Rules Proposal No. 10

AOSA RULES CHANGE PROPOSAL

KIND OF SEED

All dicótyledonous species.

PRESENT RULE

New rule.

PROPOSED RULE

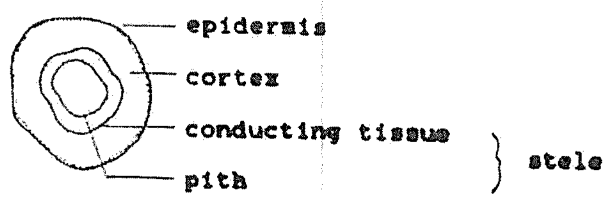
Add an elaboration of lesion assessment as Section 3.5.9 of the Seedling Evaluation Handbook:

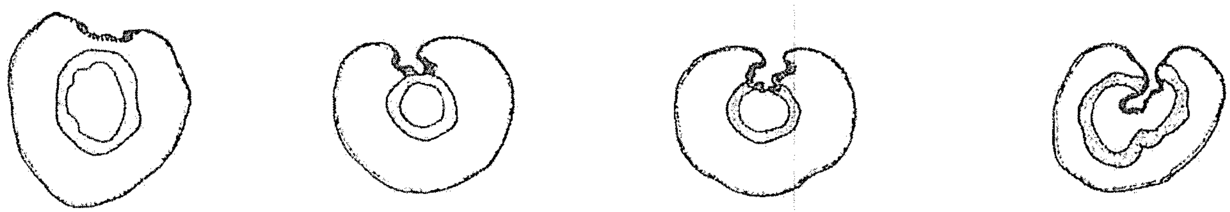
3.5.9 Lesions in dicotyledonous species

In seedlings of dicotyledons the root/shoot axis is made up of a central stele (or cylinder), surrounded by cortex and epidermis. The conducting tissues are in a concentric ring forming the outer layers of the stele, and serve to transport water and nutrients. In the seedling descriptions, deep open cracks extending into the conducting tissue of the hypocotyl or epicotyl are considered to be abnormalities, for two reasons: (a) interference with movement of water and nutrients through the affected area, and (b) increased susceptibility of the seedling to microorganism attack.

The location of the conducting tissue (i.e. distance from the surface) may vary between species and it is not readily visible without magnification. Therefore, it is strongly recommended that some time be spent observing hypocotyl and epicotyl cross-sections under the microscope. It is particularly useful to observe various types of lesions in cross section, in order to get a "feel" for the link between the appearance of the lesion and its severity.

The following drawings of a soybean hypocotyl cross section illustrate the severity of lesion depth. Note that this guideline cannot be applied to monocots, because in monocots the vascular bundles are not in a clearly defined concentric ring, but are scattered.





shallow lesion (normal)

lesion to, but not into conducting tissue (normal)

lesion into conducting tissue (abnormal)

lesion through conducting tissue (abnormal)

REASONS FOR THE RULE

Classification of seedlings with deep lesions as abnormal is a long-standing and accepted rule in germination testing. The addition of the proposed Handbook section 3.5.9 will contribute to uniformity in application of this rule, as well as aid in the training of analysts. Since the rule is applied uniformly to all dicots, its placement in Section 3.5.9 avoids the duplication which would occur if the elaboration was placed with each description.

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November 27, 1990

Rules Proposal No. 11

AOSA RULES CHANGE PROPOSAL

KIND OF SEED

Cereals and small grasses.

PRESENT RULE

One of the abnormal seedling descriptions in the Seedling Evaluation Handbook, sections 4.10.1.b (cereals) and 4.10.5.b (small grasses):

"- scutellum obviously detached from the endosperm (e.g. kernel lifted away by the growing shoot) and the seedling very weak in comparison with other seedlings in the same test."

PROPOSED RULE

In the Seedling Evaluation Handbook abnormal seedling descriptions sections 4.10.1.b (cereals) and 4.10.5.b (small grasses), reword as follows:

"- endosperm obviously detached from the root/shoot axis (e.g. kernel lifted away by the growing shoot)."

REASONS FOR THE RULE

The detached endosperm condition is observed occasionally in the cereals and small grasses. In the cereals, its occurrence is generally not significant, but in certain lots of small grasses the number of affected seedlings can be significant.

The proposed rewording has two parts:

1. The current version states that the endosperm is detached from the scutellum. This is not strictly correct, because in some cases the separation occurs as a result of a fracture between the scutellum and the root/shoot axis (i.e. the scutellum remains attached to the endosperm). The proposed version states that the endosperm is detached from the root/shoot axis, which covers both possibilities. This change in wording has no impact on the outcome of the evaluation.

2. The current version states that only seedlings which are "very weak in comparison with other seedlings in the same test" should be classified as abnormal. The proposed version deletes this qualification, making all affected seedlings abnormal. There are three reasons why we feel this change should be made:

a. Grow-out tests done in Oregon (see attached), on the strongest of the seedlings with this condition, showed that 50% to 60% of the seedlings did not survive to produce plants. Plants that did survive produced seeds showing a high frequency of the same detached endosperm condition.

b. Another seedling description for these crop kinds states that seedlings with decay "at the point of attachment to the scutellum" are to be classified as abnormal, with no consideration given to the strength of the seedling. The detached endosperm condition has the same impact as decay, i.e. the food supply of the endosperm cannot be moved into the growing seedling. The method of evaluation for the two conditions should therefore be the same.

c. Removal of the requirement to make a subjective judgement of seedling strength will improve uniformity between analysts and laboratories.

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SUPPORTING EVIDENCE FOR "DETACHED ENDOSPERM" RULES CHANGE PROPOSAL

Coralie Wilson
Northrup King, Tangent, Oregon

The condition in which the root-shoot axis of a grass seed is detached from the scutellum and/or endosperm exhibits itself in a broad range of severity. Seedling development may be barely discernible by the end of the test with only the blunt base of the coleoptile protruding and no visible root development. At the other end of the range, seedlings appear otherwise normal with a green leaf and good root, although they are usually smaller than other seedlings in the same test which are not detached.

In the two studies on perennial ryegrass described below, only the detached seedlings which were otherwise normal were used for grow-out. No record was kept on what percentage this would have been of the total detached seedlings present in the samples used.

Study 1.

In 1982 Dr. Don Grabe at Oregon State University planted forty detached seedlings from three lots of a variety of perennial ryegrass in which this abnormality was significant in germination tests, i.e. up to 3.25%.

Eighteen plants (40%) survived and grew to maturity in pots in the greenhouse. Seed produced by these plants was not harvested separately.

Study 2.

In 1986 another variety of perennial ryegrass under development was found to produce an even greater percentage of detached seedlings. It was decided to continue study on these seedlings at the Northrup King Co., Tangent, Oregon laboratory.

On 10-7-86, fifteen detached but otherwise normal seedlings were planted in pots. By 10-28-86, seven seedlings had died. The remainder were planted outdoors with isolation. All survived and grew to maturity in the summer of 1987. Six of the plants produced seed. Germination of this seed produced the following results:

Plant no.	Normal %	Detached %	Other Abnormals	Ungerminated %
2	61.75	11.75	13.25	13.25
3	50.00	22.50	23.25	4.25
5	49.00	14.50	18.25	18.25
6	30.50	44.50	16.25	8.75
7	14.25	1.00	12.25	72.50
8	42.00	5.00	14.50	38.50
control	88.25	1.00	5.50	5.25

Rules Proposal No. 12

AOSA RULES CHANGE PROPOSAL

KIND OF SEED

All species of Poaceae.

PRESENT RULE

The AOSA Seedling Evaluation Handbook (adopted in June 1989, published in AOSA Newsletter 63(2), February 1989), uses the term "epicotyl" in reference to the coleoptile and leaf. Mesocotyl is treated separately.

For example, Section 4.10.1 (cereals) is written, in part:

b Abnormal seedling description

Epicotyl
- missing
- no leaf
- (etc.)

Mesocotyl (if visible)
- deep open cracks

PROPOSED RULE

1. Replace the term "epicotyl" with the term "shoot" wherever it appears in the Poaceae descriptions of the Handbook. Include the mesocotyl description in the shoot description.

   For example:

   b Abnormal seedling description

   Shoot
   - missing
   - no leaf
   - (etc.)
   - deep open cracks in the mesocotyl

2. Modify the definition of "shoot" in the glossary as follows (underlined words added to the existing definition):

   Shoot.
   A collective term including all structures above the root in epigeal species and above the cotyledonary node in hypogeal species. <u>In the Poaceae, all structures above the scutellar node are included, i.e. the mesocotyl, coleoptile and leaves.</u>

REASONS FOR THE RULE

In writing the Seedling Evaluation Handbook, it was generally agreed that the old term "plumule" used in the Poaceae descriptions should be abandoned because there was not a clear interpretation as to what the term meant, and since it had been in use for a long time, it would be difficult for users of the Handbook to accept a single definition. There was an extraordinary amount of debate over which term to use as a replacement, and in the end, to finish the debate and proceed with the rest of the Handbook, epicotyl was chosen. The term "shoot" was rejected at that time because it can have a very broad meaning, not restricted to the seedling stage of growth; "epicotyl", on the other hand, is used in all of the other families and is restricted to the seedling stage.

The Seedling Evaluation Committee has reevaluated the use of "epicotyl" in the Poaceae descriptions, and feels that it should be replaced with "shoot" for the following reasons:

1. Epicotyl means "above the cotyledon". In the Poaceae, the location of the cotyledon is not at all clear, and has been the subject of academic debate for many years. Use of the term "mesocotyl" implies that the coleoptile is part of the cotyledon. If this is correct then the coleoptile cannot also be part of the epicotyl. The current description is therefore incorrect, either in the use of the term mesocotyl or in including the coleoptile in the description of the epicotyl.
2. Epicotyl is not used by seed analysts or researchers in reference to the Poaceae.
3. The part of the Poaceae seedling growing above the scutellar node is complex, consisting of mesocotyl, coleoptile and leaf, with enclosed growing point. There is no precise botanical term which includes the entire structure. The term epicotyl is inadequate because it cannot include the mesocotyl (and perhaps should not include the coleoptile).
4. The term "shoot" is in common usage among seed analysts, and its definition is unambiguous and widely understood. This term, as defined, includes all of the structures above the scutellar node.

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November 27, 1990

Rules Proposal No. 13

AOSA RULES CHANGE PROPOSAL

KIND OF SEED

Polygonaceae - Fagopyrum esculentum (buckwheat); Rheum rhabarbarum (rhubarb); Rumex acetosa (sorrel)

PRESENT RULE

The seedling description for Polygonaceae is contained in the "miscellaneous" Section 4.11 of the Seedling Evaluation Handbook which was adopted in June 1989 (AOSA Newsletter 63(2):72-73, February 1989). This section includes 9 families, with one seedling description covering all.

PROPOSED RULE

Place a full description of the Polygonaceae, as given in the attached, in the Handbook. In the attached, the underlined words are new. If the proposal is adopted, Polygonaceae would be removed from the miscellaneous section of the Handbook, and the Handbook sections would be renumbered.

REASONS FOR THE RULE

The current seedling descriptions lump nine diverse families under one description. Separation of the Polygonaceae from the miscellaneous section will allow inclusion of seedling drawings specific to this family. There is no change in the intent of the abnormal seedling descriptions already accepted for the Handbook, with the following two exceptions:

1. Under abnormal seedlings, the category "seedling" has been added, to cover seedlings impaired due to primary infection, and albinos.
2. Under "root", the word "weak" has been added in reference to the primary root.

These additions are consistent with the other descriptions of the Handbook.

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DATE:

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[UNDERLINED WORDS ARE NEW]

1 Polygonaceae, Knotweed family

1.1 Polygonaceae = All kinds

Fagopyrum esculentum, buckwheat
Rheum rhabarbarum, rhubarb
Rumex acetosa, sorrel

a General description

Germination habit: Epigeal.

Food reserves: Cotyledons, starchy endosperm

Shoot system: The hypocotyl elongates carrying the cotyledons above the soil surface. The epicotyl usually does not show any development within the test period.

Root system: A primary root with secondary roots developing within the test period for some species.

b **Abnormal seedling description**

Cotyledons

-less than half of the original cotyledon tissue remaining attached

-less than half of the original cotyledon tissue free of necrosis or decay

Epicotyl:

-missing (may be assumed to be present if cotyledons are intact)

Hypocotyl:

-deep open cracks or grainy lesions extending into the conducting tissue

-malformed, such as markedly shortened, curled or thickened

-watery

Root:

-none

-weak, stubby or missing primary root with weak secondary or adventitious roots

Seedling:

-one or more essential structures impaired as a result of decay from primary infection

-albino

Rules Proposal No. 14

AOSA RULES CHANGE PROPOSAL

KIND OF SEED

All tree and shrub seeds.

PRESENT RULE

The seedling description for trees and shrubs is contained in Section 4.12 of the Seedling Evaluation Handbook which was adopted in June 1989 (AOSA Newsletter 63(2):74-75, February 1989). This section covers all species of trees and shrubs found in the rules, with one seedling description covering all.

PROPOSED RULE

Split the tree and shrub seedling descriptions into three sections:

1. Gymnosperms (3 families, 14 genera);
2. Angiosperms with hypogeal germination (3 families, 3 genera);
3. Angiosperms with epigeal germination (22 families, 28 genera).

The descriptions are new, as given in the attached.

If the proposal is adopted, Section 4.12 would be removed, and the Handbook sections would be renumbered.

REASONS FOR THE RULE

The current seedling descriptions lump all of the tree and shrub families together under one description, with no consideration of differences in seedling morphology. The proposed descriptions allow appropriate description of the major family groups. The descriptions are consistent with the principles of seedling evaluation, and are consistent with the format of the rest of the Handbook. Note that the number of species included in the proposal does not quite match the number of tree and shrub species listed in the Rules. This is because a few of the species in the Rules are tested only by the excised embryo method, and therefore no seedling descriptions are required.

These descriptions were prepared by the AOSA Tree and Shrub Working Group.

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1 Trees and shrubs

1.1 Gymnosperms

Cupressaceae
- Calocedrus decurrens
- Chamaecyparis spp.
- Platycladus orientalis
- Thuja spp.

Pinaceae
- Abies spp.
- Cedrus spp.
- Larix spp.
- Picea spp.
- Pinus spp.
- Pseudotsuga menziesii spp.
- Tsuga spp.

Taxodiaceae
- Sequoia sempervirens
- Sequoiadendron giganteum

a General description

Germination habit: Epigeal.

Food reserves: Gametophyte tissue which is absorbed through the cotyledons. The remnant falls off with the seed coat after hypocotyl elongation and soil emergence.

Shoot system: The hypocotyl elongates carrying the cotyledons above the soil surface; the epicotyl usually does not show any development within the test period. No elongation of the hypocotyl occurs in Pinus palustris.

Root system: A long primary root.

b Abnormal seedling description

Cotyledons

-emerging before the radicle

Epicotyl:

-missing (may be assumed to be present if cotyledons are intact)

Hypocotyl:

-short, thickened - dwarf
-grainy in appearance
-carrying a collar of endosperm tissue
-watery - translucent in appearance
-in *Pinus palustris*, hypocotyl elongation

Root:

-weak, stubby or missing primary root (secondary roots will not compensate for a defective primary root)
-trapped in the seed coat
-growing upward - negative geotropism

Seedling:

-one or more essential structures impaired as a result of primary infection
-fused embryos (twin embryos are normal provided one of the embryos is otherwise normal)
-weak or broken
-albino

1.2 Angiosperms with hypogeal germination

Fagaceae
Quercus spp
Hippocastanaceae
Aesculus pavia
Juglandaceae
Carya spp

a General description

Germination habit: Hypogeal.

Food reserves: Cotyledons which are large and fleshy, and remain enclosed within the seed coat beneath the soil surface. They are usually not photosynthetic.

Shoot system: The epicotyl elongates and carries the terminal bud and primary leaves above the soil surface. The stem bears one or more scale leaves and, prior to emergence, is arched near the apex, causing the terminal bud to be pulled through the soil; after emergence, the stem straightens. For practical purposes the hypocotyl is not discernible and is not an evaluation factor. There are buds in the axils of each cotyledon and scale leaf, but these usually remain dormant unless the terminal bud is seriously damaged.

Root system: A long primary root with secondary roots.

b **Abnormal seedling description**

Cotyledons

-less than half of the original cotyledon tissue remaining attached
-less than half of the original cotyledon tissue free of necrosis or decay

Epicotyl:

-missing
-less than one primary leaf
-malformed stem, such as markedly shortened, curled, or thickened
-severely damaged (e.g. terminal bud missing or damaged) with only a weak secondary epicotyl developing from the axil of a cotyledon or scale leaf
-two weak epicotyls
-deep, open cracks extending into the conducting tissue

Root:

-none
-weak, stubby or missing primary root with weak secondary roots

Seedling:

-one or more essential structures impaired as a result of decay from primary infection
-albino

1.3 Angiosperms with epigeal germination

Aceraceae
    Acer spp
Asteraceae
    Artemisia spp
Betulaceae
    Betula spp
Bignoniaceae
    Catalpa spp
Casuarinaceae
    Casuarina spp
Chenopodiaceae
    Atriplex canescens spp
    Ceratoides lanata
Cornaceae
    Cornus spp
Ephedraceae
    Ephedra viridis
Ericaceae
    Rhododendron spp
Fabaceae
    Gleditsia triacanthos
    Robinia pseudoacacia
Myrtaceae
    Eucalyptus spp
Nyssaceae
    Nyssa spp
Oleaceae
    Fraxinus spp
    Syringa vulgaris
Platanaceae
    Platanus occidentalis
Proteaceae
    Grevillea robusta
Rosaceae
    Crataegus mollis
    Purshia communis
    Rosa multiflora
Salicaceae
    Populus spp
Simaroubaceae
    Ailanthus altissima
Ulmaceae
    Ulmus spp
Vitaceae

Hamamelidaceae
    Liquidambar styraciflua
Magnoliaceae
    Liriodendron tulipifera
    Magnolia grandiflora

Vitis vulpina

a **General description**

Germination habit: Epigeal.

Food reserves: Cotyledons.

Shoot system: The hypocotyl elongates carrying the cotyledons above the soil surface. The epicotyl usually does not show any development within the test period.

Root system: A primary root; secondary roots may develop within the test period.

b **Abnormal seedling description**

Cotyledons
- -less than half of the original cotyledon tissue remaining attached
- -less than half of the original cotyledon tissue free of necrosis or decay

Epicotyl:
- -missing (may be assumed to be present if cotyledons are intact)

Hypocotyl:
- -malformed, such as markedly shortened, curled or thickened
- -deep, open cracks extending into the conducting tissue
- -watery - transluscent in appearance

Root:
- -none
- -missing or stubby primary root with weak secondary or adventitious roots

Seedling:
- -one or more essential structures impaired as a result of decay from primary infection
- -albino

Rules Proposal No. 15

KIND OF SEED:

Sorghum x drummondii, sorghum-sudangrass

PRESENT RULE:

New Rule

PROPOSED RULE:

1) Include in Table 1 (Weights for working samples, Agricultural Seeds) the following:

Kind of seed	Min. wt. for purity anal. (g)	Min. wt. for noxious-weed seed exam. (g)	Approx. no. seeds/gram	Approx. no. seeds/oz.
Sorghum x drummondii (Steudel) Millsp. and Chase sorghum-sudangrass	65	500	38	1080

2) Include in Table 3 (Methods of testing for laboratory germination, Agricultural Seeds) the following:

Kind of seed	Substrata	°C Temp.	First count days	Final count days	Spec. requir. and photo. #	Fresh and dormant seed
Sorghum x drummondii sorghum-sudangrass	B, T	20-30; 25	4	10		Prechill at 5° or 10°C. for 5 days

SUPPORTING EVIDENCE OR REASONS FOR THE PROPOSED RULE:

A survey, the results of which are published elsewhere in the this issue of the Newsletter, indicates that most official seed testing laboratories test samples of sorghum-sudangrass, Sorghum x drummondii. Sorghum-sudangrass is a kind in the Federal Seed Act (FSA)(1) and the rules for testing seeds of the International Seed Testing Association (ISTA)(2).

Using different procedures given by the survey respondents and the FSA and ISTA rules, the following results were obtained on six samples of sorghum-sudangrass at 10 days:

Sample Number	20°C URT 1/	20°C B 2/	20-30°C URT	20-30°C B	25°C URT	25°C B
1	80.25	80.00	84.25	83.75	81.75	83.25
2	86.25	88.75	85.50	91.25	90.25	92.25
3	65.75	64.50	69.50	66.50	69.00	67.25
4	92.50	95.00	94.50	94.25	95.75	96.00
5	91.50	94.25	93.25	92.50	94.00	93.25
6	92.75	91.00	94.75	92.50	93.75	95.50

1/ Upright rolled towels.
2/ Between blotters.

Five of the lowest results of the six samples occurred when the seed was tested at 20°C. Additionally, seedling development is very slow at 20°C. For these reasons, this temperature is not recommended. Results obtained at 20-30°C and 25°C were very similar, with seedling development fastest at 25°C. Germination percentages obtained using either paper toweling or between blotters as substrate were nearly identical.

Based on these preliminary findings, a germination referee was prepared using subsamples of the above samples number 1, 3, and 4 and sent to sixteen official seed testing laboratories. The laboratories were requested to germinate the samples at both 20-30°C and 25°C, using paper toweling or between blotters as substrate.

Responses were received from fourteen labs. The results were analyzed according to the procedure outlined by Sundermeyer (3). The following results were obtained:

Sample 1; 20-30°C

Laboratory No.	Substrate	Normal	Abnormal	Dead	
					tol. 1 (90%)
5	B	89	1	10	
					tol. 2 (88%)
15	B	85	4	11	
16	T	84	4	12	
6	T	83	6	11	
7	T	83	4	13	
14	T	83	9	8	ave. 1 (82%)
13	B	82	3	15	ave. 2 (82%)
1	T	81	4	15	
8	T	81	5	14	
11	T	81	5	14	
4	T	80	6	14	
9	T	80	5	15	
2	T	79	7	14	
3	T	78	5	17	
					tol. 2 (76%)
					tol. 1 (74%)

All results between 76% and 88% are within tolerances.

Sample 1; 25°C

Laboratory No.	Substrate	Normal	Abnormal	Dead	
					tol. 1 (90%)
5	B	89	3	8	
					tol. 2 (88%)
1	T	86	5	9	
6	T	83	6	11	
11	T	83	6	11	ave. 1 (82%)
14	T	82	8	10	ave. 2 (82%)
3	T	81	7	12	
4	T	81	5	14	
8	T	81	5	14	
2	T	80	4	16	
7	T	80	4	16	
16	T	80	9	11	
9	T	79	6	15	
					tol. 2 (76%)
					tol. 1 (74%)

All results between 76% and 88% are within tolerances.

Sample 3; 20-30°C

Laboratory No.	Substrate	Normal	Abnormal	Dead	
					tol. 1 (79%)
					tol. 2 (76%)
13	B	72	5	23	
15	B	72	7	21	
5	B	71	2	27	
14	T	71	8	21	
1	T	70	5	25	
16	T	70	8	22	
8	T	69	8	23	ave. 1 (68%)
4	T	68	5	27	ave. 2 (68%)
3	T	67	5	28	
11	T	67	12	21	
9	T	66	4	30	
7	T	65	6	29	
6	T	63	6	31	
2	T	60	8	32	
					tol. 2 (60%)
					tol. 1 (57%)

All results between 60% and 76% are within tolerances.

Sample 3; 25°C

Laboratory No.	Substrate	Normal	Abnormal	Dead	
					tol. 1 (79%)
					tol. 2 (76%)
5	B	75	4	21	
14	T	72	6	22	
16	T	72	8	20	
3	T	71	8	21	
8	T	70	5	25	
2	T	69	4	27	ave. 1 (68%)
1	T	68	7	25	ave. 2 (68%)
7	T	67	2	31	
6	T	65	14	21	
4	T	64	4	32	
11	T	64	8	28	
9	T	60	6	34	
					tol. 2 (60%)
					tol. 1 (57%)

All results between 60% and 76% are within tolerances.

Sample 4; 20-30°C

Laboratory No.	Substrate	Normal	Abnormal	Dead	
					tol. 1 (99%)
					tol. 2 (98%)
1	T	97	1	2	
4	T	97	1	2	
5	B	97	1	2	
8	T	96	2	2	
15	B	96	1	3	
16	T	96	3	1	ave. 1 (95%)
3	T	95	1	4	ave. 2 (95%)
9	T	95	1	4	
14	T	95	3	2	
6	T	94	3	3	
7	T	94	2	4	
11	T	93	3	4	
13	B	93	2	5	
2	T	92	5	3	
					tol. 2 (92%)
					tol. 1 (91%)

All results between 92% and 98% are within tolerances.

Sample 4; 25°C

Laboratory No.	Substrate	Normal	Abnormal	Dead	
					tol. 1 (99%)
					tol. 2 (98%)
5	B	97	0	3	
16	T	97	2	1	
3	T	96	1	3	
8	T	96	2	2	
1	T	95	2	3	
6	T	95	1	4	ave. 1 (94%)
4	T	94	4	2	ave. 2 (94%)
2	T	93	2	5	
9	T	93	4	3	
11	T	93	3	4	
14	T	93	3	4	
7	T	90	1	9	
					tol. 2 (90%)
					tol. 1 (89%)

All results between 90% and 98% are within tolerances.

The referee results indicate that the procedures produce uniformity in germination testing of sorghum-sudangrass between laboratories. Although none of the samples tested had dormancy, a prechill is recommended for fresh and dormant seed. Many of the respondents in the survey indicated that a prechill is used on fresh and dormant seeds. Additionally, a prechill is given in both the FSA(1) and ISTA Rules(2).

As with other Sorghum spp. currently in the AOSA rules, the seed unit includes caryopses and single florets as well as entire spikelets which may have attached rachis segments, pedicels, and sterile spikelets. Seed weight for sorghum-sudangrass is the average of seed weights of eight samples of different lots of seed, using the procedures for weight determination in the ISTA Rules(2).

References:

1. USDA. 1987. Federal Seed Act. Part 201 - Federal Seed Act Regulations.

2. International Seed Testing Association. 1985. International rules for seed testing. Seed Sci. and Tech. 13 (2). Revised 1990. 520pp.

3. Sundermeyer, E.W. 1975. Suggested procedure for analysis of referee test results. Seed Technologists News 45 (3). pp. 13-15.

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Rules Proposal No. 16

KIND OF SEED:

Trifolium vesiculosum, arrowleaf clover

PRESENT RULE:

New Rule

PROPOSED RULE:

1) Include in Table 1 (Weights for working samples, Agricultural Seeds) the following:

Kind of seed	Min. wt. for purity anal. (g)	Min. wt. for noxious-weed seed exam. (g)	Approx. no. seeds/gram	Approx. no. seeds/oz.
Trifolium vesiculosum Savi, arrowleaf clover	4	40	705	20,000

2) Include in Table 3 (Methods of testing for laboratory germination, Agricultural Seeds) the following:

Kind of seed	Substrata	°C Temp.	First count days	Final count days	Spec. requir. and photo. #	Fresh and dormant seed
Trifolium vesiculosum arrowleaf clover	B,T	20; 15	4	14[a]	See sec. 4.9-C.	

SUPPORTING EVIDENCE OR REASONS FOR THE PROPOSED RULE:

A survey, which is reported in this issue of the AOSA Newsletter, shows that many laboratories test seeds of arrowleaf clover, *Trifolium vesiculosum*. Not all of the survey respondents test the same amounts for purity tests and noxious-weed seed examinations. Germination procedures also varied, particularly in days of first and final counts. Arrowleaf clover is a kind found in the Federal Seed Act(1) and the International Rules for Seed Testing(2).

Some preliminary tests were conducted to compare germination testing procedures reported in the survey. Five samples were tested at three different temperatures (15°, 18°, and 20°C). The samples were tested on three different substrata (upright rolled towels, between blotters, and in covered plastic boxes on top of blotters). All germinators used had light for eight hours of each twenty-four hour period. Because the International Rules for Seed Testing has a ten day final count and the Federal Seed Act has a fourteen day final count, all tests were counted at ten days, removing and recording all normals, abnormals, and dead seeds, and recording and leaving all hard seeds on the test for four additional days. The results obtained are as follows:

Sample No.	Temperature	Substrate 1/	Germ. & Hard Seed (14 days)
1	15	URT	87.25
1	15	B	91.75
1	15	PB	89.00
1	18	URT	86.50
1	18	B	88.75
1	18	PB	84.00
1	20	URT	84.50
1	20	B	91.50
1	20	PB	67.75
2	15	URT	73.50
2	15	B	78.25
2	15	PB	79.50
2	18	URT	82.00
2	18	B	79.50
2	18	PB	85.00
2	20	URT	75.00
2	20	B	84.50
2	20	PB	74.50
3	15	URT	77.75
3	15	B	77.50
3	15	PB	80.25
3	18	URT	80.75
3	18	B	81.25
3	18	PB	83.00
3	20	URT	77.00
3	20	B	84.00
3	20	PB	*
4	15	URT	81.75
4	15	B	82.75
4	15	PB	84.75
4	18	URT	85.75
4	18	B	84.00
4	18	PB	83.50
4	20	URT	78.00
4	20	B	88.50
4	20	PB	68.75

Sample No.	Temperature	Substrate	Germ. & Hard Seed (14 days)
5	15	URT	66.50
5	15	B	74.50
5	15	PB	72.75
5	18	URT	73.00
5	18	B	68.00
5	18	PB	73.75
5	20	URT	79.75
5	20	B	73.25
5	20	PB	64.66

1/ Abbreviations used for substrata are as follows: URT = upright rolled towels, B = between blotters, PB = in covered plastic boxes on top of blotters.

*Results exceeded the maximum tolerated range between replicates.

The results indicate that similar germination percentages can be obtained at any of the three temperatures tested. There is a substrate effect evident in these results. When planted on top of blotters in covered plastic boxes, germination of the samples was usually lowest when tested at 20°. This seems to be a light effect. Seedling development was retarded and many seeds did not germinate with this light/temperature combination. The light intensity was greatest in this particular germinator than the other two used in this study. While this effect deserves further study, the data reported here seem sufficient to avoid recommending the substrata P or TB for this proposal.

When comparing the results of a ten day count vs. a fourteen day count, using only the results from the tests with towels or blotters, the fourteen day count averaged only 0.35 percent higher than at ten days for the thirty tests. The light effect was observed here also, as the fourteen tests of the seeds germinated in light averaged an increase of 3.50% between ten day and fourteen day counts.

The following results provided by Sharon Lusk of Agri Seed Testing of Salem, Oregon support the finding that 15°C is a suitable temperature for germination of arrowleaf clover:

arrowleaf clover germination, 14 days
substrate = T

Sample	Temperature	Germ. & Hard Seed
A	15	87.75
A	20	89.50
B	15	88.50
B	20	89.50
C	15	94.25
C	20	95.25
D	15	70.00
D	20	68.00
E	15	65.50
E	20	67.50
F	15	62.75
F	20	66.25

Following the preliminary investigation of germination procedures, a referee project was prepared. Subsamples of samples 1, 3, and 5 used in the preliminary studies were sent to thirteen different laboratories. Instructions were to germinate the seeds using either between blotters or on paper toweling at a temperature of either 18°C or 20°C. A first count was suggested at four days and the final count at fourteen. Results were received from twelve labs. Statistical analysis was done by the procedure outlined by Sundermeyer(3). The following results were obtained:

Sample 1

Lab No.	Substrate	Temp.	Normal + Hard	Normal	Hard	Abnormal	Dead	
								tol. 1 (98%)
4	B	20	98	79	19	2	–	tol. 2 (98%)
8	B	20	98	78	20	1	1	
5	B	20	97	75	22	2	1	
3	B	20	96	79	17	3	1	
9	B	20	96	78	18	3	1	
10	B	20	95	73	22	3	2	ave. 2 (94%)
12	T	20	93	75	18	5	2	ave. 1 (93%)
2	B	20	92	75	17	7	1	
7	T	20	91	75	16	7	2	
1	T	18	90	75	15	8	2	
								tol. 2 (90%)
6	T	20	89	69	20	10	1	
								tol. 1 (88%)
11	B	20	86	68	18	–	14	

All results between 90% and 98% (normal + hard) are within tolerances.

Sample 3

Lab No.	Substrate	Temp.	Normal + Hard	Normal	Hard	Abnormal	Dead	
								tol. 1 (94%)
4	B	20	93	77	16	2	5	
5	B	20	93	82	11	3	4	
								tol. 2 (92%)
8	B	20	90	79	11	4	6	
3	B	20	89	75	14	3	8	
2	B	20	88	73	15	5	7	ave. 1 (87%)
9	B	20	86	75	11	12	2	ave. 2 (87%)
6	T	20	85	72	13	5	10	
10	B	20	85	72	13	5	10	
11	B	20	85	74	6	7	13	
7	T	20	82	73	9	12	6	
12	T	20	82	69	13	6	12	
								tol. 2 (82%)
1	T	18	80	73	7	8	12	
								tol. 1 (80%)

All results between 82% and 92% (normal + hard) are within tolerances.

Sample 5

Lab No.	Substrate	Temp.	Normal + Hard	Normal	Hard	Abnormal	Dead	
8	B	20	91	84	7	4	5	
								tol. 1 (88%)
								tol. 2 (86%)
4	B	20	85	78	7	9	6	
5	B	20	83	79	4	10	7	
3	B	20	82	73	9	14	4	
7	T	20	80	74	6	17	3	
11	B	20	80	74	6	7	13	
2	B	20	79	73	6	14	7	ave. 1 (79%)
9	B	20	79	74	5	18	3	ave. 2 (79%)
1	T	18	75	71	4	18	7	
10	B	20	75	68	7	16	9	
								tol. 2 (72%)
6	T	20	71	64	7	15	14	
								tol. 1(70%)
12	T	20	69	65	4	28	3	

All results between 72% and 86% (normal + hard) are within tolerances.

The seed unit for arrowleaf clover is the true seed. Seed weights were determined on pure seed from eleven samples of different lots using the procedures for seed weight determination in the International Rules for Seed Testing(2). Jane Bowdish of Agri Seed Testing provided seed weights on six more lots of arrowleaf clover. All of the seed weights she reported fall within the range of the eleven other determinations, so that the reported seed weight is the average of seventeen seed lots.

References:

1. USDA. 1987. Federal Seed Act. Part 201 - Federal Seed Act Regulations.

2. International Seed Testing Association. 1985. International rules for seed testing. Seed Sci. and Tech. 13 (2). Revised 1990. 520 pp.

3. Sundermeyer, E.W. 1975. Suggested procedure for analysis of referee test results. Seed Technologists News 45 (3). pp. 13-15.

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Rules Proposal No. 17

KIND OF SEED:

Brassica napus var. pabularia, Siberian kale

PRESENT RULE:

New Rule

PROPOSED RULE:

1) Include in Table 1 (Weights for working samples, Vegetable and Herb Seeds) the following:

Kind of seed	Min. wt. for purity anal. (g)	Min. wt. for noxious-weed seed exam. (g)	Approx. no. seeds/gram	Approx. no. seeds/oz.
Brassica napus var. pabularia (DC.) Reichb., Siberian kale	8	80	325	9215

2) Include in Table 3 (Methods of testing for laboratory germination, Vegetable and Herb Seeds) the following:

Kind of seed	Substrata	°C Temp.	First count days	Final count days	Spec. requir. and photo. #	Fresh and dormant seed
Brassica napus var. pabularia Siberian kale	B,T,P	20-30; 20	3	7		

SUPPORTING EVIDENCE OR REASONS FOR THE PROPOSED RULE:

The results of a survey, reported in this issue of the AOSA Newsletter, indicates that Siberian kale, Brassica napus var. pabularia, is tested by six of the forty laboratories responding. Siberian kale is a kind included in the Federal Seed Act (FSA)(1). Brassica napus is a crop listed in the International Seed Testing Association (ISTA) Rules for Seed Testing(2).

Laboratory germination tests were conducted on three samples of Siberian kale using procedures mentioned by the survey respondents, as well as procedures given by FSA and ISTA rules. Both germinators in this study had alternating cycles of sixteen hours dark/eight hours light. The 20-30°C germinator had light while at 30°C. The following results were obtained:

Siberian kale, 7 days

Sample	Temp.	Substrate 1/	Normal	Abnormal	Dead
1	20	B	95.25	2.50	2.25
1	20	URT	96.75	1.50	1.75
1	20	PB	93.50	4.00	2.50
1	20-30	B	96.75	2.50	0.75
1	20-30	URT	95.75	3.25	1.00
1	20-30	PB	96.75	2.25	1.00
2	20	B	96.75	2.00	1.25
2	20	URT	93.25	3.75	3.00
2	20	PB	94.00	2.75	3.25
2	20-30	B	91.75	4.25	4.00
2	20-30	URT	92.75	5.75	1.50
2	20-30	PB	92.25	4.50	3.25
3	20	B	97.50	0.50	2.00
3	20	URT	97.00	0.75	2.25
3	20	PB	98.25	0.75	1.00
3	20-30	B	98.00	0.25	1.75
3	20-30	URT	96.50	2.25	1.25
3	20-30	PB	97.00	1.00	2.00

1/ Abbreviations used for substrata are as follows: B = between blotters, URT = upright rolled towels, PB = in plastic boxes on top of blotters.

These results indicate that a temperature of either 20°C or 20-30°C and any of the three substrata B, T, or P are suitable for germination of Siberian kale.

A referee was prepared using subsamples of samples 2 and 3 used in the preliminary investigation of germination procedures. The samples were sent to eleven laboratories. The laboratories were requested to conduct germination tests on each sample using B (between blotters) and T (paper toweling) as substrata. The samples were to be germinated at either 20°C or 20-30°C, with the first count at three days and final count at seven days. Responses were received from ten laboratories, with one laboratory having used both temperatures. Referee results are presented below, with statistical analysis according to the method suggested by Sundermeyer (3).

Siberian kale, Sample 2, Substrate = B

Lab No.	Temp.	Normal	Abnormal	Dead	
					tol. 1 (97%)
7	20	97	1	2	
					tol. 2 (96%)
9	20-30	95	3	2	
2	20-30	93	2	5	
6	20-30	93	2	5	
1	20-30	92	5	3	ave. 1 (92%)
4	20-30	92	8	-	ave. 2 (92%)
8	20	92	2	6	
4	20	91	8	1	
5	20-30	91	7	2	
3	20-30	90	7	3	
10	20-30	89	8	3	
					tol. 2 (88%)
					tol. 1 (87%)

All results between 88% and 96% are within tolerances.

Siberian kale, Sample 2, Substrate = T

tol. 1 (97%)
tol. 2 (96%)

Lab No.	Temp.	Normal	Abnormal	Dead	
8	20	96	4	-	
9	20-30	96	3	1	
7	20	95	3	2	
10	20-30	93	5	2	
1	20-30	92	6	2	
2	20-30	92	1	7	ave. 1 (92%)
4	20-30	92	6	2	ave. 2 (92%)
6	20-30	92	4	4	
4	20	91	6	3	
5	20-30	90	6	4	
3	20-30	88	10	3	

tol. 2 (88%)
tol. 1 (87%)

All results between 88% and 96% are within tolerances.

Siberian kale, Sample 3, Substrate = B

tol. 1 (100%)
tol. 2 (100%)

Lab No.	Temp.	Normal	Abnormal	Dead	
7	20	99	-	1	
2	20-30	98	-	2	
9	20-30	98	1	1	
1	20-30	97	1	2	ave. 1 (97%)
4	20-30	97	2	1	ave. 1 (97%)
8	20	97	1	2	
3	20-30	96	2	2	
5	20-30	96	2	2	
6	20-30	96	1	3	
10	20-30	96	2	2	
4	20	95	4	1	

tol. 2 (94%)
tol. 1 (94%)

All results between 94% and 100% are within tolerances.

Siberian kale, Sample 3, Substrate = T

tol. 1 (100%)
tol. 2 (100%)

Lab No.	Temp.	Normal	Abnormal	Dead	
8	20	99	1	-	
1	20-30	98	1	1	
2	20-30	98	-	2	
4	20-30	98	2	-	
7	20	98	-	2	
9	20-30	98	1	1	
4	20	97	2	1	ave. 1 (97%)
5	20-30	97	2	1	ave. 2 (97%)
3	20-30	96	3	1	
6	20-30	96	1	3	
10	20-30	96	1	3	

tol. 2 (94%)
tol. 1 (94%)

All results between 94% and 100% are within tolerances.

Although the substrate P was not requested for this referee, one laboratory that normally tests Brassica spp. in petri dishes reported results using this substrate in addition to B and T. This laboratory reported a germination of 91% for sample 2 and 95% for sample 3. Each of these results are close to the average and within tolerances of the other referee results.

The seed weight used in the proposal is the average of three lots of seed of Siberian kale. The method of seed weight determination used is from the ISTA International Rules for Seed Testing(2). This value is in the range of seed weights given by Berggren (4) for Brassica napus. Siberian kale samples were used, along with other varieties of Brassica napus, by Berggren in making this seed weight determination. Musil (5) illustrates a very close size relationship between Siberian kale and cabbage. The seed weight of 325 seeds/gram for Siberian kale in this proposal compares very closely with the seed weight of 315 seeds/gram for cabbage given in the AOSA Rules for Testing Seeds, 2.4, Table 1 (6). As with other Brassica spp. currently in the AOSA rules., the seed unit for Siberian kale is a true seed.

References:

1. USDA. 1987. Federal Seed Act. Part 201 - Federal Seed Act Regulations.

2. International Seed Testing Association. 1985. International rules for seed testing. Seed Sci. and Tech. 13 (2). Revised 1990. 520 pp.

3. Sundermeyer, E.W. 1975. Suggested procedure for analysis of referee test results. Seed Technologists News 45 (3). pp. 13-15.

4. Berggren, Greta. 1962. Reviews on the taxonomy of some species of the genus Brassica, based on their seeds. Svensk Botanisk Tidskrift 56 (1). pp. 65-135.

5. Musil, Albina F. 1948. Distinguishing the species of Brassica by their seed. USDA. Misc. Pub. No. 643. 35 pp.

6. Association of Official Seed Analysts. 1988. Rules for testing seed. J. of Seed Tech. 12 (3). Revised 1989. p. 39.

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Rules Proposal No. 18.

AOSA RULES CHANGE PROPOSAL

KIND OF SEED

Tree and shrub.

PRESENT RULE

New.

PROPOSED RULE

Add text describing the gymnosperms to chapters 2 and 3 and the glossary of the Seedling Evaluation Handbook. The relevant sections with new wording underlined is attached.

REASONS FOR THE RULE

The current wording of Chapters 2 and 3 of the Seedling Evaluation Handbook (published in AOSA Newsletter 63(2), February 1989) deals only with the angiosperms. The seedling descriptions of Chapter 4, however, also include gymnosperms. Addition of the new text is necessary for completeness of the Handbook.

The added text was prepared by the Chairperson of the Tree and Shrub Seed Committee.

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