day seedling.

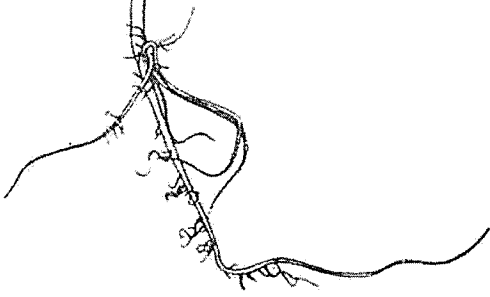


2a. } Leaf large enough.
 2b. }

2c. Leaf borderline size, with damage to the epicotyl.

2d. Leaf too small.

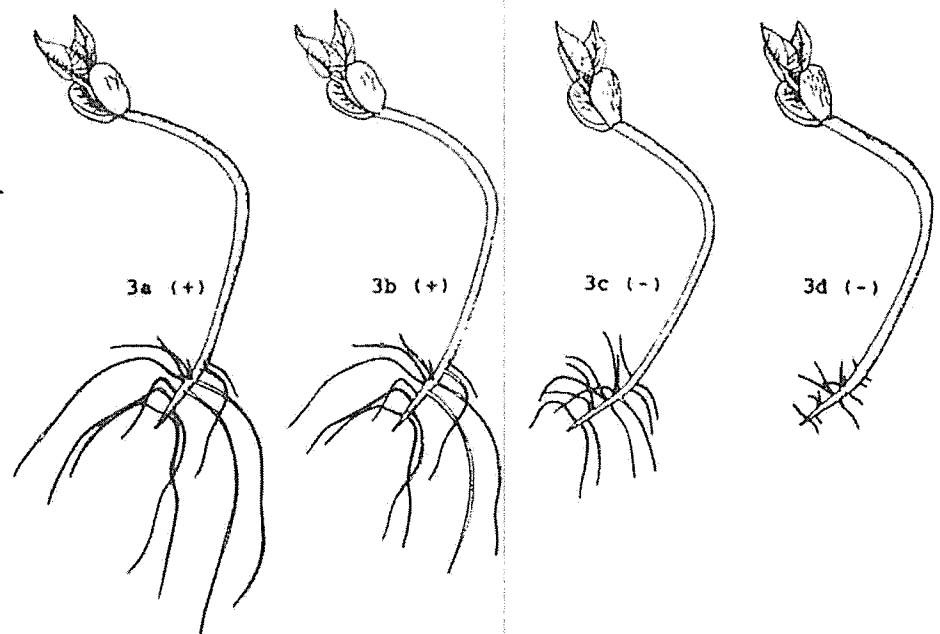
Fig. 2. Leaf size.



3a. } Stubby primary root with sufficient secondary roots.
 3b. }

3c. } Insufficient roots.
 3d. }

Fig. 3. Root defects.



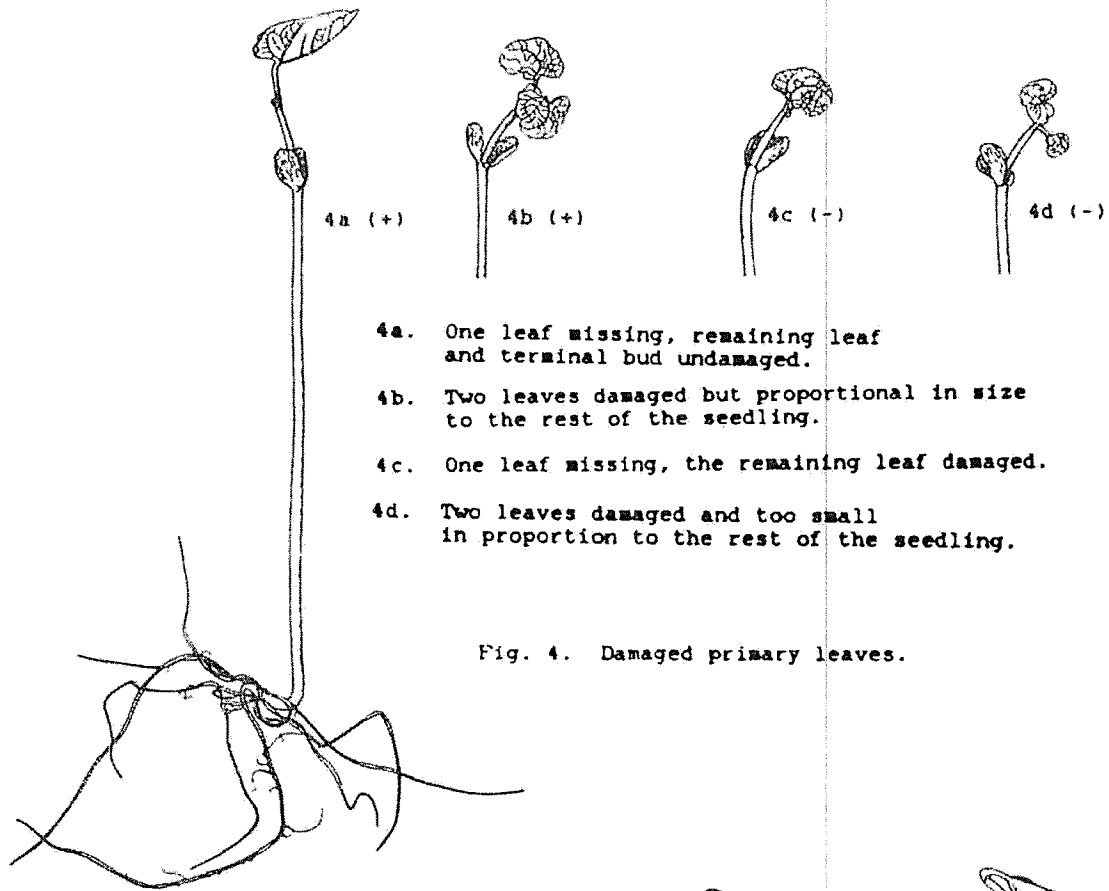


Fig. 4. Damaged primary leaves.

- 5a. Hypocotyl thickened due to towel test.
- 5b. Hypocotyl thickened and short relative to epicotyl

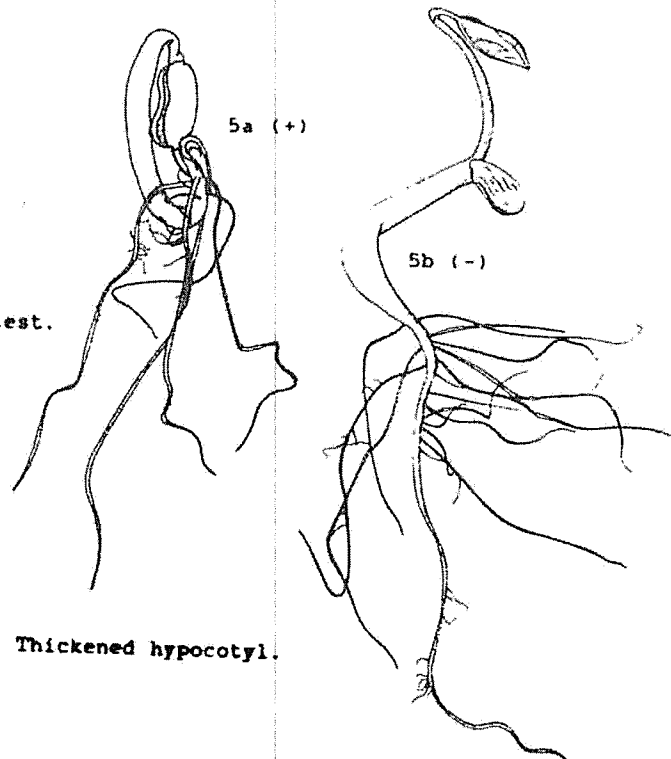
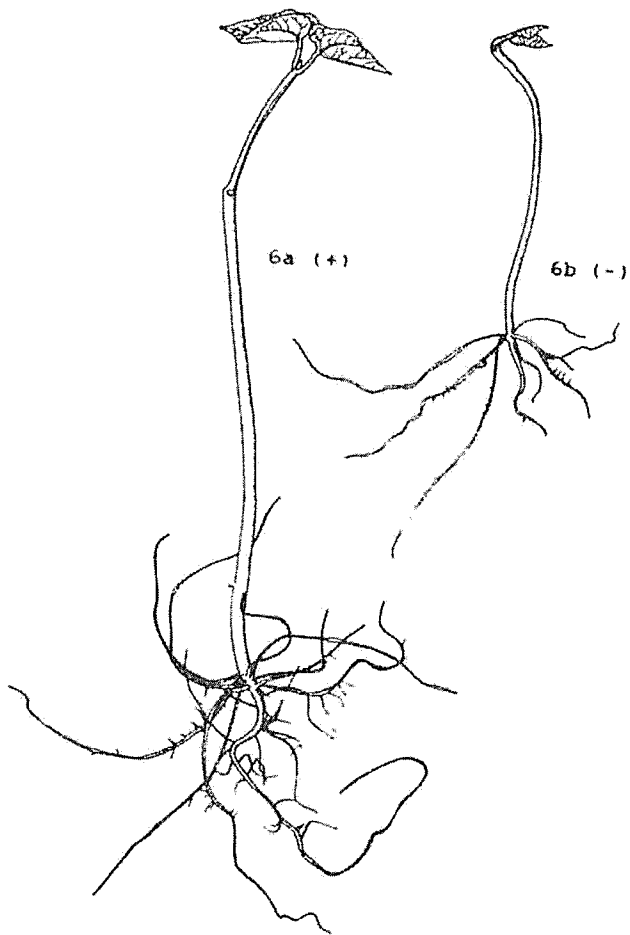


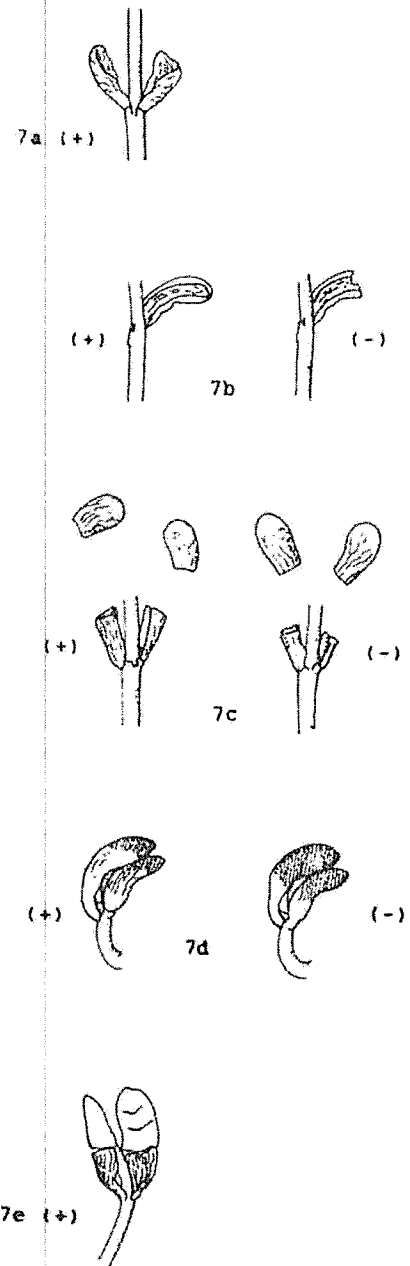
Fig. 5. Thickened hypocotyl.

Fig. 6. Cotyledons,
bean other than garden bean.

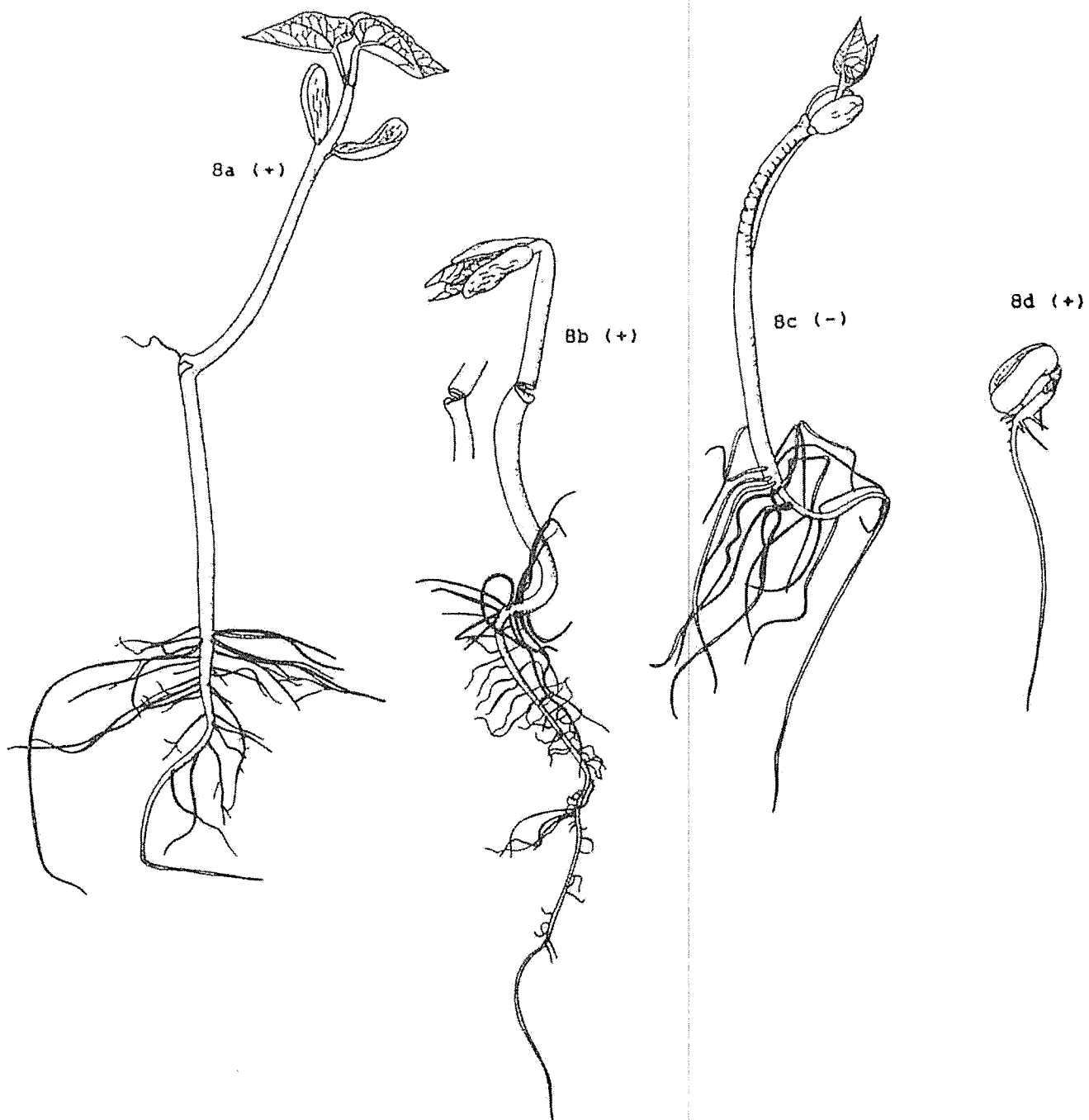


- 6a. Cotyledons missing but seedling vigorous.
6b. Cotyledons missing and seedling weak.

Fig. 7. Cotyledons, garden bean.



- 7a. Cotyledons shrivelled, but intact.
7b. One cotyledon missing.
7c. Parts of both cotyledons missing.
7d. Cotyledons decayed.
7e. Part of cotyledons non-functional but attached.



- 8a. Healed lesion ('knee')
- 8b. Hypocotyl break due to towel test.
- 8c. Deep lesion.
- 8d. Hypocotyl collar rot

Fig. 8. Hypocotyl defects.

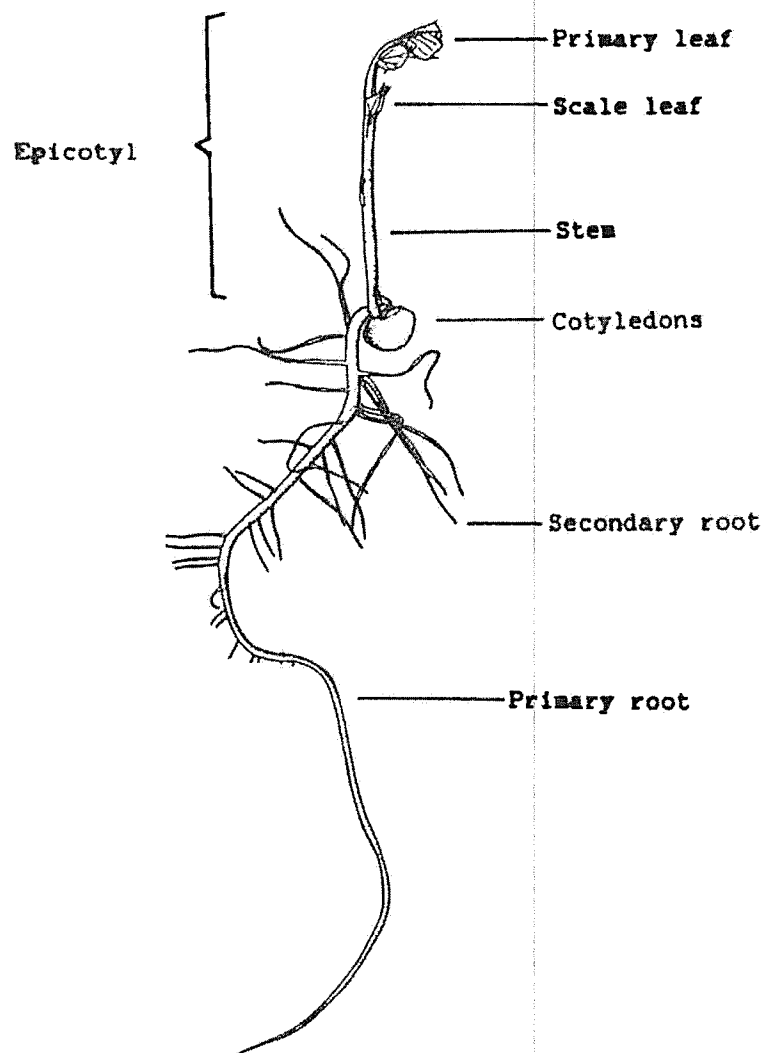
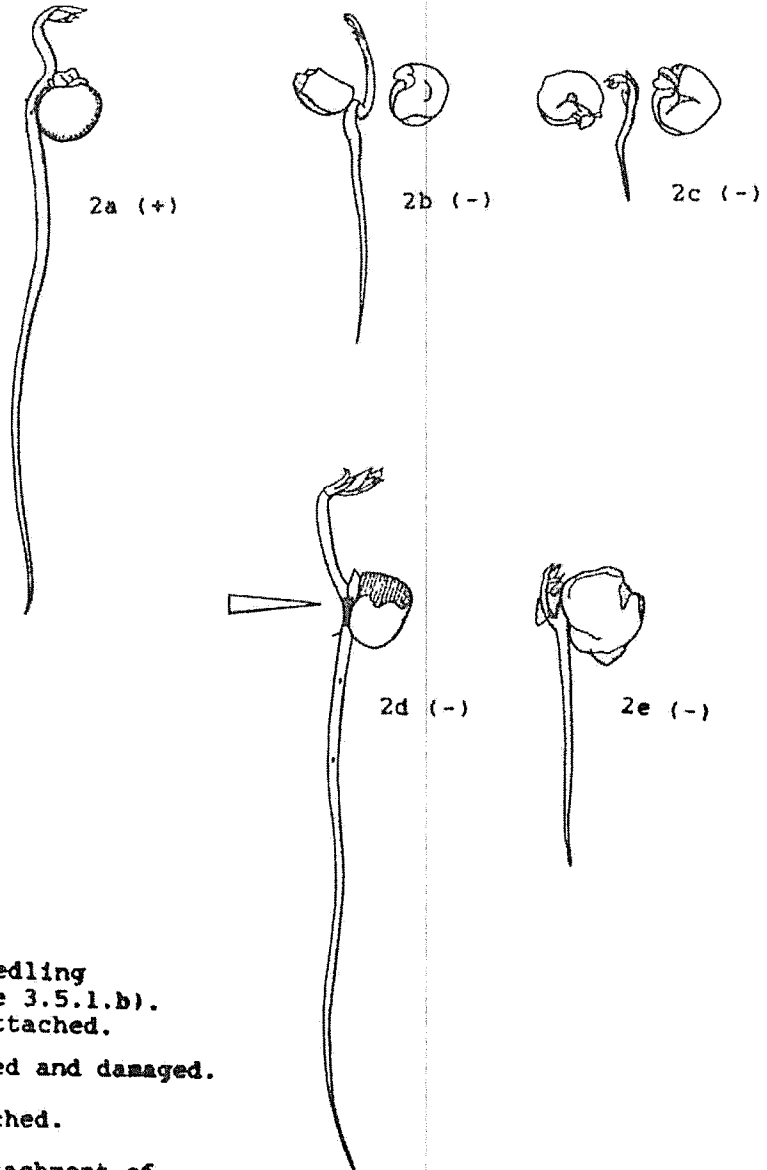


Fig. 1. 7-day Pea Seedling



- 2a. Late-germinating seedling
(at final count; see 3.5.1.b).
Cotyledons firmly attached.
- 2b. One cotyledon attached and damaged.
- 2c. Both cotyledons detached.
- 2d. Decay at point of attachment of
cotyledons.
- 2e. Cotyledons attached, but
more than half decayed.

Fig. 2. Cotyledon Defects

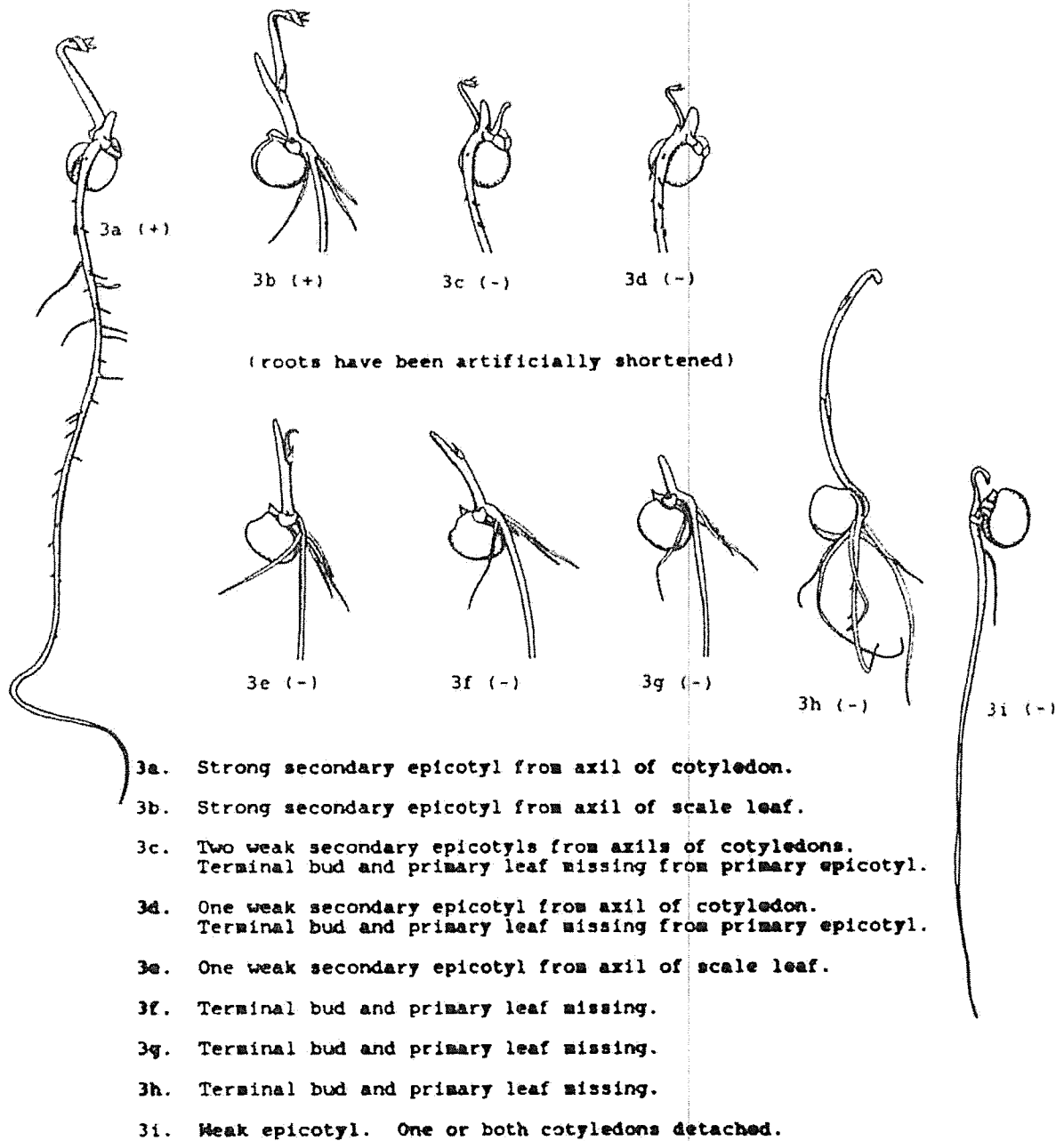
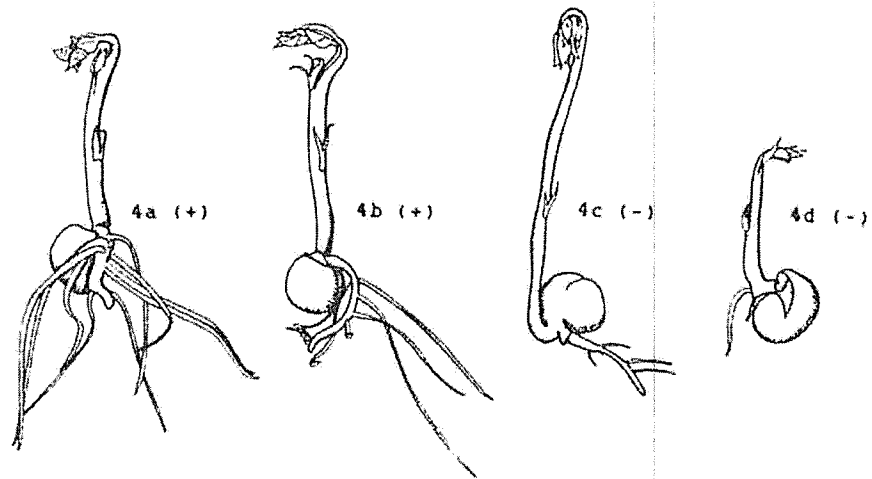
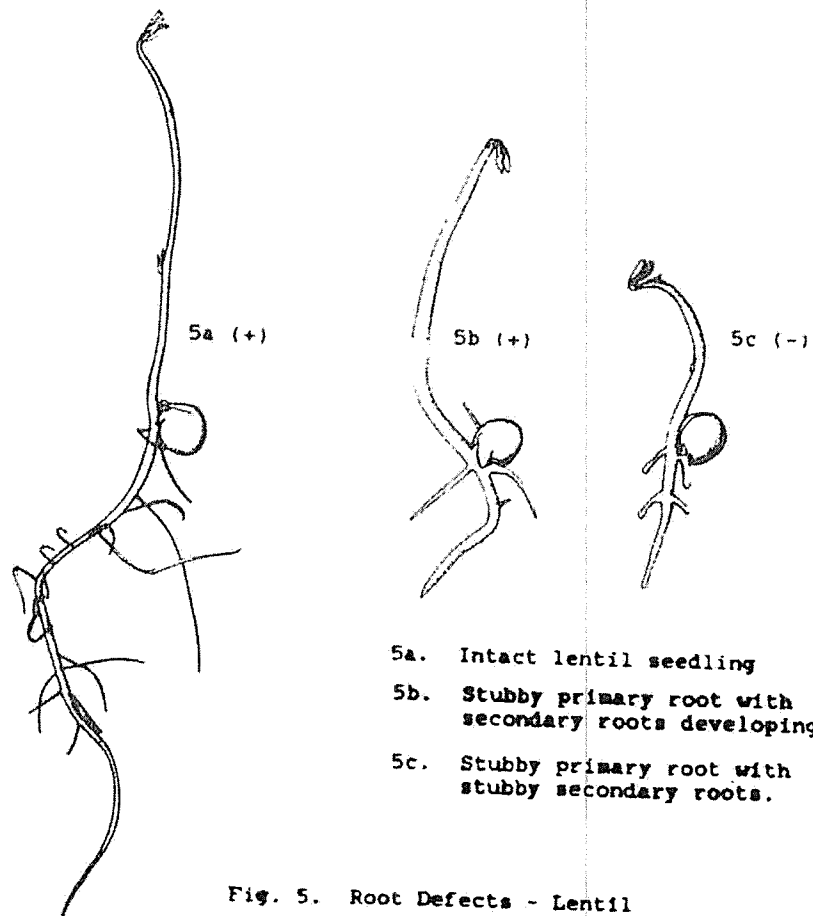


Fig. 3. Epicotyl Defects



- 4a. Stubby primary root, sufficient secondary roots.
 4b. Stubby primary root, sufficient secondary roots.
 4c. Stubby primary root, insufficient secondary roots.
 4d. Insufficient roots.

Fig. 4. Root Defects - Pea



- 5a. Intact lentil seedling
 5b. Stubby primary root with secondary roots developing.
 5c. Stubby primary root with stubby secondary roots.

Fig. 5. Root Defects - Lentil

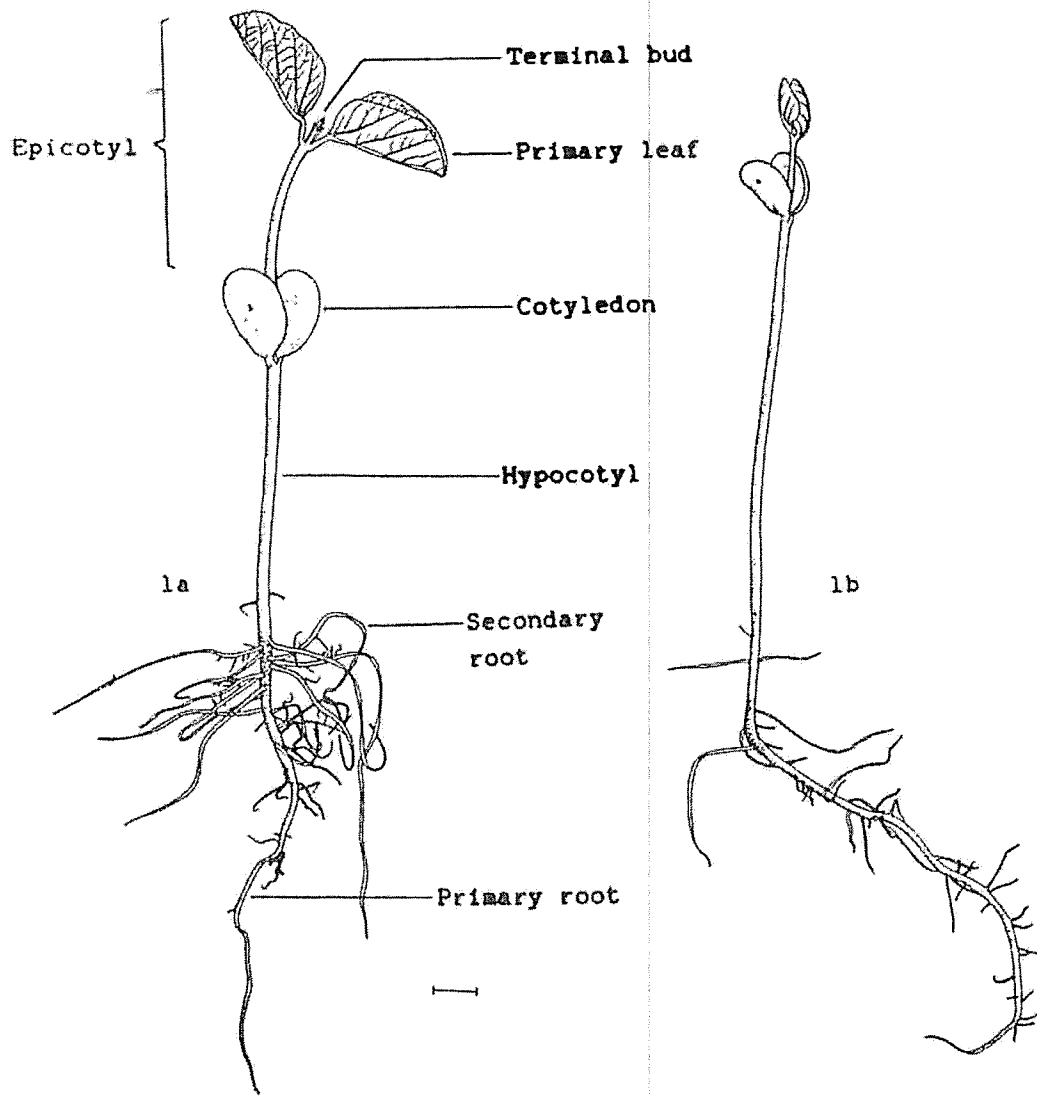


Fig. 1. Soybean 7-day seedlings
(1a. sand test, 1b. towel test)

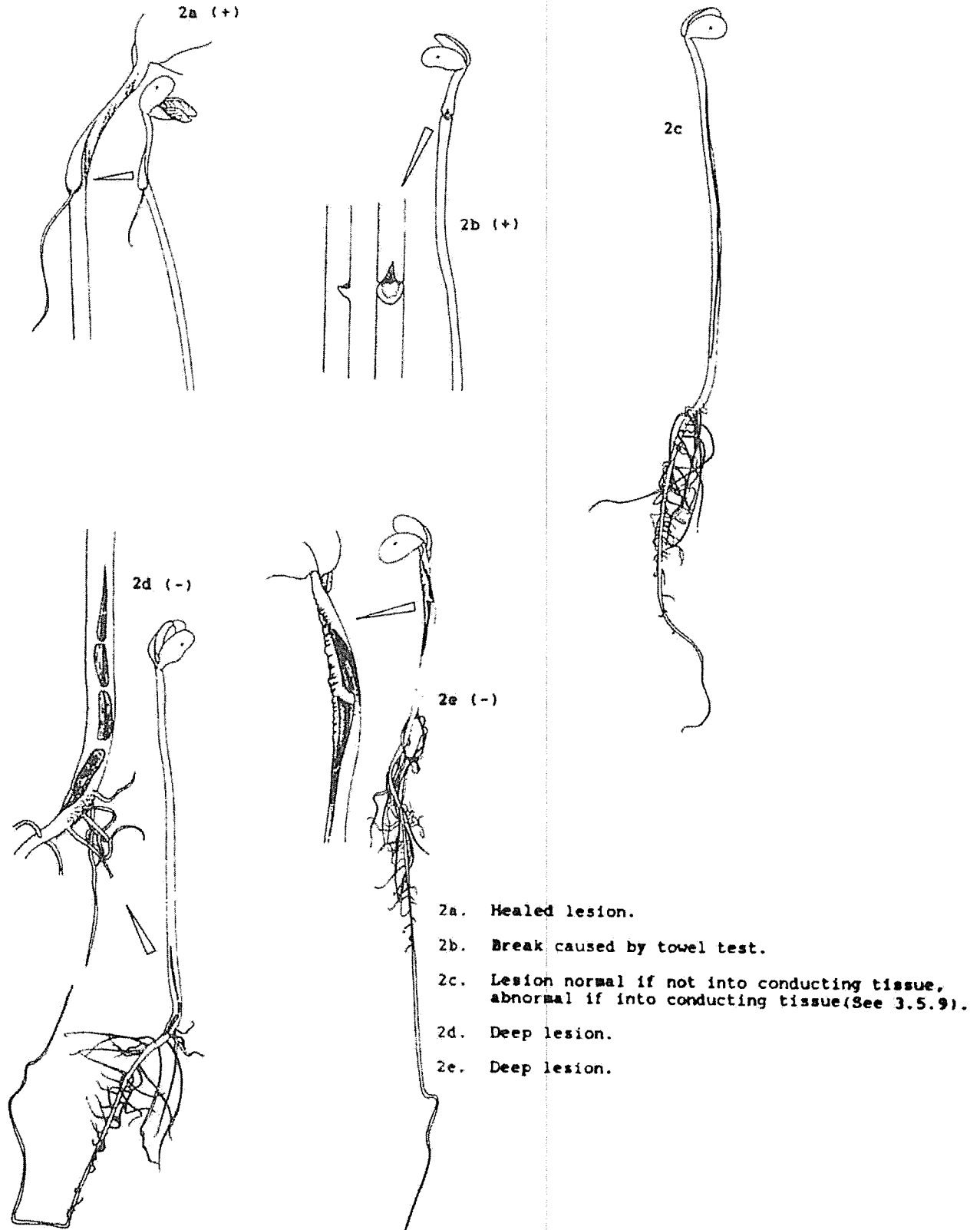
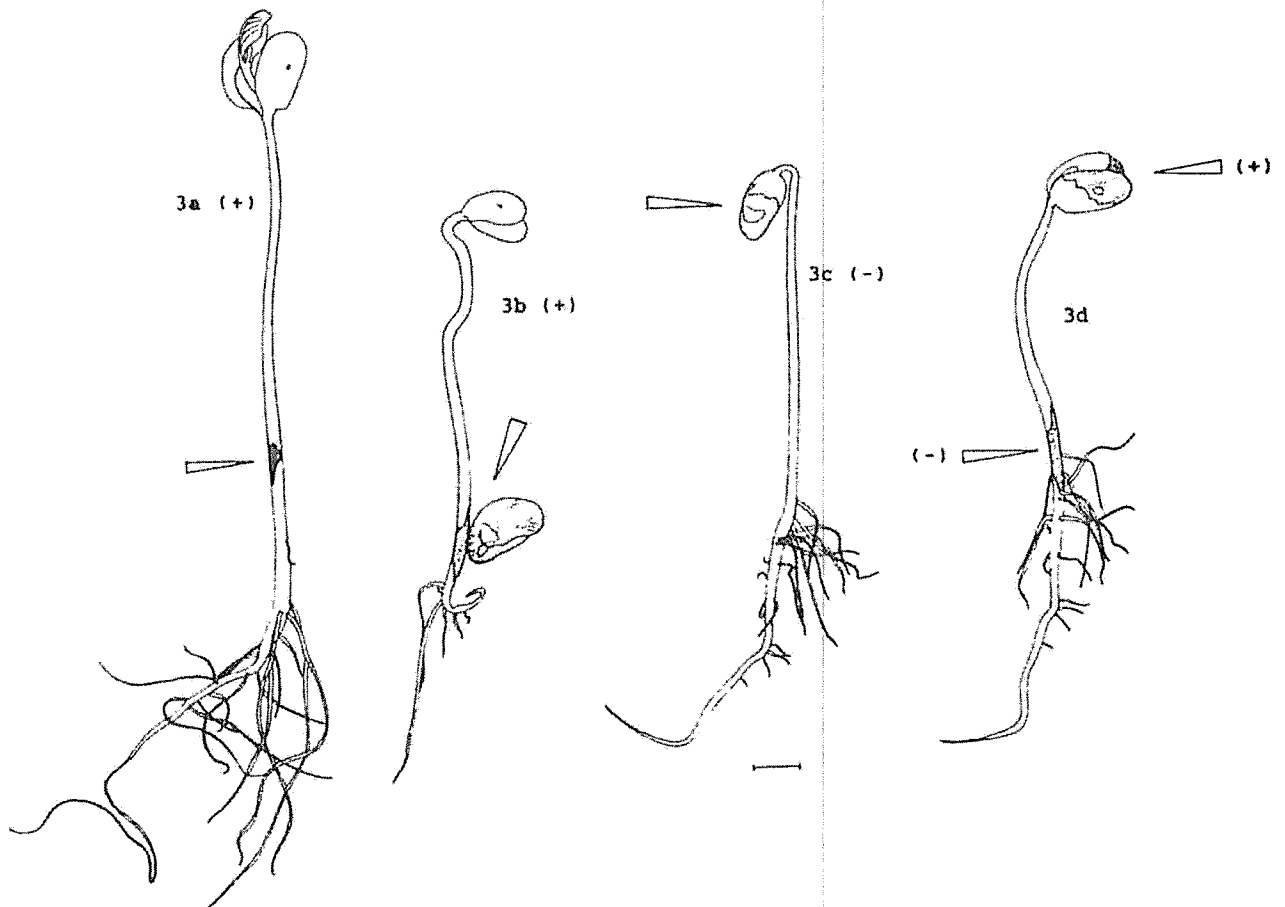


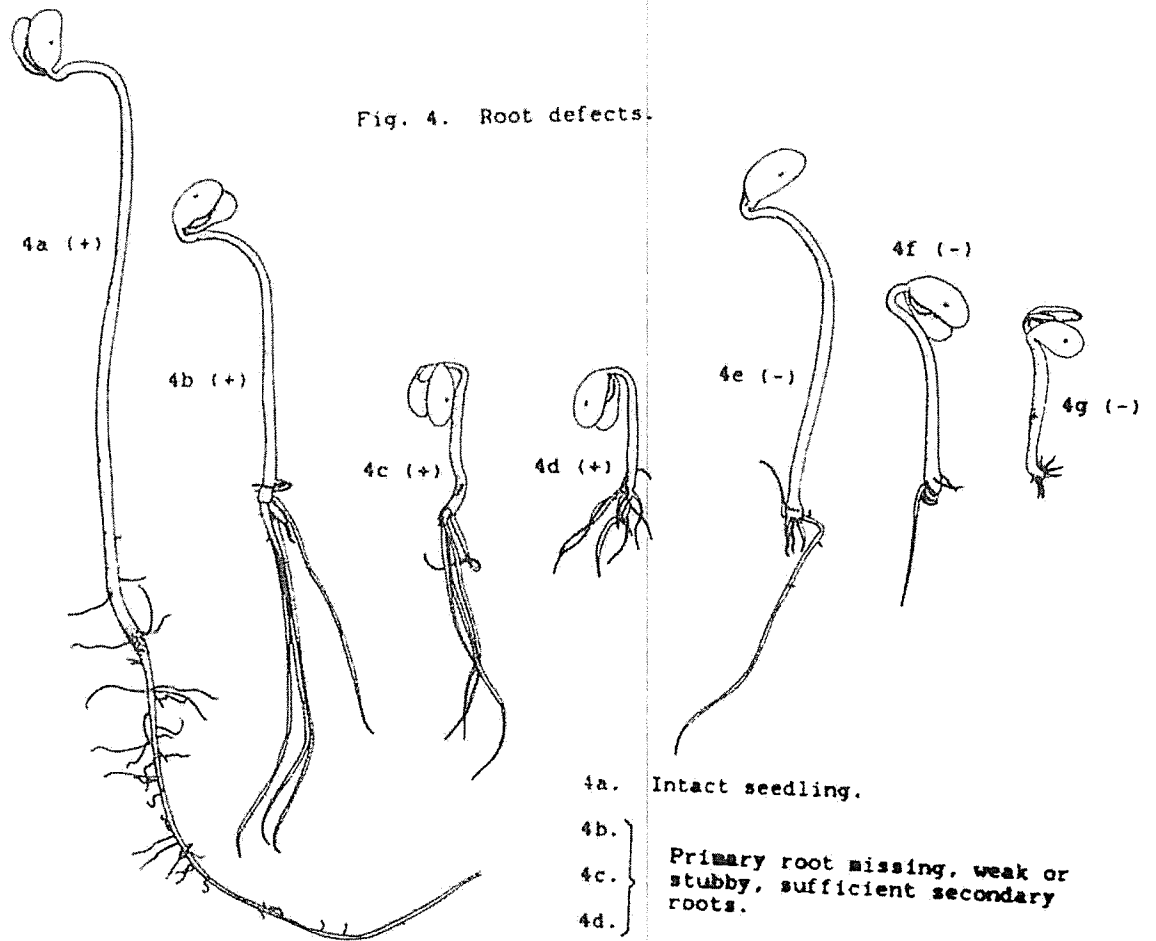
Fig. 2. Hypocotyl lesions.



- 3a. Decay on surface.
- 3b. Secondary infection from another seed or seed coat.
- 3c. Primary infection more than half of cotyledons.
- 3d. Cotyledons infected less than half (normal), deep infection into hypocotyl tissue. Seedling abnormal.

Fig. 3. Decay.

Fig. 4. Root defects.



4a. Intact seedling.

4b. }

4c. } Primary root missing, weak or
stubby, sufficient secondary
roots.

4d. }

4e. }

4f. } Primary root missing, weak or
stubby, insufficient secondary
roots.

4g. }

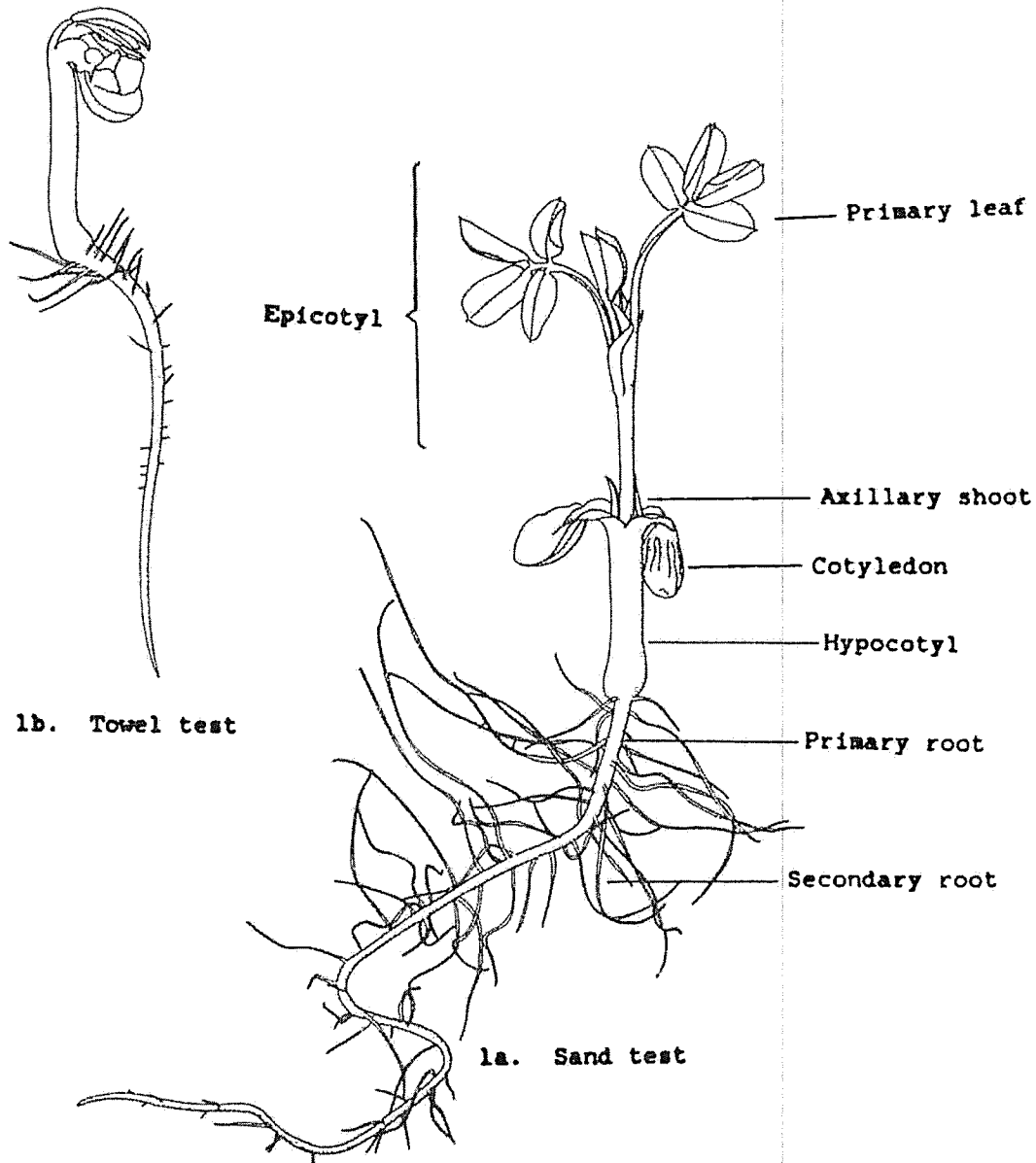
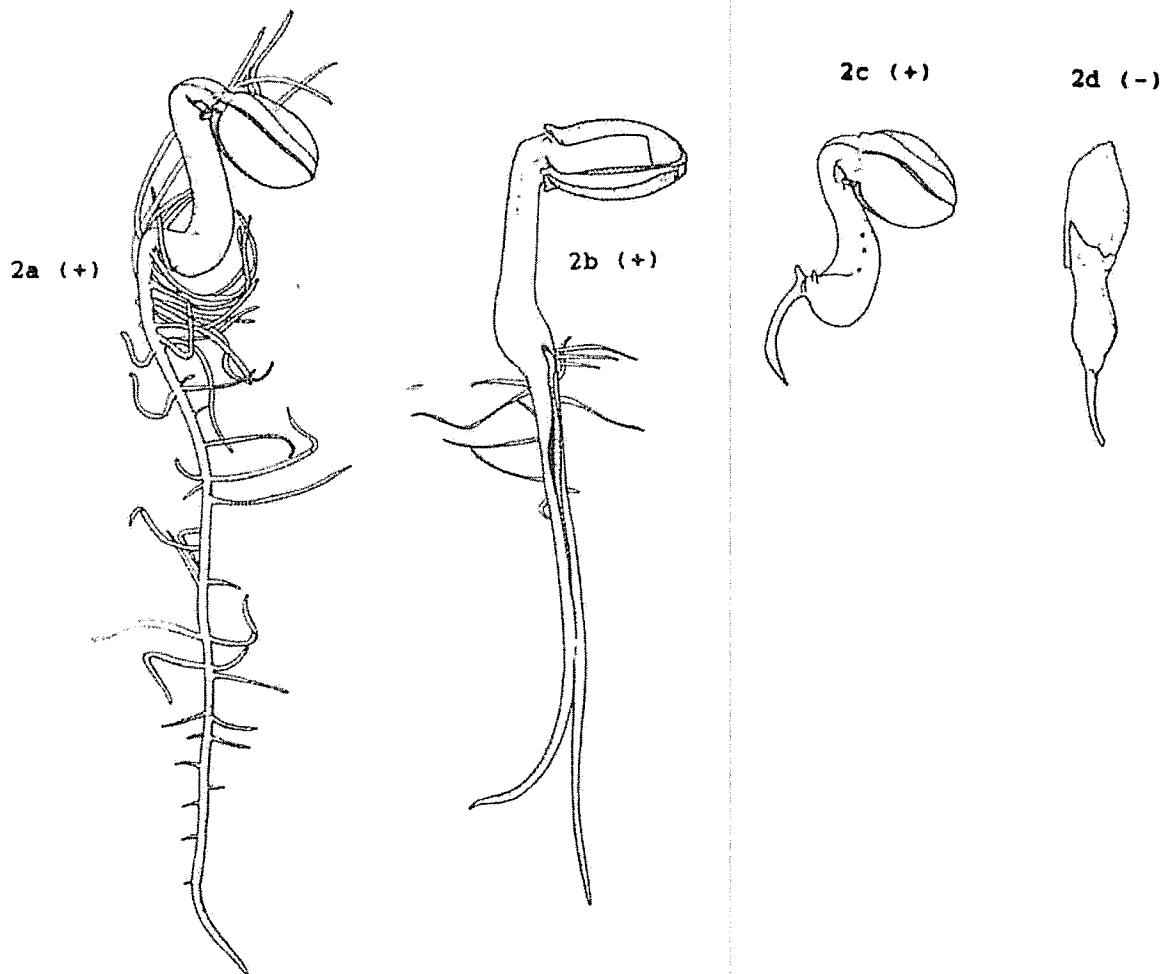


Fig. 1. Peanut 8-day seedlings

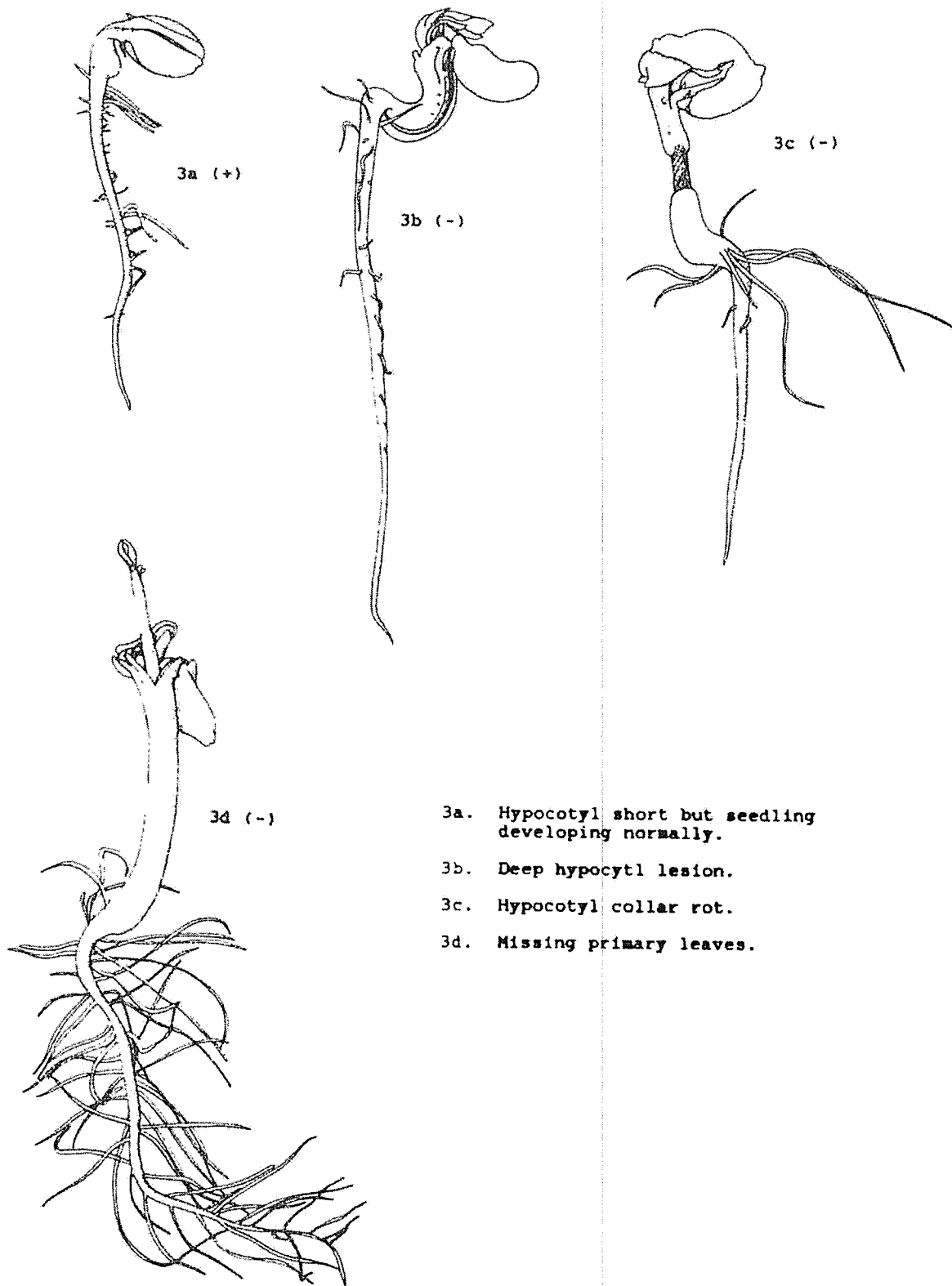
Fig. 2. Root defects



- 2a. Intact seedling.
- 2b. Split root, split not extending into hypocotyl.
- 2c. Short primary root, secondary roots developing.
- 2d. Stubby primary root, no secondary roots developing.

Note: For seedlings to be classified as normal, the cotyledons must be split apart to verify that there are no serious epicotyl defects.

Fig. 3. Peanut.



3a (+)

3b (-)

3c (-)

3d (-)

- 3a. Hypocotyl short but seedling developing normally.
- 3b. Deep hypocotyl lesion.
- 3c. Hypocotyl collar rot.
- 3d. Missing primary leaves.

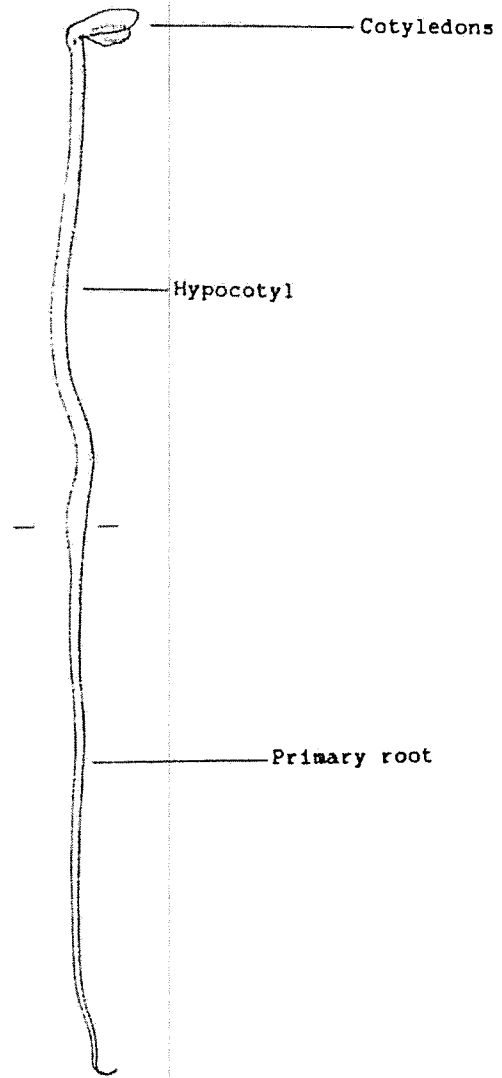


Fig. 1. Alfalfa 5-day seedling.

Fig. 2. Root defects.

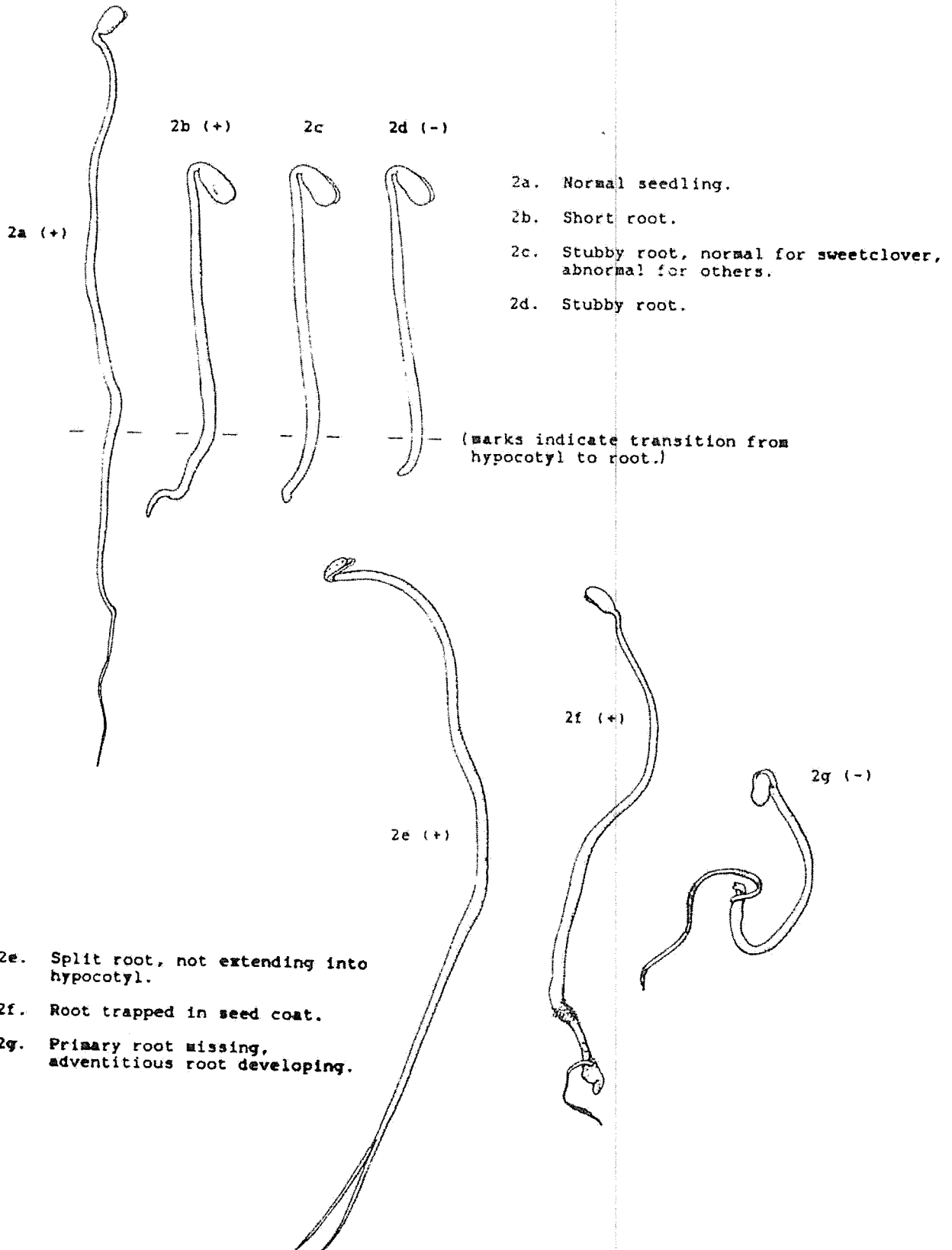
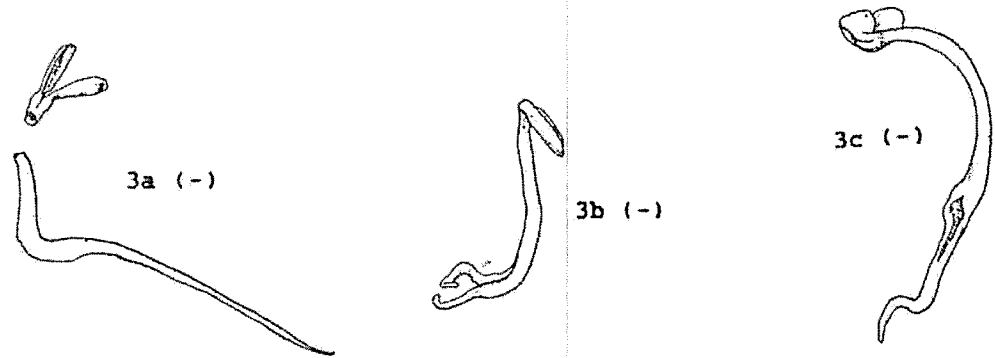
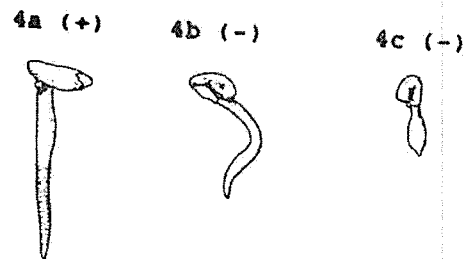


Fig. 3.



- 3a. Broken hypocotyl.
 3b. Split root and hypocotyl.
 3c. Deep lesion of hypocotyl.

Fig. 4. Small seedlings.



- 4a. Late-germinating seedling
 (at final count; see 3.5.1.b).
 4b. Small weak seedling.
 4c. Swollen hypocotyl, stubby root.

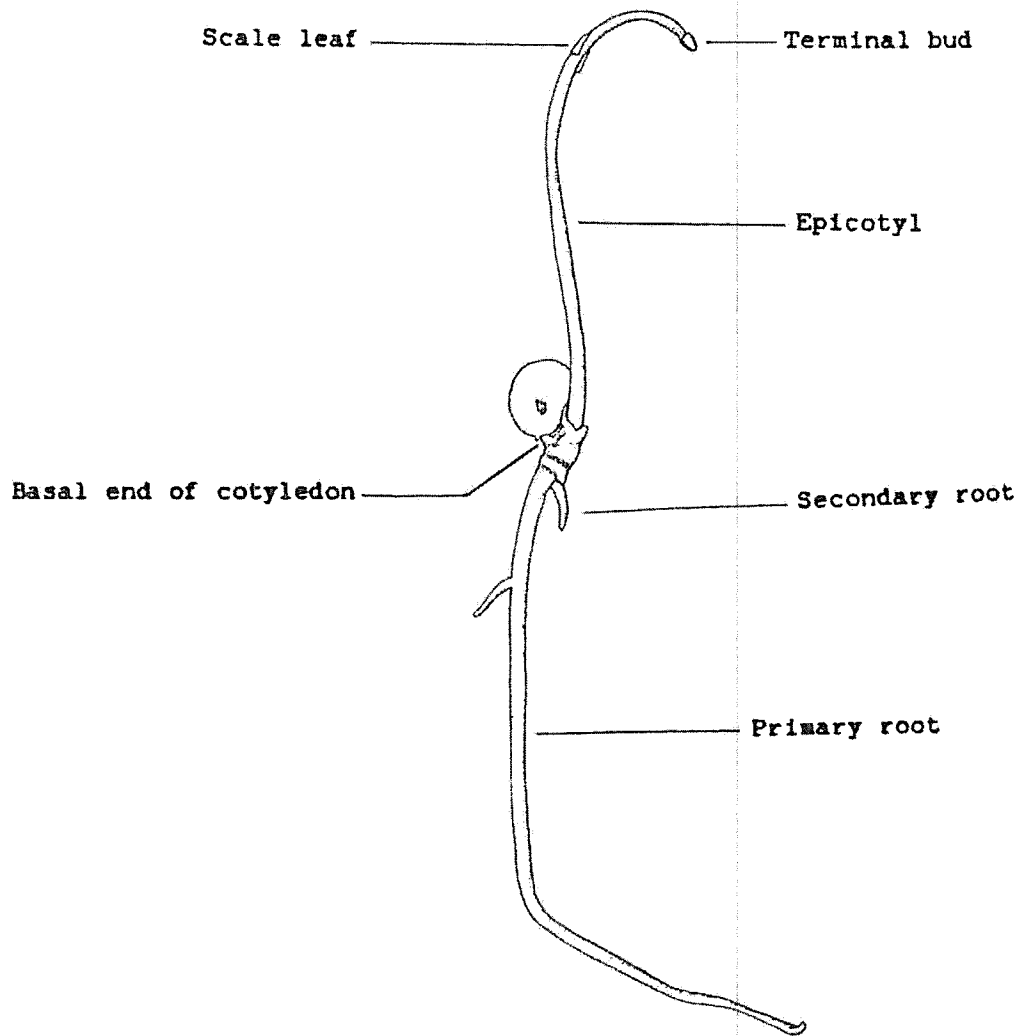
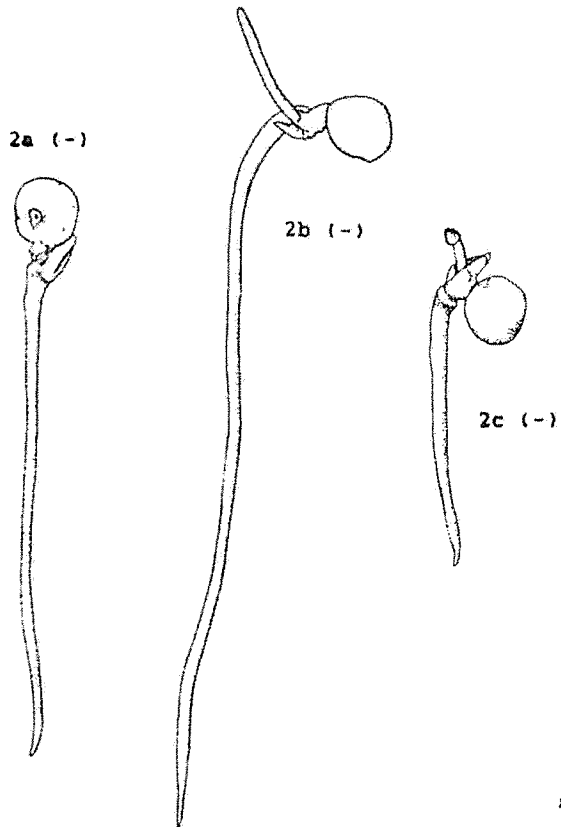


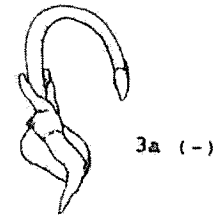
Fig. 1. Asparagus 10-day seedling.

Fig. 2. Epicotyl defects.



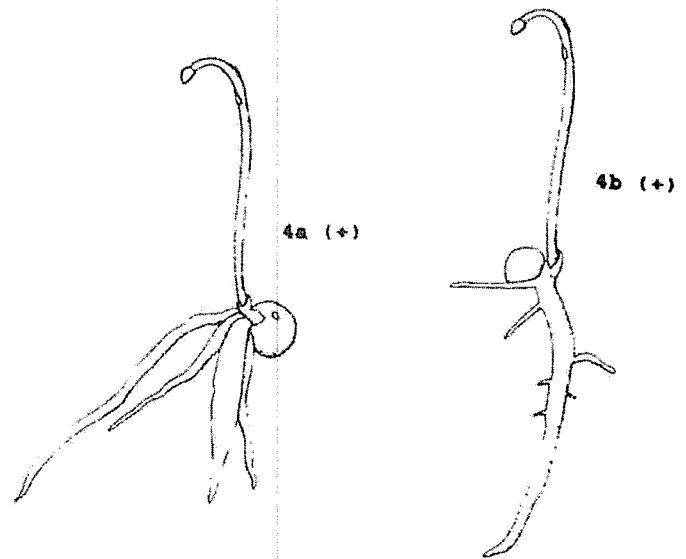
- 2a. Epicotyl missing.
 2b. Terminal bud missing.
 2c. Epicotyl markedly shortened.

Fig. 3.



3a. Stubby primary root.

Fig. 4. Ornamental asparagus with thickened primary root.



- 4a. *Asparagus densiflorus*.
 4b. *Asparagus setaceus*.

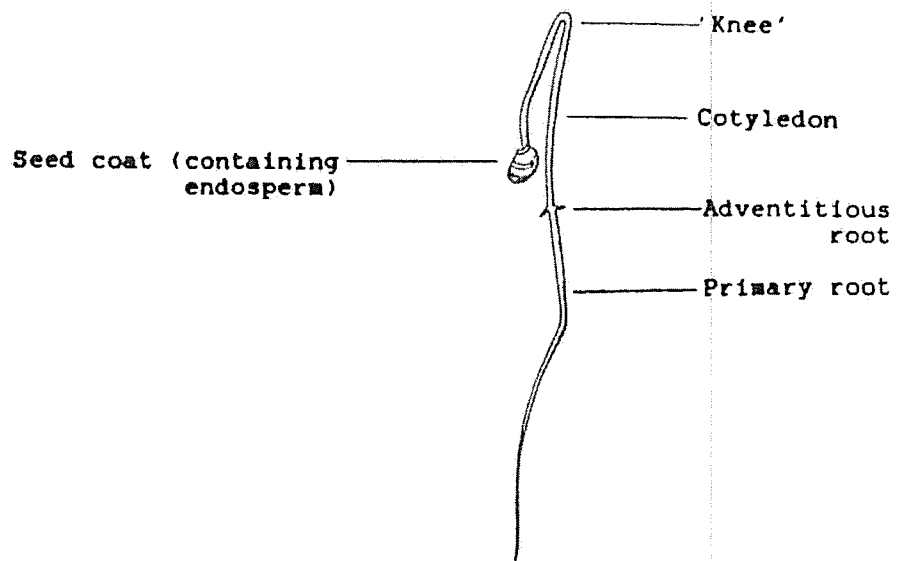


Fig. 1. Onion 7-day seedling.

2a. Slight 'knee' visible.

2b. No 'knee' visible.

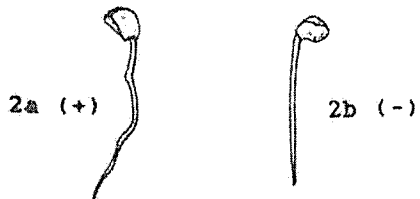


Fig. 2.

3a. Slightly stubby root.

3b. Stubby root, with
adventitious roots started.

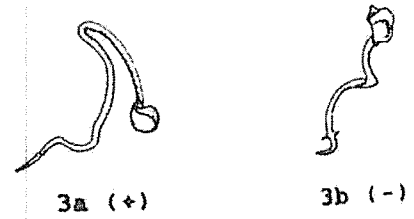


Fig. 3. Root defects.

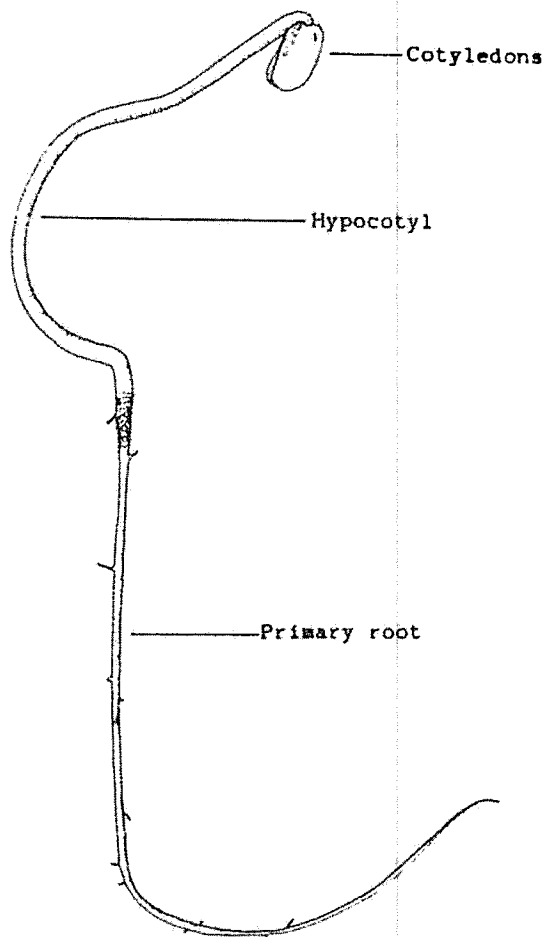
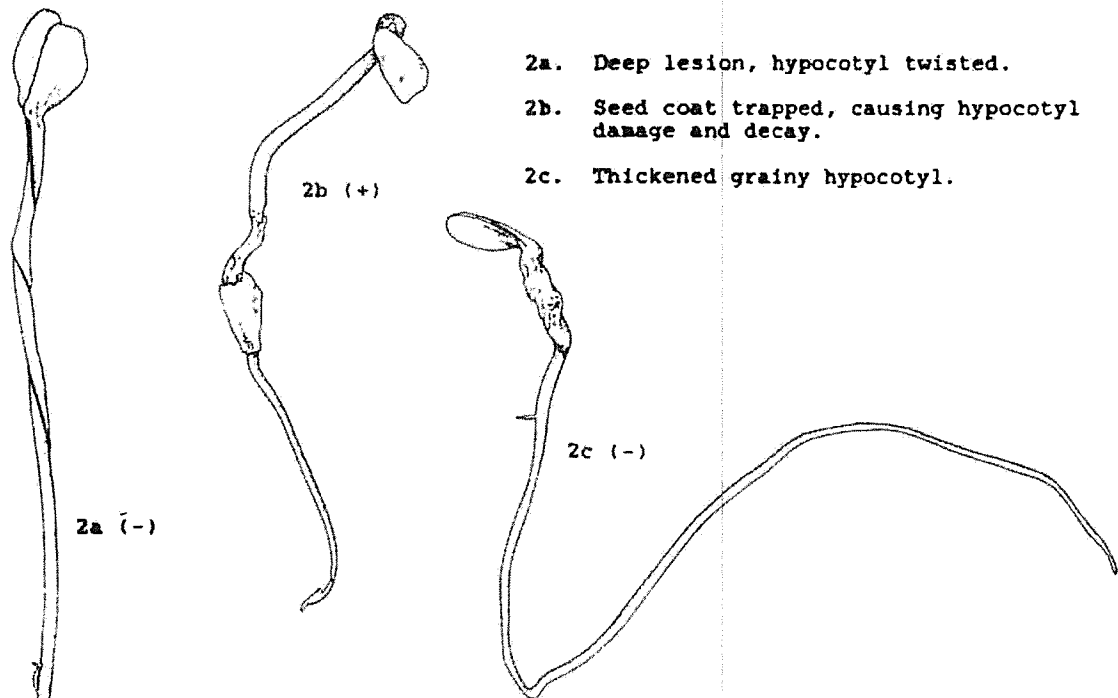
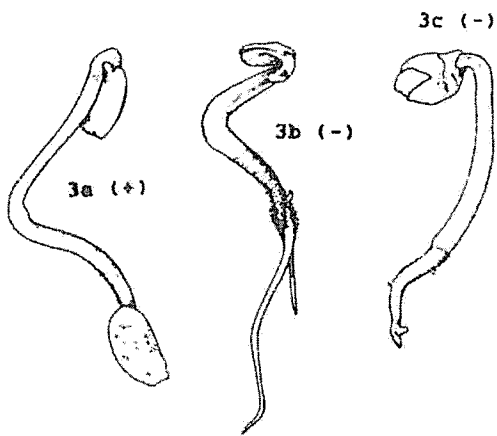


Fig. 1. Flax 7-day seedling.



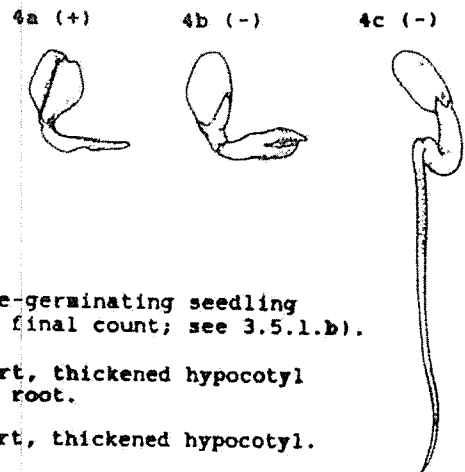
- 2a. Deep lesion, hypocotyl twisted.
- 2b. Seed coat trapped, causing hypocotyl damage and decay.
- 2c. Thickened grainy hypocotyl.

Fig. 2. Hypocotyl defects.



- 3a. Root trapped in seed coat.
- 3b. Deep lesion in root.
- 3c. Stubby root.

Fig. 3. Root defects.



- 4a. Late-germinating seedling (at final count; see 3.5.1.b).
- 4b. Short, thickened hypocotyl and root.
- 4c. Short, thickened hypocotyl.

Fig. 4. Small seedlings.

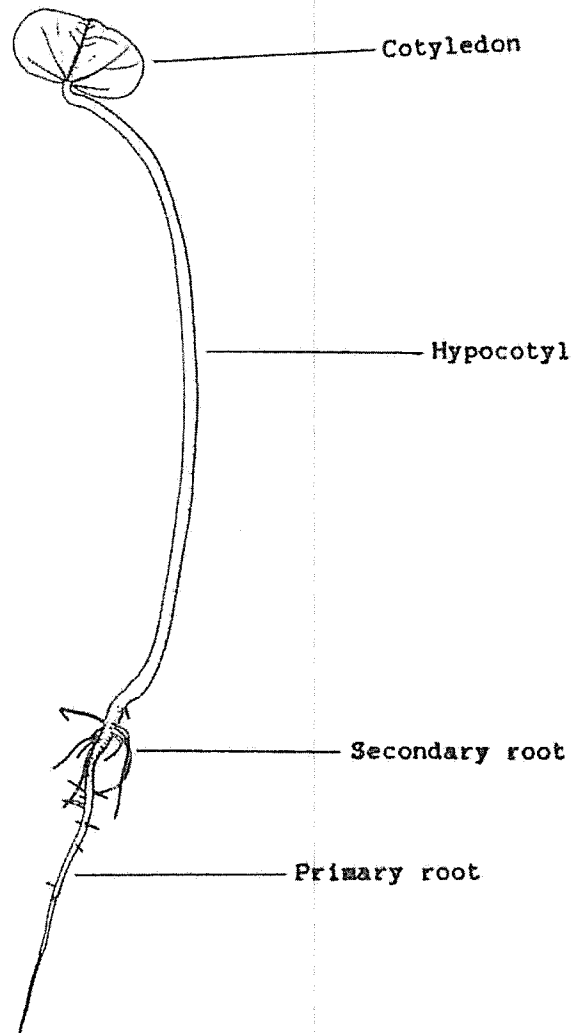


Fig. 1. Cotton 7-day seedling.

- 2a. Intact seedling.
- 2b. Primary root missing, sufficient secondary roots.
- 2c. Primary root missing, insufficient secondary roots.
- 2d. Deep hypocotyl lesion.

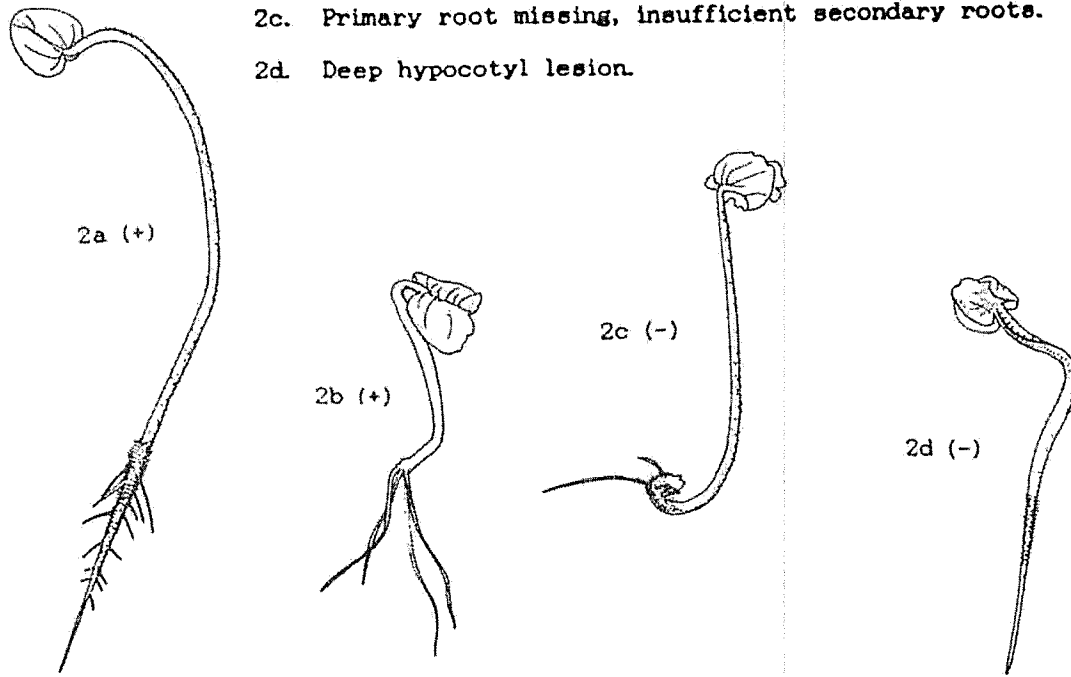


Fig. 2.

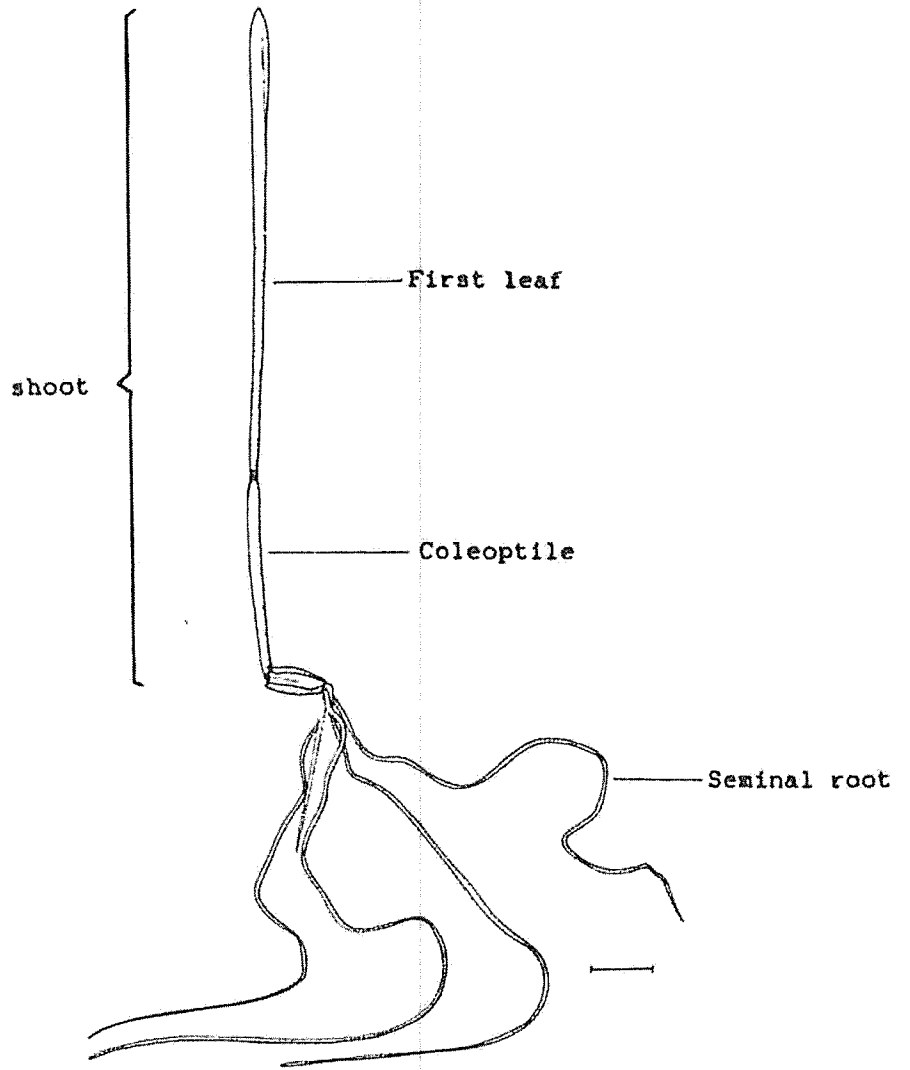


Fig. 1. Cereal 7-day seedling.

- 2a. Two seminal roots in proportion to shoot.
- 2b. One strong seminal root.
- 2c. One seminal root short relative to shoot.
- 2d. Less than one strong seminal root.

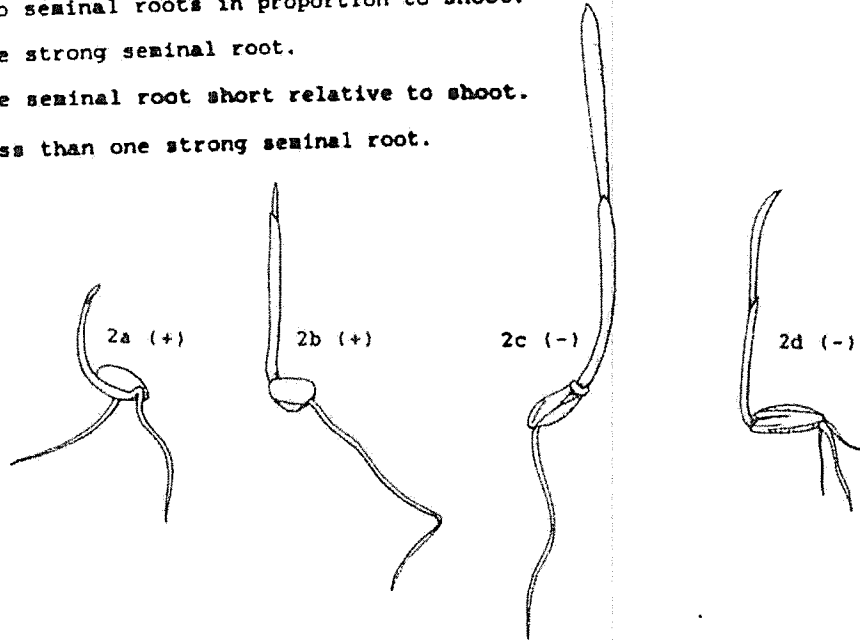


Fig. 2. Root defects.

- 3a. Shoot slightly deformed.
- 3b. Leaf less than half the length of coleoptile.
- 3c. Shoot short in proportion to roots.

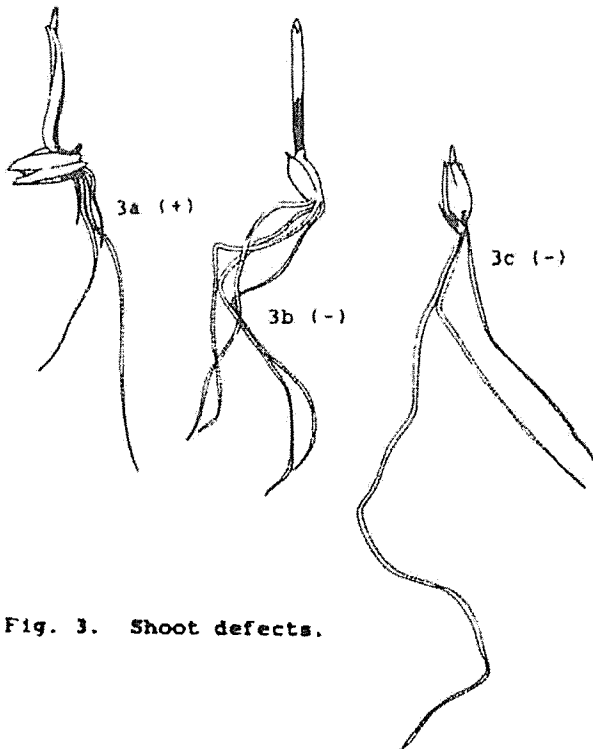


Fig. 3. Shoot defects.

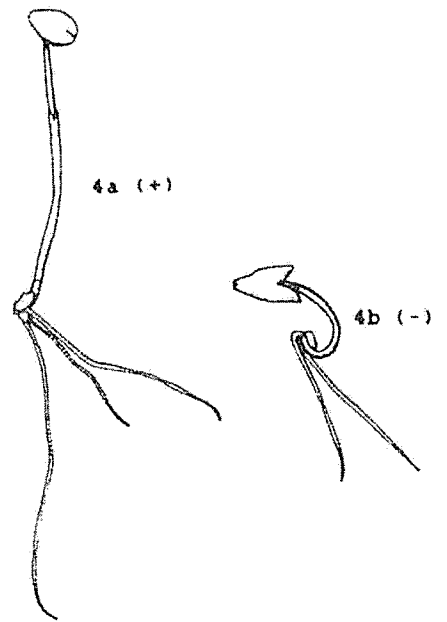
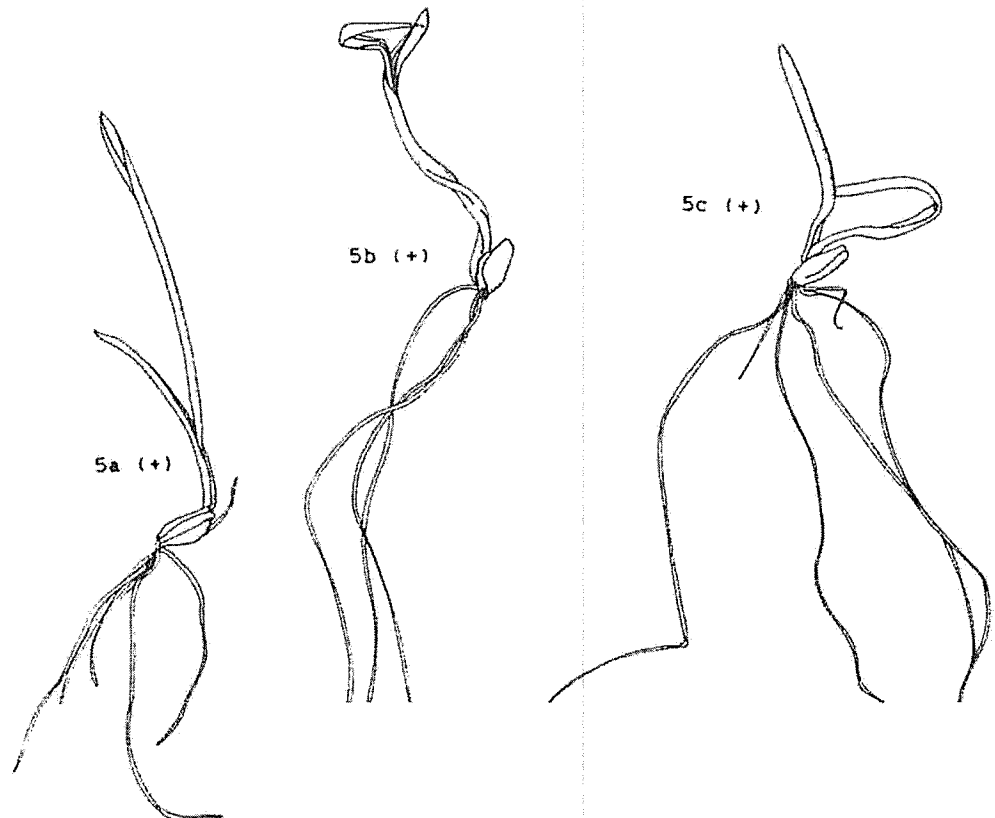


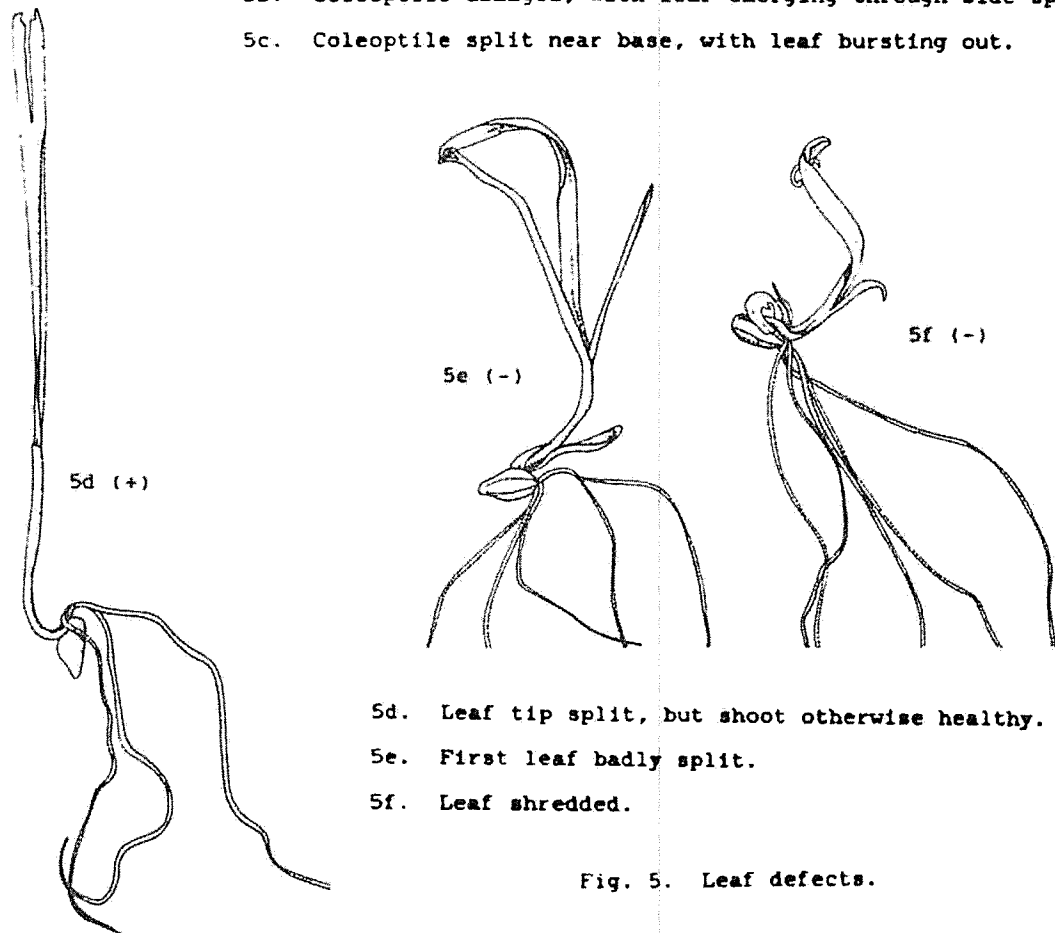
Fig. 4. Detached endosperm.



5a. Coleoptile split, but shoot otherwise healthy.

5b. Coleoptile damaged, with leaf emerging through side split.

5c. Coleoptile split near base, with leaf bursting out.

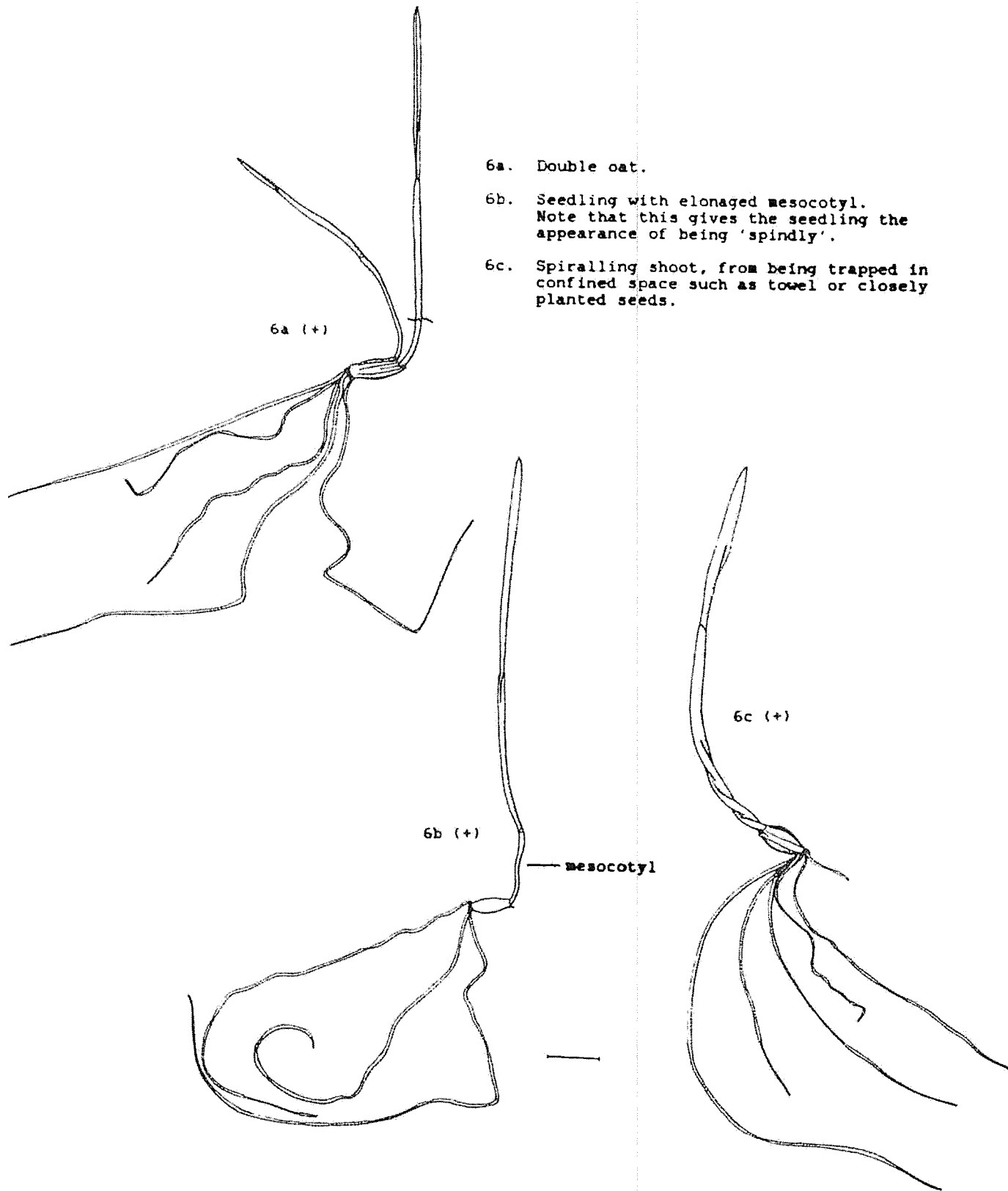


5d. Leaf tip split, but shoot otherwise healthy.

5e. First leaf badly split.

5f. Leaf shredded.

Fig. 5. Leaf defects.



6a. Double oat.

6b. Seedling with elongated mesocotyl. Note that this gives the seedling the appearance of being 'spindly'.

6c. Spiralling shoot, from being trapped in confined space such as towel or closely planted seeds.

Fig. 6. Seedlings.

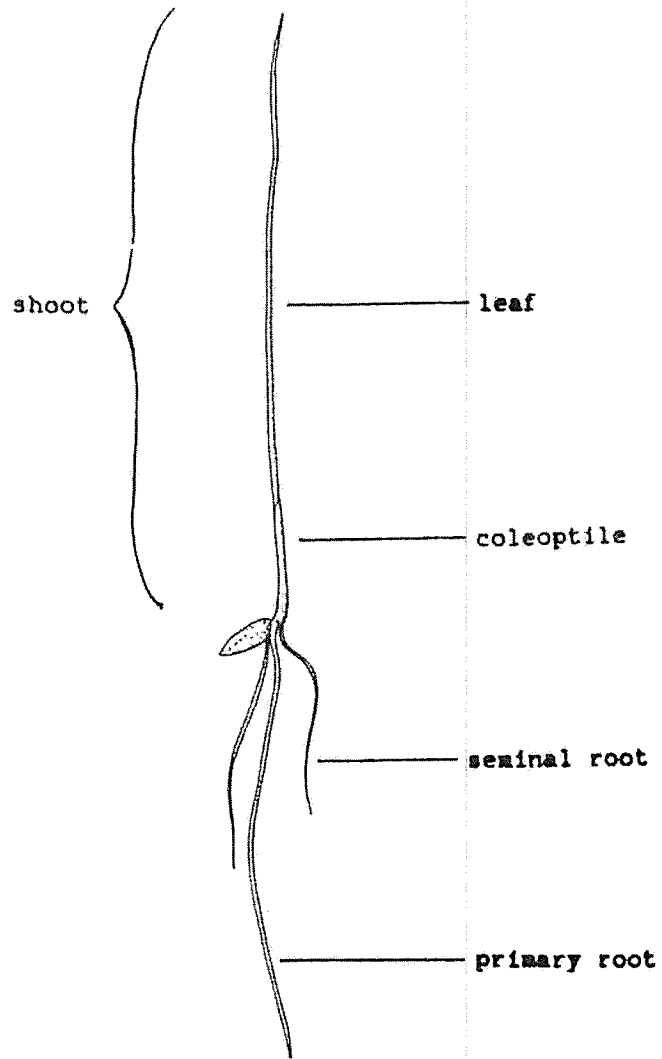
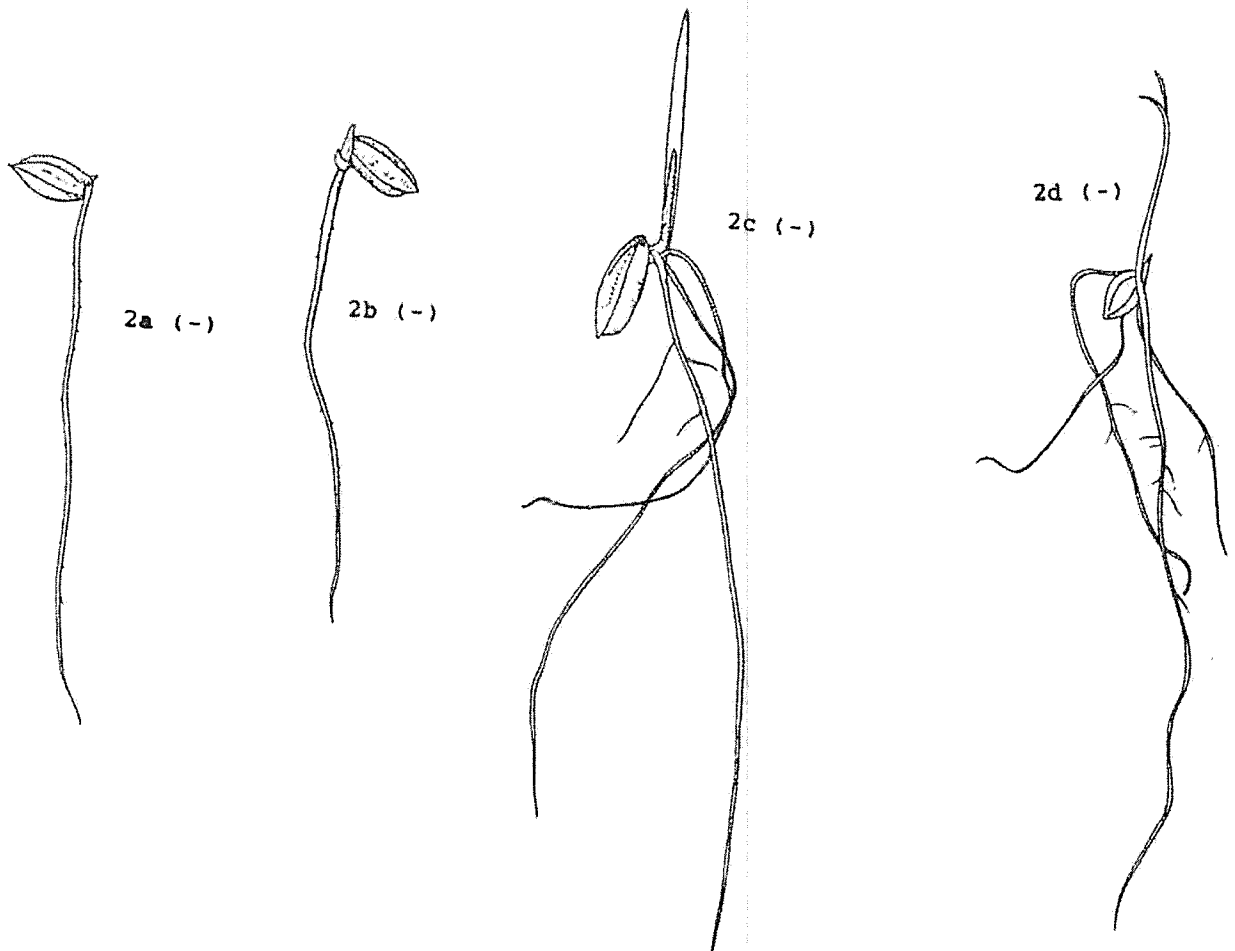


Fig. 1. Rice 10-day seedling.

Fig. 2. Shoot defects.



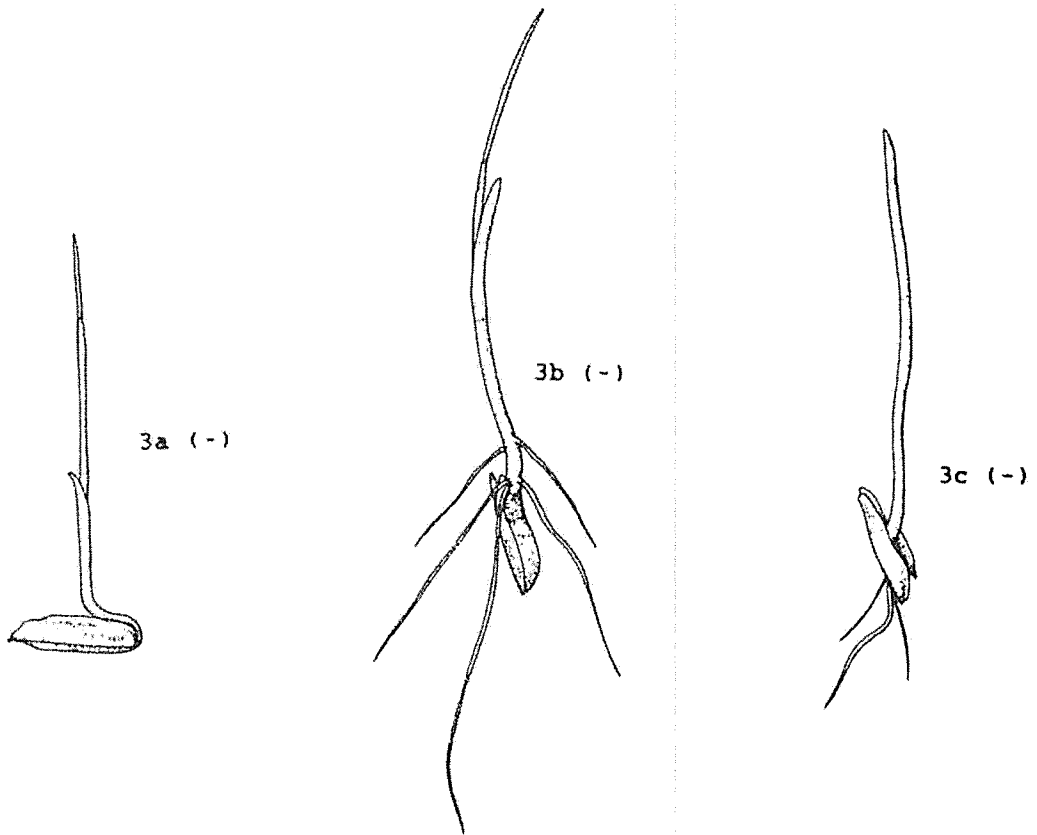
2a. Missing shoot.

2b. Empty coleoptile.

2c. Leaf less than half the length of coleoptile.

2d. Thin, spindly shoot.

Fig. 3. Root defects.



3a. No roots.

3b. No primary root.

3c. Weak, short primary root.

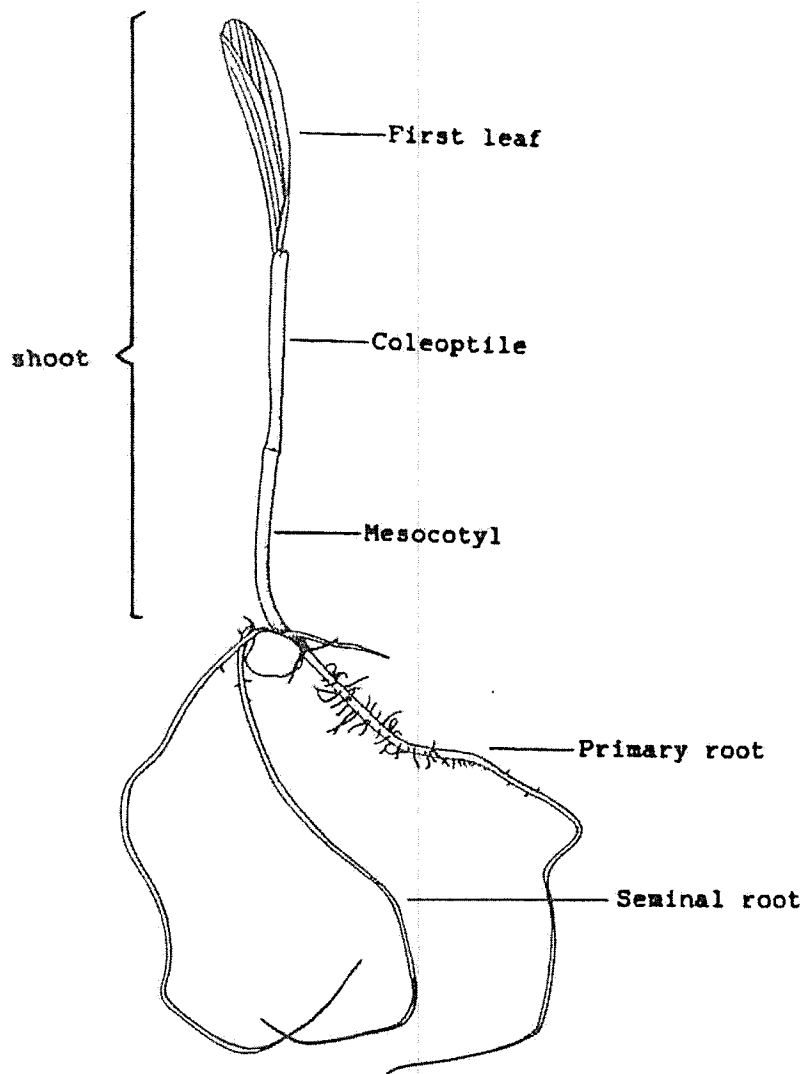


Fig. 1. Corn 7-day Seedling

- 2a. Late-germinating seedling (at final count; see 3.5.1.b).
 2b. Shoot damaged and weak roots.

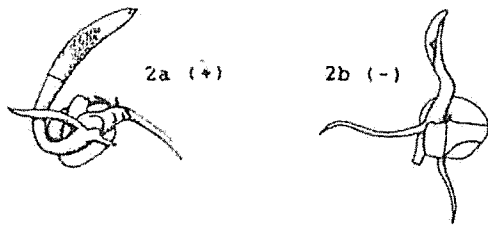


Fig. 2. Small seedlings.

- 3a. Leaf split at tip, seedling otherwise healthy.
 3b. Leaf badly split.
 3c. Leaf shredded.
 3d. Leaf damaged.

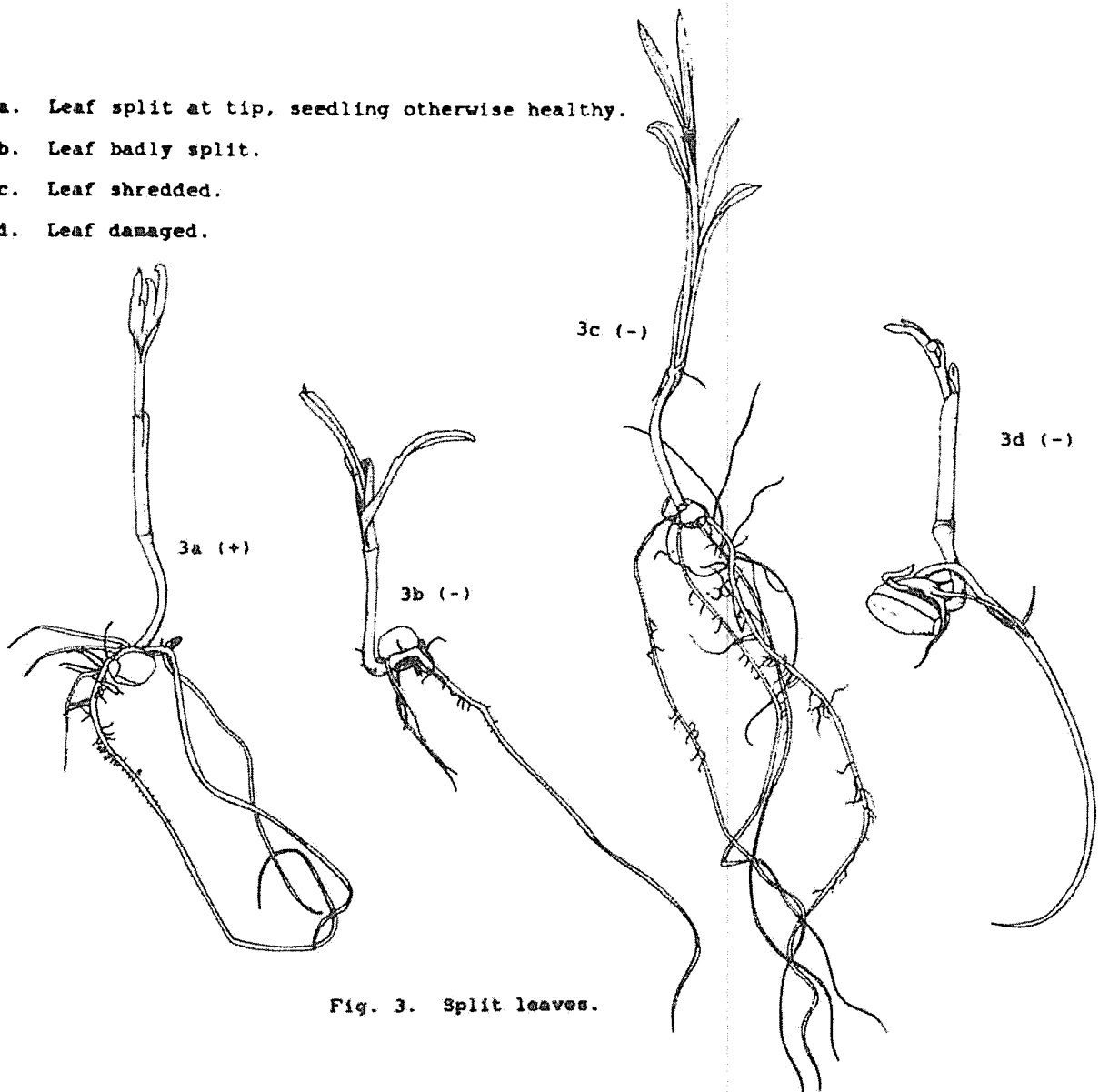
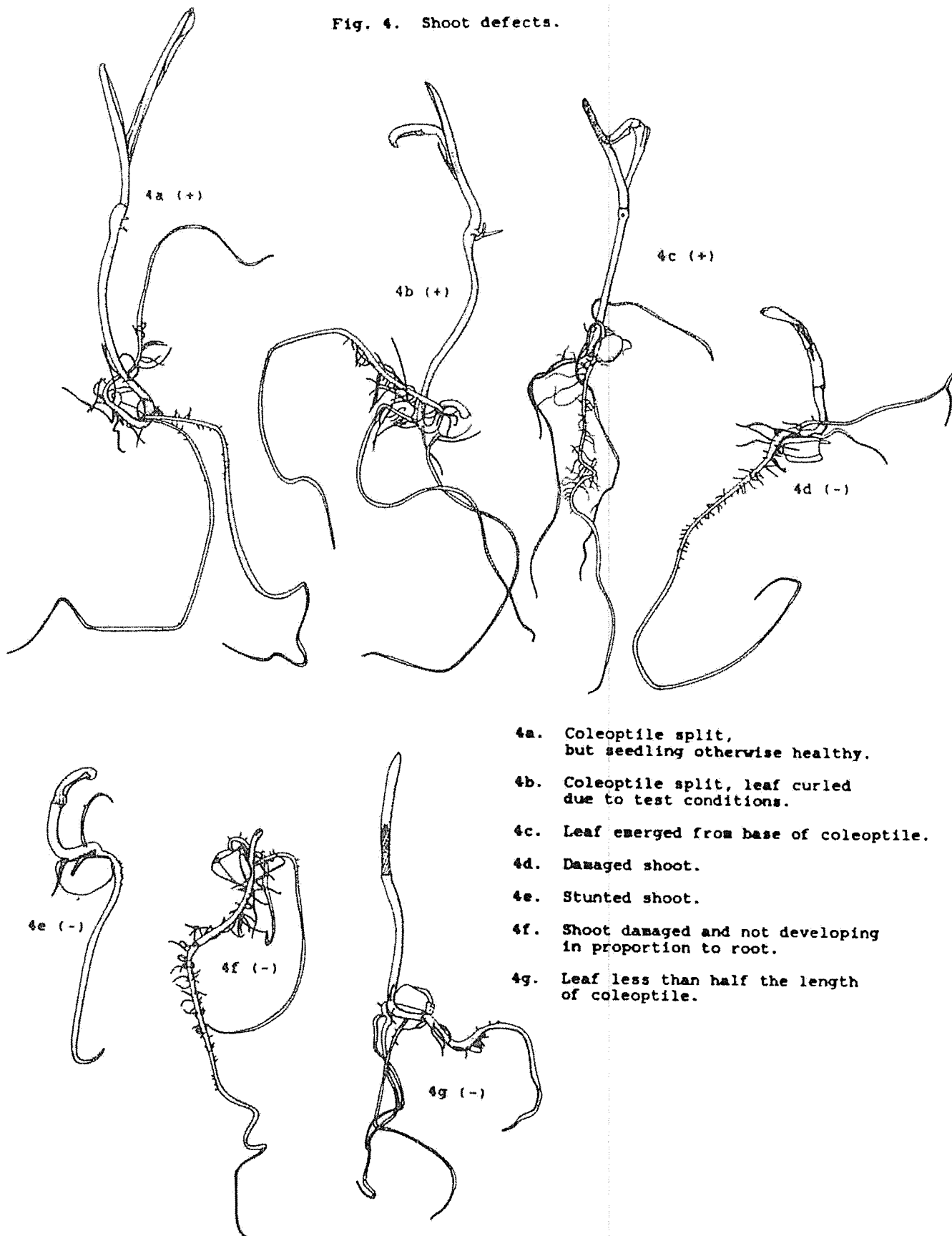
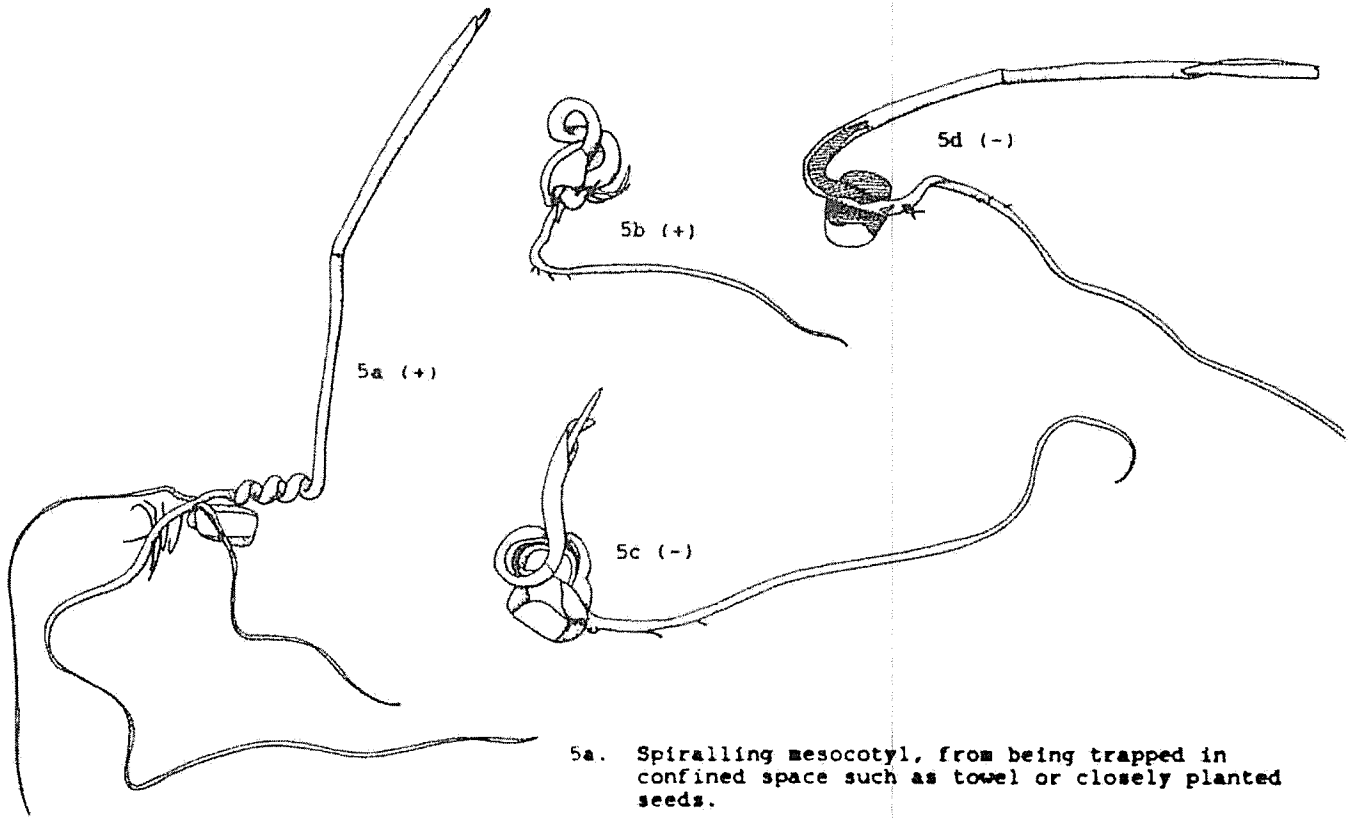


Fig. 3. Split leaves.

Fig. 4. Shoot defects.

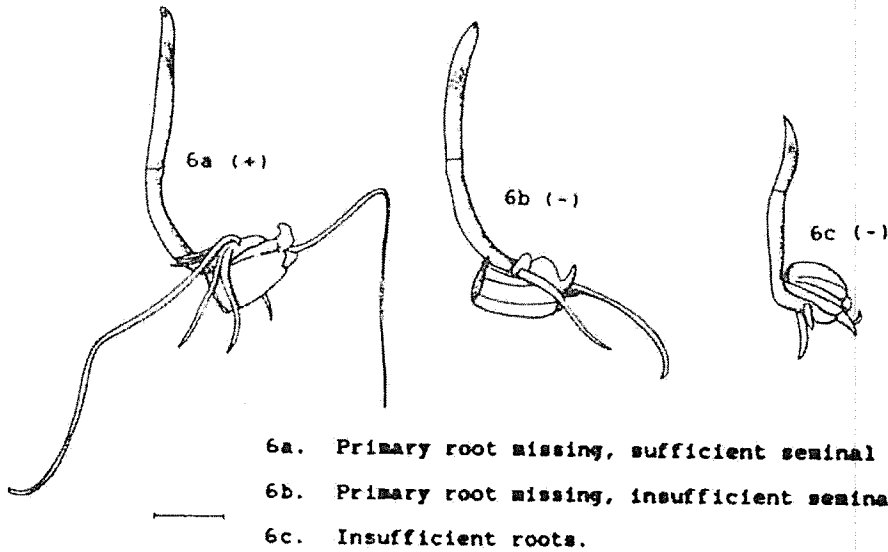


- 4a. Coleoptile split,
but seedling otherwise healthy.
- 4b. Coleoptile split, leaf curled
due to test conditions.
- 4c. Leaf emerged from base of coleoptile.
- 4d. Damaged shoot.
- 4e. Stunted shoot.
- 4f. Shoot damaged and not developing
in proportion to root.
- 4g. Leaf less than half the length
of coleoptile.



- 5a. Spiralling mesocotyl, from being trapped in confined space such as towel or closely planted seeds.
- 5b. Shoot trapped in seed coat, but otherwise healthy.
- 5c. Deep mesocotyl lesion.
- 5d. Decay deep into mesocotyl tissue.

Fig. 5. Mesocotyl defects.



- 6a. Primary root missing, sufficient seminal roots.
- 6b. Primary root missing, insufficient seminal roots.
- 6c. Insufficient roots.

Fig. 6. Root defects.

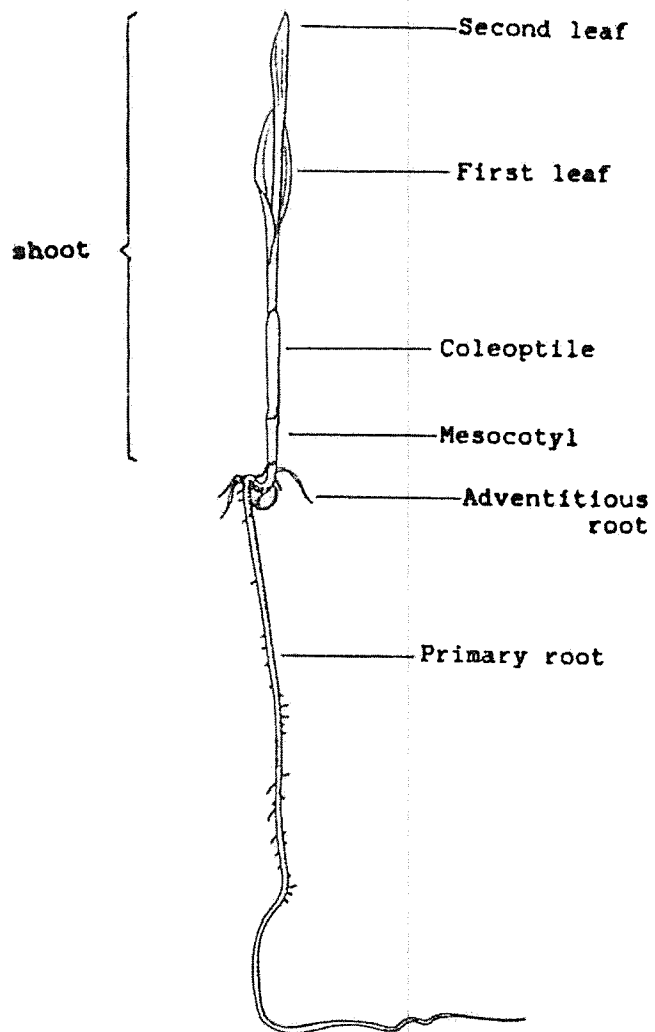


Fig. 1. Sorghum 7-day seedling.

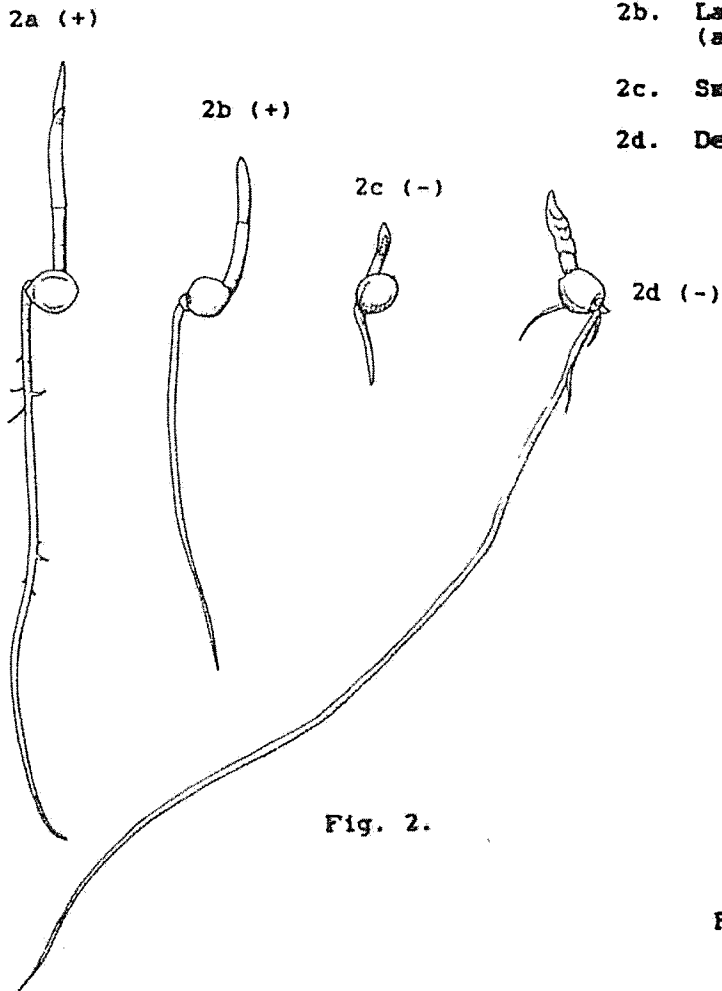
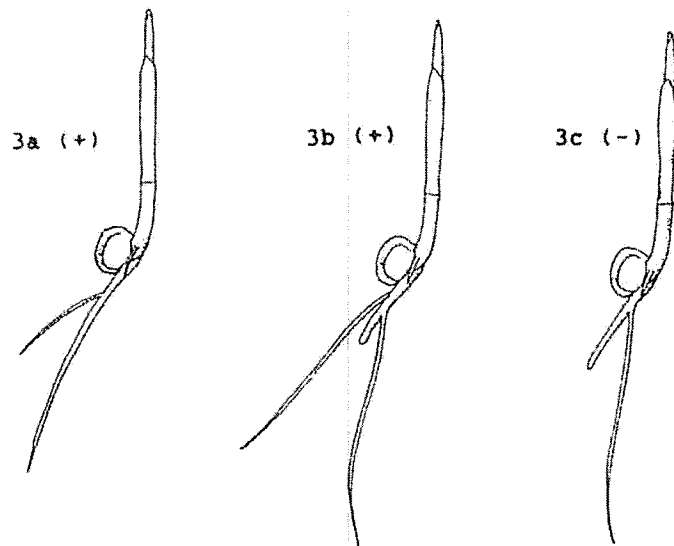


Fig. 2.

- 2a. Intact seedling. Pigmentation normal.
- 2b. Late-germinating seedling (at final count; see 3.5.1.b).
- 2c. Small weak seedling.
- 2d. Deformed grainy shoot.

Fig. 3. Root defects.



- 3a. Primary root long enough.
- 3b. Stubby primary root, with sufficient secondary roots.
- 3c. Stubby primary root, with insufficient secondary roots.

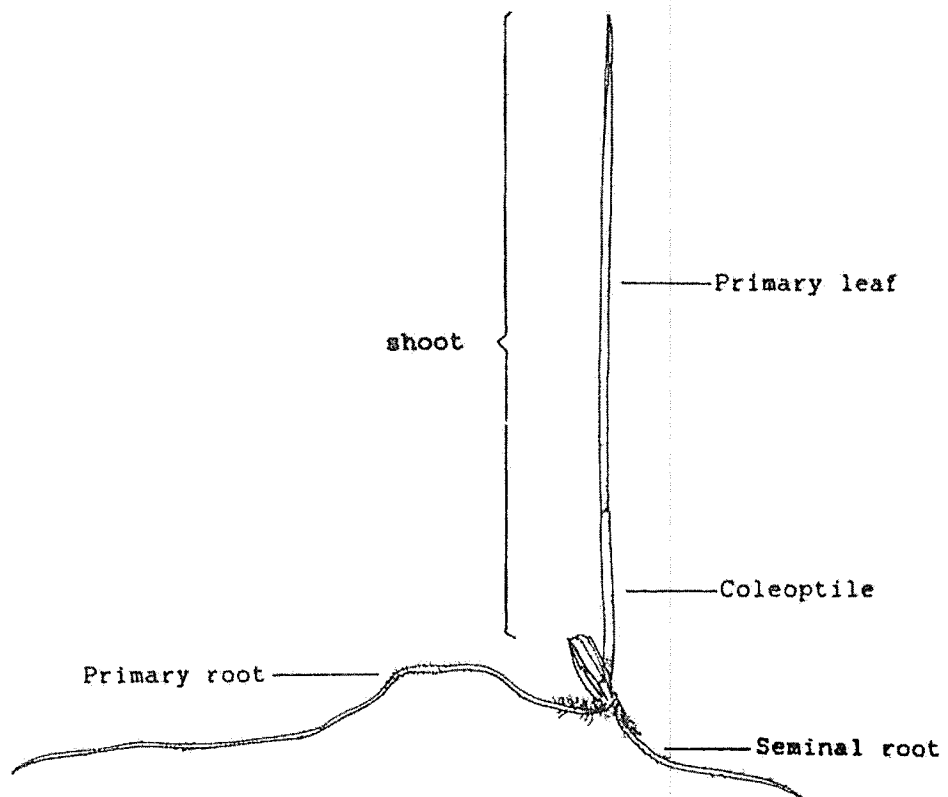
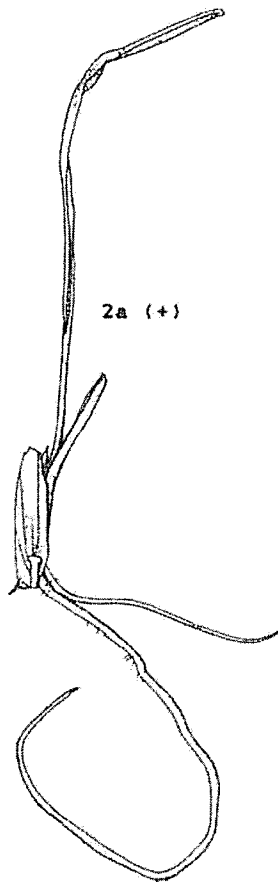
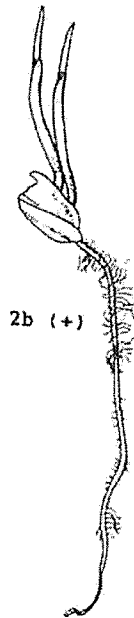


Fig. 1. Lolium 10-day seedling.

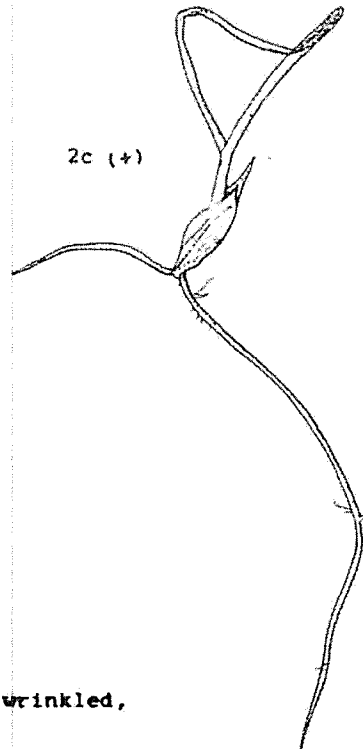
Fig. 2. Shoot defects.



2a (+)



2b (+)



2c (+)

2a. Coleoptile split and leaf wrinkled, shoot otherwise healthy.

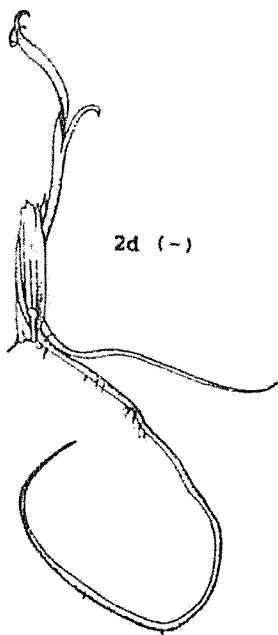
2b. Double shoot.

2c. Coleoptile split below the tip and leaf bursting out.

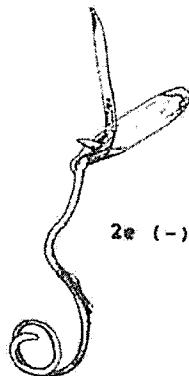
2d. Badly split or shredded leaf.

2e. Leaf less than half the length of the coleoptile.

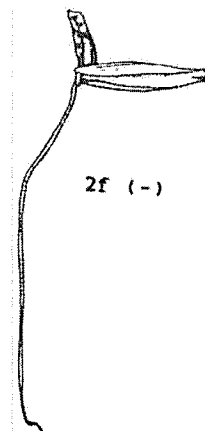
2f. Short grainy shoot.



2d (-)

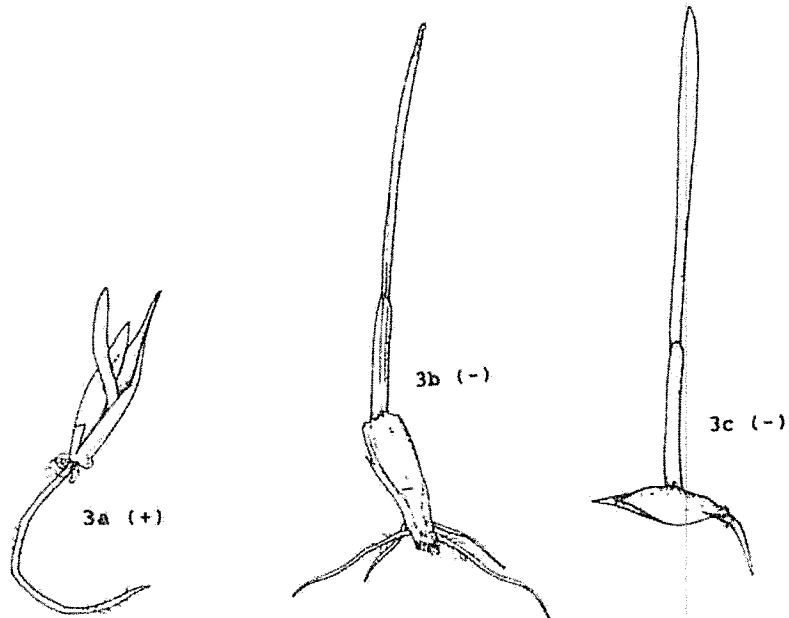


2e (-)



2f (-)

Fig. 3. Root defects.

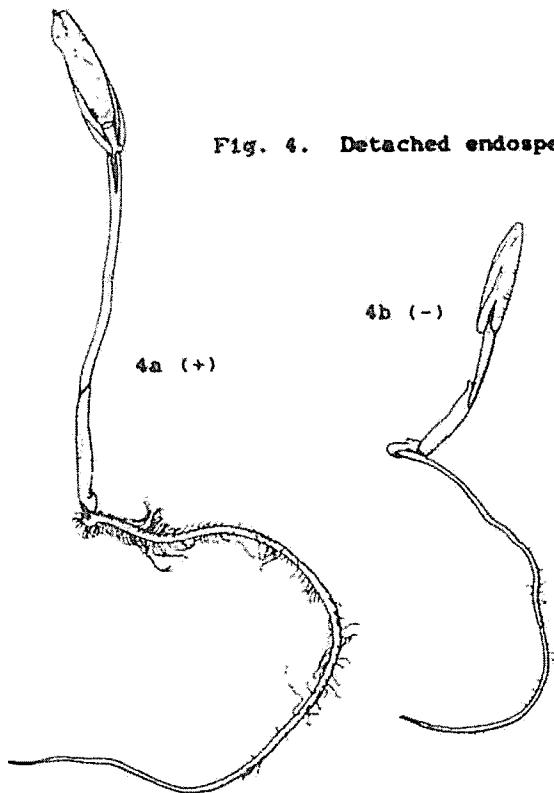


3a. Late-germinating seedling (at final count; see 3.5.1.b).

3b. Missing primary root (note shrivelled leaf tip).

3c. Stubby primary root.

Fig. 4. Detached endosperm.



4a. Endosperm detached from the root/shoot axis and seedling strong.

4b. Endosperm detached from the root/shoot axis and seedling weak.

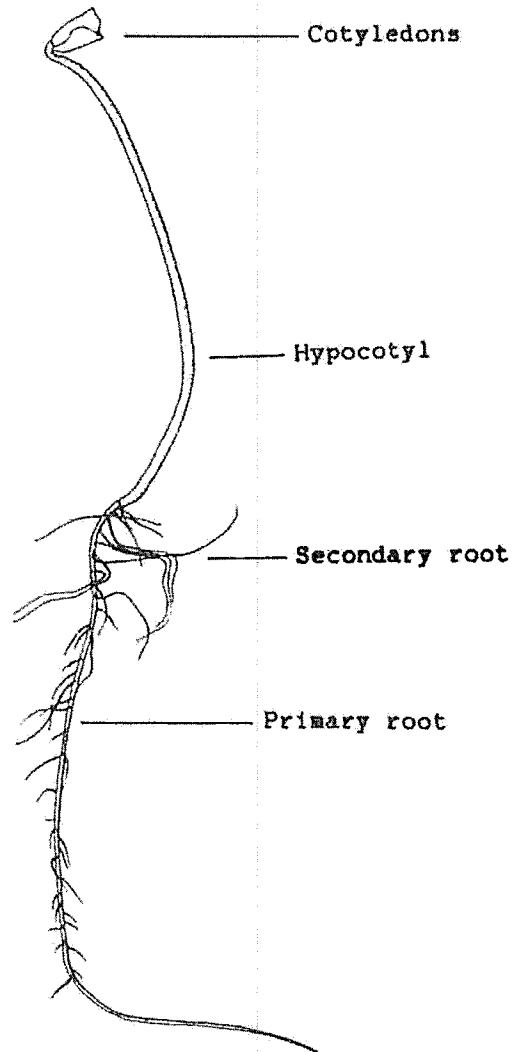


Fig. 1. Buckwheat 6-day seedling.

Fig. 2. Small seedlings.

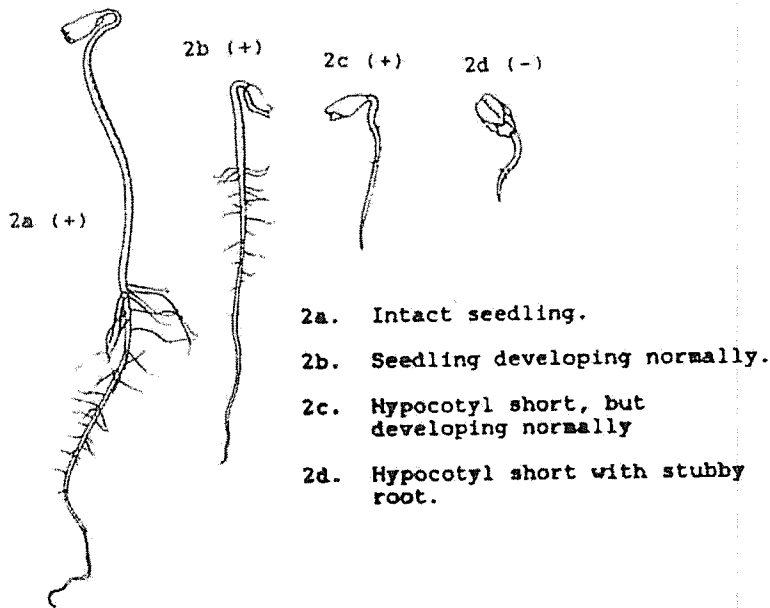
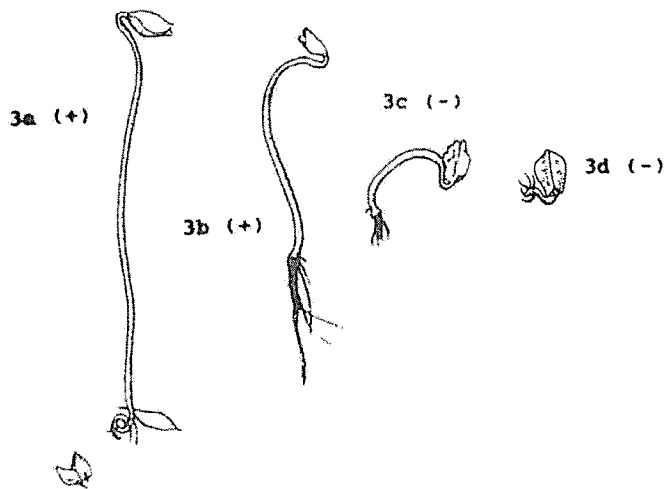
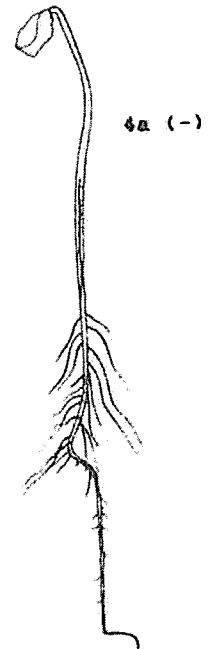


Fig. 3. Root defects.



- 3a. Root coiled inside seed coat.
- 3b. Primary root damaged or missing, sufficient secondary or adventitious roots.
- 3c. Insufficient roots.
- 3d. Insufficient roots and short hypocotyl.

Fig. 4.



- 4a. Deep hypocotyl lesion (see 3.5.9)