Passed

Proposal #32

Rule Change Proposal: Handbook 25

Present Rule

Scientific / Common Name	Family	Class	Classification Spp. A	F	H	contaminating R	S	T	V
Petroselinum crispum --parsley	(Apiaceae)	V,W	W	W	C	W	W	W	C

Proposed Rule

Scientific / Common Name	Family	Class	Classification Spp. A	F	H	contaminating R	S	T	V
Petroselinum crispum --parsley	(Apiaceae)	V, H, W	W	W	C	W	W	W	C

Supporting Evidence

The vegetative parts of this species may be considered either vegetable or herb. This would allow for classification of species contaminating seed lots of parsley, the herb, to be classified according to the herb column in Handbook 25.

Reference

Rosengarten, F. 1969. The Book of Spices. Livingston Publishing Co., Wynnewood, Pennsylvania.

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Passed

Proposal #33

Rule Change Proposal: Handbook 25

Present Rule

Scientific /Common Name	Family	Spp. Class	Classification: contaminating A	F	H	R	S	T	V
Poa secunda --bluegrass, alkali --bluegrass, big --bluegrass, Canby --bluegrass, Nevada --bluegrass, pine --bluegrass, Sandberg	(Poaceae)	A, T, W	W	W	W	W	W	C	W

Proposed Rule

Scientific /Common Name	Family	Spp. Class	Classification: contaminating A	F	H	R	S	T	V
Poa secunda --bluegrass, alkali --bluegrass, big --bluegrass, Canby --bluegrass, Nevada --bluegrass, pine --bluegrass, Sandberg	(Poaceae)	R, W	W	W	W	C	W	W	W

Supporting Evidence

This species of grass is considered a bunchgrass and therefore would be unsuitable as a turf species. The committee was unable to find evidence to support the use of this species as an agricultural crop. As a native species it would be more appropriately placed in the range and revegetative category. It is the recommendation of the Purity Subcommittee that this species be considered "R" and that the "A" and "T" designations be dropped.

Since this species is used commercially for revegetative purposes it should be considered a "C" under "R". It is not suitable as a turf species and if found as a contaminant in turf grass species it is considered undesirable by certain states.

References

Alderson, J. and W.C. Sharp. 1995. Grass Varieties in the United States. Lewis Publishers.

Stubbendieck, J., et al. 1992. North American Range Plants. Univ. of Nebraska Press.

USDA Forest Service. 1937. Range Plant Handbook. United States Government Printing Office, Washington, D.C.

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Passed

Proposal #34

Rule Change Proposal: Handbook 25

Present Rule

Scientific /Common Name	Family	Classification: Spp. Class	contaminating A	F	H	R	S	T	V
Rosmarinus officinalis --rosemary	(Lamiaceae)	H, W	W	W	C	W	W	W	C

Proposed Rule

Scientific /Common Name	Family	Classification: Spp. Class	contaminating A	F	H	R	S	T	V
Rosmarinus officinalis --rosemary	(Lamiaceae)	H, S, W	W	W	C	W	C	W	C

Supporting Evidence

This species is sold commercially as a landscape shrub. The Purity Subcommittee recommends the addition of "S" to the spp. classification. Further, it is recommended the contaminating classification for this species become "C" under the "S" category.

References

Bremness, L. 1994. The Eyewitness Handbook of Herbs. Dorling Kindersley.

Brenzel, K. (ed.). 1995. Sunset Western Garden Book. Sunset Publishing Corporation.

Brickell, C. and J.D. Zuk (eds.) 1997. The American Horticultural Society A-Z Encyclopedia of Garden Plants. DK Publishing, Inc.

Everett, T.H. 1982. The New York Botanical Garden Illustrated Encyclopedia of Horticulture. Vol. 9. Garland Publishing, Inc.

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#34

Passed

Proposal #35

Rule Change Proposal: Handbook 25

Present Rule

none

Proposed Rule

Scientific /Common Name	Family	Spp. Class	Classification: contaminating A	F	H	R	S	T	V
Solanum viarum --tropical soda apple	(Solanaceae)	W	W	W	W	W	W	W	W

Supporting Evidence

This species is considered a prohibited noxious weed in many southern states and is a Federal Noxious Weed.

Appropriate changes will be made to the appendices of the handbook to accommodate this addition.

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Date of Proposal: October 1, 1997

Passed

Proposal #36

Rule Change Proposal: Handbook 25

Present Rule

Scientific /Common Name	Family	Spp. Class	Classification: contaminating A	F	H	R	S	T	V
Sphaeralcea munroana --globemallow, munro	(Malvaceae)	F, W	W	C	W	W	W	W	W

Proposed Rule

Scientific /Common Name	Family	Spp. Class	Classification: contaminating A	F	H	R	S	T	V
Sphaeralcea munroana --globemallow, munro	(Malvaceae)	F, W	W	C	W	C	W	W	W

Supporting Evidence

Sphaeralcea munroana is a native wildflower species in North America (MT, ID, WA, WY, UT, CA). Therefore when found as a contaminant in seed used for revegetation purposes it should be considered other crop.

Reference

Everett, T.H. 1982. The New York Botanical Garden Illustrated Encyclopedia of Horticulture. Vol. 9. Garland Publishing, Inc.

Hickman, J. C. (ed.) 1993. The Jepson Manual, Higher Plants of California. Univ. of CA Press.

Stevens, R., et al. Forb and Shrub Seed Production Guide for Utah. Utah State University Extension.

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Passed

Proposal #37

Rule Change Proposal: Handbook 25

Present Rule

Scientific /Common Name	Family	Spp. Class	Classification: contaminating A	F	H	R	S	T	V
Tanacetum parthenium --matricaria --feverfew, common	(Asteraceae)	F, W	W	C	W	W	W	W	W

Proposed Rule

Scientific /Common Name	Family	Spp. Class	Classification: contaminating A	F	H	R	S	T	V
Tanacetum parthenium --matricaria --feverfew, common	(Asteraceae)	F, H,W	W	C	W	W	W	W	W

Supporting Evidence

This species is also used as a medicinal herb. This would allow for classification of species contaminating seed lots of common feverfew (the herb) to be classified according to the herb column in Handbook 25. Note: *Chrysanthemum parthenium* (L.) Bernh. is a synonym of *Tanacetum parthenium* (L.) Sch. Bip.

References

Bremness, L. 1994. The Eyewitness Handbook of Herbs. Dorling Kindersley.

Dobelis, I.N. (ed.). 1986. Magic and Medicine of Plants. The Reader's Digest Association, Inc.

Tyler, V.E. 1993. The Honest Herbal. Pharmaceutical Products, Inc.

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Passed

Proposal #38

Rule Change Proposal: Handbook 25

Present Rule

Scientific / Common Name	Family	Class	Classification: Spp. A	F	contaminating H	R	S	T	V
Thymus vulgaris --thyme, common	(Lamiaceae)		H, W	W	C	C	W	W	W	W

Proposed Rule

Scientific / Common Name	Family	Class	Classification: Spp. A	F	contaminating H	R	S	T	V
Thymus vulgaris --thyme, common	(Lamiaceae)		F, H	W	C	C	W	W	W	W

Supporting Evidence

This species is used as an ornamental and as an herb. This would allow for classification of species contaminating seed lots of common thyme, the flower, to be classified according to the flower column in Handbook 25.

Reference

Bremness, L. 1994. The Eyewitness Handbook of Herbs. Dorling Kindersley.

Brenzel, K. (ed.). 1995. Sunset Western Garden Book. Sunset Publishing Corporation.

Huxley, A (ed.). 1992. The New Royal Horticultural Society Dictionary of Gardening. Vol. 4. The Macmillan Press Limited.

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Passed

Proposal #39

Rule Change Proposal: Handbook 25

Present Rule

Scientific / Common Name	Family	Class	Classification: Spp. A	F	contaminating H	R	S	T	V
Thymus serphyllum --mother-of-thyme --thyme, lemon --thyme, creeping	(Lamiaceae)	F, W	W	C	C	W	W	W	W

Proposed Rule

Scientific / Common Name	Family	Class	Classification: Spp. A	F	contaminating H	R	S	T	V
Thymus serphyllum --mother-of-thyme --thyme, lemon --thyme, creeping	(Lamiaceae)	F, H,W	W	C	C	W	W	W	W

Supporting Evidence

This species is used as an ornamental and as an herb. This would allow for classification of species contaminating seed lots of lemon thyme, the herb, to be classified according to the herb column in Handbook 25.

References

Bremness, L. 1994. The Eyewitness Handbook of Herbs. Dorling Kindersley.

Brenzel, K. (ed.). 1995. Sunset Western Garden Book. Sunset Publishing Corporation.

Huxley, A (ed.). 1992. The New Royal Horticultural Society Dictionary of Gardening. Vol. 4. The Macmillan Press Limited.

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Passed

Proposal #40

RULE CHANGE PROPOSAL FORM

PRESENT RULE

Table 1. Weights for working sample of agricultural, vegetable and herb, flowers, and tree and shrub seeds.

Kind of seed	Minimum weight for purity analysis (grams)	Minimum weight for noxious weed seed or bulk examination (grams)	Approximate number of seeds per gram	Approximate number of seeds per ounce
Linaria maroccana Hook f. linaria	0.2	2	1,730	147,595

PROPOSED RULE

Table 1. Weights for working sample of agricultural, vegetable and herb, flowers, and tree and shrub seeds.

Kind of seed	Minimum weight for purity analysis (grams)	Minimum weight for noxious weed seed or bulk examination (grams)	Approximate number of seeds per gram	Approximate number of seeds per ounce
Linaria maroccana Hook f. linaria	0.2	2	14,040	398,015

SUPPORTING EVIDENCE

The purpose of this proposal is to correct an error in the current Rules.
Seed data obtained by actual counts of minimum weights for purity.

Linaria macroccana

Sample no.	Seeds per gram	Seeds per oz	Seeds per lb
1	15,230	431,771	6,908,328
2	13,610	385,844	6,173,496
3	13,870	393,215	6,291,432
4	14,170	401,720	6,427,512
5	12,941	366,888	5,870,208
6	14,415	408,665	6,538,644
Ave.	14,039	398,017	6,368,270

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DATE OF PROPOSAL

October 9, 1997

Passed

Proposal #41

RULE CHANGE PROPOSAL FORM

PRESENT RULE

Table 1. Weights for working sample of agricultural, vegetable and herb, flowers, and tree and shrub seeds.

Kind of seed	Minimum weight for purity analysis (grams)	Minimum weight for noxious weed seed or bulk examination (grams)	Approximate number of seeds per gram	Approximate number of seeds per ounce
Anagallis arvensis L. anagallis	2	20	1,170	3,317

PROPOSED RULE

Table 1. Weights for working sample of agricultural, vegetable and herb, flowers, and tree and shrub seeds.

Kind of seed	Minimum weight for purity analysis (grams)	Minimum weight for noxious weed seed or bulk examination (grams)	Approximate number of seeds per gram	Approximate number of seeds per ounce
Anagallis arvensis L. anagallis	2	20	1,200	34,035

SUPPORTING EVIDENCE

The purpose of this proposal is to correct an error in the current Rules.
Two samples analyzed gave an average count of 1,200 seeds per gram and 34,035 seeds per oz. Also, in Flower Seed Descriptions 1971. Betty Ransom Atwater lists the Approx. no. of seeds per gram = 1,200 and Approx. no. of seeds per oz = 34,000. Seed data obtained by actual counts of minimum weights for purity.

Proposal #41

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Passed

Proposal #42

RULE CHANGE PROPOSAL FORM

PRESENT RULE

Table 1. Weights for working sample of agricultural, vegetable and herb, flowers, and tree and shrub seeds.

New Rule

PROPOSED RULE

Table 1. Weights for working sample of agricultural, vegetable and herb, flowers, and tree and shrub seeds.

Kind of seed	Minimum weight for purity analysis (grams)	Minimum weight for noxious weed seed or bulk examination (grams)	Approximate number of seeds per gram	Approximate number of seeds per ounce
Hesperis matronalis L. dame's rocket sweet rocket	5	50	515	14,665

SUPPORTING EVIDENCE

Seed data obtained by actual counts of minimum weights for purity.

Hesperis matronalis

Sample no.	Seeds per gram	Seeds per oz	Seeds per lb
1	636	18,042	288,671
2	657	18,626	298,015
3	441	12,491	199,856
4	543	15,388	246,214
5	469	13,308	212,920
6	512	14,527	232,425
7	398	11,270	180,315

8	469	13,302	212,829
9	520	14,748	235,963
10	527	14,946	239,138
Ave.	517	14,665	234,138

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Proposal #43

RULE CHANGE PROPOSAL FORM

PRESENT RULE

Table 1. Weights for working sample of agricultural, vegetable and herb, flowers, and tree and shrub seeds.

New Rule

PROPOSED RULE

Table 1. Weights for working sample of agricultural, vegetable and herb, flowers, and tree and shrub seeds.

Kind of seed	Minimum weight for purity analysis (grams)	Minimum weight for noxious weed seed or bulk examination (grams)	Approximate number of seeds per gram	Approximate number of seeds per ounce
Iberis umbellata L.				
candytuft, annual	6	60	455	12,860

SUPPORTING EVIDENCE

Seed data obtained by actual counts of minimum weights for purity.

Iberis umbellata

Sample no.	Seeds per gram	Seeds per oz	Seeds per lb
1	444	12,587	201,398
2	375	10,617	169,873
3	445	12,956	207,295
4	461	13,069	209,110
5	526	14,912	238,594
6	460	13,027	208,429
Ave.	452	12,861	205,783

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DATE OF PROPOSAL

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Proposal #44

RULE CHANGE PROPOSAL FORM

PRESENT RULE

Table 1. Weights for working sample of agricultural, vegetable and herb, flowers, and tree and shrub seeds.

New Rule

PROPOSED RULE

Table 1. Weights for working sample of agricultural, vegetable and herb, flowers, and tree and shrub seeds.

Kind of seed	Minimum weight for purity analysis (grams)	Minimum weight for noxious weed seed or bulk examination (grams)	Approximate number of seeds per gram	Approximate number of seeds per ounce
Cosmos bipinnatus				
Cavanilles cosmos: sensation mammoth or crested types	16	160	160	4,495

SUPPORTING EVIDENCE

Seed data obtained by actual counts of minimum weights for purity.

Sample no.	Seeds per gram	Seeds per oz	Seeds per lb
1	139	3,946	63,141
2	163	4,627	74,028
3	154	4,360	69,764
4	159	4,502	72,032
5	163	4,627	74,028
6	157	4,440	71,034
7	162	4,598	73,574
8	167	4,723	75,027
9	181	5,120	81,920
10	149	4219	67,496
11	152	4,298	68,766
12	147	4,170	66,725
13	169	4,794	76,704
Ave.	159	4,494	71,865

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Proposal #45

RULE CHANGE PROPOSAL FORM

PRESENT RULE

Table 1. Weights for working sample of agricultural, vegetable and herb, flowers, and tree and shrub seeds.

New Rule

PROPOSED RULE

Table 1. Weights for working sample of agricultural, vegetable and herb, flowers, and tree and shrub seeds.

Kind of seed	Minimum weight for purity analysis (grams)	Minimum weight for noxious weed seed or bulk examination (grams)	Approximate number of seeds per gram	Approximate number of seeds per ounce
Gazania rigens (L.) Gaertner pied gazania	11	110	235	6,705
'Rubbed' seed	6	60	425	12,000

SUPPORTING EVIDENCE

Hortus III describes *Gazania* seed as "achenes villous". 'Rubbed' seed is seed which is hairless due to processing. Seed data obtained by actual counts of minimum weights for purity.

2	306	8,664	138,620
3	404	11,459	183,345
4	225	6,384	102,151
5	246	6,985	111,767
6	182	5,160	82,555
7	191	5,421	86,728
8	171	4,854	77,656
9	186	5,262	84,188
Ave.	235	6,708	107,322

Gazania 'rubbed' seed

1	325	9,214	147,420
2	648	18,356	293,693
3	355	10,052	160,834
4	366	10,376	166,018
Ave.	424	11,999	191,991

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Passed

Proposal #46

RULE CHANGE PROPOSAL FORM

Amended

PRESENT RULE

Methods of testing for laboratory germination, Agricultural seeds.

Kind of seed	Substrata	Temperature °C	First count days	Final count days	Additional directions
Coronilla varia Crownvetch	B,T. TB,S.	20	7	14[a]	

PROPOSED RULE

Methods of testing for laboratory germination, Agricultural seeds.

Kind of seed	Substrata	Temperature °C	First count days	Final count days	Additional directions
Securigeria ~~*Coronilla varia*~~ Crownvetch	B,T. TB,S.	20	7	14	Hard seeds: see sec. 4.2 d and 4~~9~~.9K(6). Swollen seeds: see sec. 4.8~~m~~. 4.8O Excessive moisture needed.

4.8 ~~m~~. Special procedures and alternate methods for germination in Crownvetch (*Coronilla varia*) - Swollen seeds: At the conclusion of the 14 day test period place seeds on new substrate and pierce the seedcoat with a sharp instrument, continue the test for 5 additional days. Alternate method: When a high percentage of swollen seeds remain at the end of the standard test, retest in a sealed polyethene enevelope. ziplock

SUPPORTING EVIDENCE

The current AOSA Rules do not adequately address the problem of swollen seed at the end of the prescribed test period for crownvetch. Variations in how analysts deal with swollen seeds result in inconsistencies in test procedures, reporting test results and in labeling seed lots. Determining viability of swollen seed by TZ may be an acceptable solution for some segments of the seed industry, but not for all. State highway and environmental projects have specific label requirements which do not include dorment seed, other than hard seed. Swollen seed must be alleviated to meet specifications.

Several changes have been made to the current Rules in an effort to reduce the number of swollen seed at the end of the test. Excessive moisture has been added to the Additional Directions column. The literature states that leachate from crownvetch seeds contains phenolic compounds which may prevent germination of the swollen seed or produce phytotoxic symptoms on otherwise normal seedlings (4,5). These substances accumulate in the substrate. Excessive moisture should reduce their effectiveness. Moving the swollen seed to a new substrate on the 14th day reduces contact with these compounds.

Piercing the swollen seed has been a standard practice for removing swollen seed in crownvetch for some years (1,7). However, this procedure is only in the Rules for alyceclover (*Alysiocarpus vaginalis*). Crownvetch appears to have an inner integument which requires rupturing before the seed will germinate (6). Regional referees have demonstrated that piercing the swollen seed on the 14th day of the test reduces or eliminates the swollen seed. This procedure can be labor intensive in lots which contain 20-30% swollen seeds. Lots with these high percentages of swollen seed are likely to be ones which have not completely dried down due to a prolonged wet growing season.

An Alternate method has been added. Testing the seed in a sealed polyethylene envelope is an accepted method for reducing swollen seed in *Trifolium spp.* (2,8) and is a "Treatment for promoting germination" in the ISTA Rules (3). It is presumed that carbon dioxide levels are increased in the sealed polyethylene bag by the germinating seeds, which induces the swollen seed to germinate (2,8). This procedure has been carried out in two regional referees and has resulted in reduced numbers of swollen seed.

Referees on crownvetch germination were conducted in 1979-80, 1980-81, 1995-96, and 1996-97. All germination tests have resulted in reduced numbers of swollen seed for samples which have been pricked. Use of the polyethylene bag has also resulted in reduced numbers of swollen seed in the 1996-97 Referee.

Literature Cited

1. Deppen, Richard. 1980. Pennsylvania, The Newsletter of the Association of Official Seed Analysts 54:1. p 21.
2. Ellis, R. H., T. D. Hong and E. H. Roberts. 1985. Leguminosae, In Handbook of Seed Technology for Genebanks. Volume 11. Compendium of specific germination information and test recommendations. IBPGR. pp 471-473.
3. International Seed Testing Association. 1996. International Rules for Seed Testing. Treatments for promoting germination (5.6.3.A.). Seed Sci. And Technol. 24 (Supplement). Pp 169-170.
4. Joo, P. K. , G. W. McKee, H. A. MacDonald, and R. A. Langille. 1975. Isolation and identification of phytotoxic substances from seeds of *Coronilla varia* L. Proceedings of the Association of Official Seed Analysts. 65. pp 38-51.

5. McKee, G. W., A. R. Langille, W. P. Ditmer, and P. K. Joo. 1971. Germination and seedling growth of 48 plant species as affected by leachate from seeds of *Coronilla varia* L. Crop Science. 11. pp 614-616.
6. McKee, G. W. , R. A. Peiffer, and N. N. Moksenin. 1977. Seedcoat structure in *Coronilla varia* L. and its relations to hard seed. Agronomy Journal. 69. pp 53-58.
7. Peiffer, R. A., G. W. McKee, and W. P. Ditmer. 1972. The quick swell test as an indicator of potential germination in crownvetch seed. Proceeedings of the Association of Official Seed Analysts. 62. Pp 101-108.
8. Thomson, J. R. 1965. Breaking dormancy in germination tests of *Trifolium spp.* Proc. Int. Seed Test. Assoc. 30:4. Pp 905-909.

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Proposal #47

RULE CHANGE PROPOSAL FORM

PRESENT RULE *(if new rule, state "New Rule")*

Table 3. Methods of testing for laboratory germination, (continued)

Kind of seed	Substrata	Temperature° C	First Count days	Final Count days	Additional Directions
Lupinus spp.	B, T	20-30 Hard seed:	5[a]	18[b]	
lupine, all annual types and cultivars					see sec 4.2d and 4.9k(6).

PROPOSED RULE (Exactly as it would appear in "Rules")

Kind of seed	Substrata	Temperature° C	First Count days	Final Count days	Additional Directions
Lupinus spp. lupine, all annual types and cultivars	B, T	20-30; 20	5[a]	18[b]	Hard seed: see sec 4.2d and 4.9k(6).

SUPPORTING EVIDENCE *(Research data, literature citations, published papers, or other appropriate information)*

The current AOSA rules allow only a temperature of alternating 20-30°C for annual *Lupinus* spp. in Table 4 for Flower Seeds (p. 74). However, data for several species (*L. bicolor*, *L. densiflorus*, *L. hirsutissimus*, *L. nanus*, *L. sparsiflorus*, *L. succulentus*, and *L. truncatus*) show that a temperature of constant 20°C gives higher germination results. In some cases, 20-30°C actually kills a percentage of the seeds or seedlings of *Lupinus* spp. This proposal would not eliminate 20-30°C as an option, but would add 20°C as another option. Note that 3 annual lupines are listed in the current AOSA rules on Table 3 for Agricultural Seeds (p. 58, old format) with 20°C as the only option. These same 3 species are listed in the ISTA rules for agricultural and vegetable seed (p. 181) at 20°C; in addition, ISTA lists 2 annual lupines under flower, spice, herb and medicinal species at both 20-30°C and 20°C (p.199).

Reference:

Alvarez, S.E. and N.J. Vivrette. 1997. "An Alternative Method for Germination and Determining Viability of Annual *Lupinus* spp." Abstract, AOSA/SCST Annual Meeting, June 1997. AOSA News Letter 71:2 p. 35.

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DATE OF PROPOSAL: October 10, 1997

Passed

Proposal #48

RULE CHANGE PROPOSAL FORM

PRESENT RULE *(if new rule, state "New Rule")*

Table 3. Methods of testing for laboratory germination, (continued)

Kind of seed	Substrata	Temperature° C	First Count days	Final Count days	Additional Directions
Gypsophila elegans M. Bieberstein, *G. paniculata* L. baby's-breath, gypsophila	TB	20	none[a]	7[b]	Light and KNO_3.
Gypsophila repens L., G. *elegans* M. Bieberstein, G. *pacifica* Komarov, G. *repens* L. 'Rosea' baby's-breath, gypsophila	TB	15	none[a]	8[b]	Sensitive to temperatures above 18°C.

PROPOSED RULE *(Exactly as it would appear in "Rules")*

Kind of seed	Substrata	Temperature° C	First Count days	Final Count days	Additional Directions
Gypsophila elegans M. Bieberstein baby's breath, long-pettalled	TB	20; 15	none[a]	8[b]	Light and KNO_3. Some cultivars may be sensitive to temperatures above 18°C.
Gypsophila paniculata L. baby's breath, perennial	TB	20	none[a]	7[b]	Light and KNO_3.
Gypsophila repens L., *G. pacifica* Komarov, baby's breath	TB	15	none[a]	8[b]	Sensitive to temperatures above 18°C.

SUPPORTING EVIDENCE *(Research data, literature citations, published papers, or other appropriate information)*

The intent of this proposal is to clarify the number of days a submitted sample of *Gypsophila elegans* should be tested according to AOSA rules. The current rule is confusing and contradictory. Common names are those used in AOSA Handbook 25, Uniform Classification of Weed and Crop Seeds. *Gypsophila elegans* is listed in the ISTA rules (1996, Table 5A Part 3 p. 197) at either 20°C or 15°C, for 14 days.

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Proposal #49

PRESENT RULE:

Table 3. Methods of testing for laboratory germination.

Kind of seed	Substrata	Temperature	First Count	Final Count	Additional Directions
Brassica napus Annual rape and winter rape	B, T	20 – 30	3	7	

PROPOSED RULE:

Table 3. Methods of testing for laboratory germination.

Kind of seed	Substrata	Temperature	First Count	Final Count	Additional Directions
Brassica napus Annual rape and winter rape	B, T	20 – 30; 15 – 25	3	7	

SUPPORTING EVIDENCE:

Phase I. A comparison of germination results from three seed labs was requested by a canola/rapeseed seed company due to variation in results. The three labs had three different methods in use as follows:

Method 1: 20 – 30 degrees celsius, KNO3 added
Method 2: 25 degrees celsius, KNO3 added
Method 3: 15 – 25 degrees celsius, No KNO3

Five lots were tested with the following results.

Table 1. Germination results.

	Germ I %'s			Germ II %'s			Germ III %'s			
	Lab	Lab	Lab	Lab	Lab	Lab	Lab	Lab	Lab	Mean
Lot	1	2	3	1	2	3	1	2	3	Germ
1	82	81	87	80	76	88	82	79	96	83
2	76	85	81	81	79	88	83	86	94	84
3	74	80	82	75	73	86	80	78	89	80
4	63	67	69	64	57	75	67	67	75	67
5	78	82	85	74	81	88	78	82	91	82
Mean	75	79	81	75	73	85	78	78	89	

Germination I mean = 78%
Germination II mean = 78%
Germination III mean = 82%

Table 2. Analysis of Variance.

Source	Degrees of Freedom	Sum of Squares	Mean Square	F Value	Probability > F
Lab (L)	2	2997.91	1498.96	94.16	0.0001
Lot (O)	4	6903.83	1725.96	108.42	0.0001
Treatment (T) (Germination method)	2	602.84	301.42	18.94	0.0001
L x O	8	290.03	36.25	2.28	0.0256
L x T	4	647.09	161.77	10.16	0.0001
O x T	8	102.93	12.87	0.81	0.5964
L x O x T	16	275.80	17.24	1.08	0.3773
Error	135	2149.00	15.92		

Lab, lot and treatment were all significantly different in the variance of results (Table 2). Lots were easily different with lot 4 of much lower quality than the other lots (Table 1). Germination methods were significantly different between labs with a Germ III mean of 82% for a 4% higher germination across labs and lots compared to 78% for Germ I and Germ II (Table 1). Lab 3 was significantly higher across lots and treatments but does not routinely test canola/rapeseed at the cooler temperature of 15 – 25 degrees celsius of the Germ III method.

Phase II. The previous data from phase I showed significant differences between labs and their procedures. The questions remaining were if the differences were significant due to strictly the cooler temperatures of 15 – 25 used in Canada and if potassium nitrate was a significant factor.

A second referee was organized with the same five lots with three labs in the United States and two labs in Canada. The four treatments were as follows:

Treatment 1: 15 – 25 degrees Celsius with Potassium nitrate;
Treatment 2: 15 – 25 " " without Potassium nitrate;
Treatment 3: 20 – 30 " " with Potassium nitrate;
Treatment 4: 20 – 30 " " without Potassium nitrate.

Table 3. Germination results.

	Treatment 1					Treatment 2					Treatment 3					Treatment 4					
	Lots					Lots					Lots					Lots					Lab
Labs	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	Means
1	80	82	87	80	79	79	60	85	80	85	59	71	77	63	76	69	78	84	75	83	77
2	84	85	90	82	85	75	84	87	72	85	78	80	87	81	87	71	71	84	76	84	81
3	83	87	92	80	98	82	88	93	78	94	76	71	82	59	90	66	68	77	60	86	81
4	39	41	60	60	70	77	67	86	73	67	66	71	72	61	49	74	73	82	72	70	67
5	82	80	89	82	81	62	85	88	70	82	82	79	87	80	82	81	84	87	74	84	81
Treatment Means	79					80					75					76					

Table 4. Analysis of Variance.

Source	Degrees of Freedom	Sum of Squares	Mean Square	F Value	Probability > F
Lab (L)	4	11254.81	2813.70	113.02	0.0001
Lot (O)	4	6919.63	1729.91	69.49	0.0001
Treatments (T)	3	1557.73	519.24	20.86	0.0001
L x O	16	3200.81	200.05	8.04	0.0001
L x T	12	10320.14	860.01	34.54	0.0001
O x T	12	724.31	60.36	2.42	0.0052
L x O x T	48	4260.00	88.75	3.56	0.0001
Error	294	7319.33	24.90		

Lab was highly significant and including on the lab by lot and lab by lot by treatment interactions (Table 4). Lab 4 results were inconsistent with results of the other labs with an overall germination of 67% compared to 77%, 81%, 81% and 81% for labs 1, 2, 3, and 5 respectively. Lab 4 also showed greater variation within treatments than the other four labs. The cooler temperature of 15 – 25 degrees celsius versus 20 – 30 degrees celsius was significant (Table 4). The cooler temperature increased the overall germination by 4% when all the data was included (Table 3). The cooler temperature increased the overall germination by 6% with the data from labs 1, 2, 3 and 5. The potassium nitrate showed less effects on germination results than the temperature.

The cooler temperature of 15 – 25 degrees celsius showed the best results in both Phase I and Phase II. Adding potassium nitrate was inconsistent on the germination results. Adding 15 – 25 degrees celsius as an alternative temperature should give higher and more consistent results between seed labs.

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PRESENT RULE:

Table 3. Methods of testing for laboratory germination.

Kind of seed	Substrata	Temperature Count	First Count	Final	Additional Directions
Cicer arietinum Chickpea	T, S	20 – 30	3	7	

PROPOSED RULE:

Table 3. Methods of testing for laboratory germination.

Kind of seed	Substrata	Temperature	First Count	Final Count	Additional Directions
Cicer arietinum Chickpea	T, S	20 – 30; 20	3	7	CaNO3 .3 – .6% solution

SUPPORTING EVIDENCE:

The germination procedures for Chickpea or Garbanzo Beans, (Cicer arietinum **L.**) has been studied for the past two years to reduce the variation between laboratories on germination results. Phase I looked at the effects of Calcium Nitrate to control hypocotyl collar rot in a 1996 referee. Phase II compared the effects of 20 degrees celsius versus 20 – 30 alternating degrees celsius in the 1997 referee.

Phase I. 1996-97 Northwest Area Referee, Neal R. Foster, Montana State University.

Table 1. Germination and collar rot percentages of sample 5793.

	% Germination		% Collar Rot	
Lab #	With CaNo3	No CaNo3	With CaNO3	No CaNO3
1	88	81	1.25	7.50
2	90	91	1.00	20.00
3	94	87	0.00	4.00
8	95	94	2.00	3.00
Mean	92	88	1.00	8.60
Range	7	13	2.00	17.00

Table 2. Germination and collar rot percentages of sample 5839.

Lab #	% Germination With CaNO3	% Germination No CaNO3	% Collar Rot With CaNO3	% Collar Rot No CaNO3
1	89	62	0.25	15.25
2	90	90	1.00	28.00
3	92	72	0.00	8.00
8	98	87	2.00	8.00
Mean	92	78	.80	14.80
Range	9	28	2.00	20.00

Table 3. Analysis of Variance.

Source	Degrees of Freedom	Sum of Squares	Mean Square	F Value	Probability > F
Labs	3	405.50	135.17	4.32	0.0381
Samples (S)	1	97.52	97.52	3.12	0.1113
Treatment (T) (CaNO3)	1	319.52	319.52	10.21	0.0109
S x T Interaction	1	121.00	121.00	3.87	0.0808
Error	9	281.59	31.29		

There was variation between laboratories and samples but statistically the only significant difference was between treatments, with or without calcium nitrate (Table 3). The calcium nitrate reduced variation in germination between labs from 13% to 7.25% or by 45% and reduced variation in percent of collar rot from 17% to 2% or by 88% on sample 5793 (Table 1). The calcium nitrate reduced the variation in germination between labs from 27.75% to 9% or by 67.5% and reduced variation in percent of collar rot from 20% to 2% or by 90% on sample 5839 (Table 2). The overall germination percentage across labs and samples was 92% with calcium nitrate and 83% without calcium nitrate or a 9% increase by using calcium nitrate.

Phase II. 1997-98 Northwest Area Referee.

Six official and four commercial seed laboratories responded with results on the comparison of 20 degrees celsius versus 20 – 30 alternating degrees celsius. All germinations were tested with calcium nitrate added for uniformity in test procedures. The same two varieties and lots were used on both phase I and phase II of the germinations referees.

Table 4. Germination percentages.

Lab #	20 Degrees Lot 1	20 Degrees Lot 2	20 Degrees Mean	20 – 30 Degrees Lot 1	20 – 30 Degrees Lot 2	20 – 30 Degrees Mean
1	87	84	86	92	85	89
2	83	77	80	81	81	81
3	57	77	67	65	80	73

4	93	94	94	93	95	94
5	87	86	87	77	76	77
6	94	94	94	97	83	90
7	89	85	87	93	93	93
8	86	85	86	77	80	79
9	88	83	86	77	73	75
10	74	80	77	26	67	47
Lot Means	84	85		78	81	
Treatment Means			85			81

Table 5. Analysis of Variance.

Source	Degrees of Freedom	Sum of Squares	Mean Square	F Value	Probability > F
Lab (L)	9	14185.63	1576.18	66.59	0.0001
Lot (O)	1	193.60	193.60	8.18	0.0050
Treatment (T)	1	801.03	801.03	33.84	0.0001
L x O	9	3853.78	428.20	18.09	0.0001
L x T	9	4325.60	480.62	20.30	0.0001
O x T	1	81.23	81.23	3.43	0.0664
L x O x T	9	1436.65	159.63	6.74	0.0001
Error	120	2840.50	23.67		

Temperature was a significant factor in the germination of Chickpea (Table 5). At the constant temperature of 20 degrees Celsius the germination of lot 1 was 6% higher and lot 2 was 4% higher than at the 20 – 30 alternating temperatures for an overall 5% increase in germination across labs. Laboratory was a significant factor as well as the lab by treatment interaction in the effects of temperature on germination results (Table 5). Interestingly, lab results fell into two distinct groups. Groups A of labs 5,6,8,9 and 10 found that temperature made a difference in germination from 4 to 30% increase at 20 degrees constant (Table 4). Group B of labs 1,2,3,4 and 7 found no difference or an increase of 1 to 6% in germination at the 20 – 30 degrees Table 4). Four of the five labs in Group A test some Chickpeas every year. One of the five labs in Group B test some Chickpeas every year.

The reason to do referees on Chickpea/Garbanzo Bean germinations was due to Idaho seed companies requesting help in solving the wide discrepancy between labs on the germination results. The proposed rule changes has shown to help in reducing germination differences between labs and increase the overall germination percentages.

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DATE OF PROPOSAL:

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Proposal #51

PROPOSAL

Change in the Rule for *Penstemon eatonii*--firecracker penstemon

PRESENT RULE:

4.10, Table 3. Methods of testing for laboratory germination.

Kind of seed	Substrata	Temperature ° C	First count days	Final count days	Additional Directions (See sec. 4.2 and 4.9)
Penstemon eatonii A. Gray firecracker penstemon	P	15	7[a]	21[b]	Prechill 60 days at 3-5° C; or use TZ.

PROPOSED RULE:

4.10, Table 3. Methods of testing for laboratory germination.

Kind of seed	Substrata	Temperature ° C	First count days	Final count days	Additional Directions
Penstemon eatonii A. Gray firecracker penstemon					
Method 1	P	15; 10/20	7	14	see sec. 4.8n
Method 2	P	15; 10/20	14	28	see sec. 4.8n

4.7-d.

For *Stipa viridula, Penstemon penlandii,* and ***Penstemon eatonii,*** report results of Method 2 (see Table 3 and sections 4.8k, 4.8m, and 4.8n), as percentage germination. If the number in Method 2 is less than in Method 1, subtract results of Method 2 from Method 1 and report the difference as dormant seed percentage.

4.8-n.

Firecracker penstemon (*Penstemon eatonii*).--Two test methods as prescribed in Table 3 shall be used on each sample. For Method 1, place 400 seeds on blotters moistened with 0.055% (500 ppm) GA_3, prechill for 60 days (2-5° C), and germinate for 14 days (15 or 10/20° C). Post-test viability determination of ungerminated seeds is required (sec. 4.9k). As an alternative to Method 1, conduct a TZ test on 400 seeds. For Method 2, plant 400 seeds on water-moistened blotters and germinate with light for 28 days; count normal seedlings. Refer to 4.7d for calculation and reporting of results.

SUPPORTING EVIDENCE:

Allen and Meyer (1990) found 15° C to be optimal for germination of nondormant firecracker penstemon seeds among a range (5 to 30° C) of constant temperature regimes. This temperature regime is recommended in the AOSA rules for seven of eight species. A 10/20° C temperature regime for this species has also been used successfully following prechill (Meyer 1992). This rule change would make either temperature regime acceptable.

Much of the marketed firecracker penstemon seed is harvested from wildland populations in the Intermountain West. This is a widely adapted species with natural populations associated with several plant communities from warm desert fringes to subalpine meadows. Germination requirements of seeds collected from widely different habitats vary accordingly. In one comprehensive study envolving 20 seed collections (Meyer 1992), germination response following 8 weeks of prechill (2° C) ranged from 1 to 100% of viable (mean 22%). This study suggests that firecracker penstemon seeds collected from most community types require rather lengthy periods of prechill to break dormancy. In the same study, mean germination response to 12 and 16 weeks of prechill was only 54 and 78%. The 60 days of prechill prescribed by the existing AOSA rule for this species, is clearly inadequate for breaking seed dormancy in most collections.

Given the generally poor germination response to this substantial prechill treatment, we propose a change in the rule for this species. The proposed rule includes two methods, similar in approach to those used in existing rules for green needlegrass and Penland's beardtongue (penstemon) (sec. 4.8-k and sec. 4.8-m). For Method 1, seeds are imbibed on blotters moistened with a 500 ppm GA_3 solution prior to a 60-day prechill. A synergistic, dormancy-breaking effect of GA_3 and prechill has been observed for several penstemons, including firecracker penstemon (Kitchen and Meyer 1991), as well as for a variety of other landscape species (Abdalla and McKelvie 1980). Kitchen and Meyer (1991) observed that germination response to GA_3 (250 ppm) and 8 weeks of prechill for one firecracker penstemon collection was 85%. Germination for seeds of the same collection was only 10% when the prechill treatment was used without GA_3, and 60% with GA_3 and no prechill. Similar dormancy breaking results using prechill and GA_3 in combination were observed for all other penstemon species tested. However, because not all viable seeds germinate with this method, a post-test evaluation of ungerminated seeds is required. We have found that a TZ test is a suitable alternative for Method 1.

Method 2 is a simple test in which only nondormant seeds germinate. The two methods together enable the analyst to ascertain the dormant and nondormant seed fractions.

Literature Cited

Abdalla, S.T. and A.D. McKelvie. 1980. The interaction of chilling and gibberellic acid on the germination of seeds of ornamental plants. Seed Science. Technol. 8: 139-144.

Allen, P.S. and S.E. Meyer. 1990. Temperature requirements for seed germination of three *Penstemon* species. Hortscience 25: 191-193.

Kitchen, S.G. and S.E. Meyer. 1991. Seed germination of Intermountain penstemons as influenced by stratification and GA_3 treatments. J. Environ. Hort. 9: 51-56.

Meyer, S.E. 1992. Habitat correlated variation in firecracker penstemon (*Penstemon eatonii* Gray: Scrophulariaceae) seed germination response. Bulletin of the Torrey Botanical Club 119: 268-279.

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Proposal #52

PROPOSAL

Addition of a generalized rule for the genus *Penstemon*--beardtongues

PRESENT RULE:

New rule.

PROPOSED RULE:

4.10, Table 3. Methods of testing for laboratory germination.

Kind of seed	Substrata	Temperature ° C	First count days	Final count days	Additional Directions
***Penstemon* spp.** **penstemon or beardtongue, all species not named in other rules**					
Method 1	**P**	**15; 10-20**	**7**	**14**	**see sec. 4.8n**
Method 2	**P**	**15; 10-20**	**14**	**28**	**see sec. 4.8n**

4.7-d.

For *Stipa viridula*, *Penstemon penlandii*, *Penstemon eatonii*, **and *Penstemon* spp.**, report results of Method 2 (see Table 3 and sections 4.8k, 4.8m, and 4.8n), as percentage germination. If the number in Method 2 is less than in Method 1, subtract results of Method 2 from Method 1 and report the difference as dormant seed percentage.

4.8-n.

Firecracker penstemon (*Penstemon eatonii*) **and other species of penstemon or beardtongue (*Penstemon* spp.) not named in other rules.** --Two test methods as prescribed in Table 3 shall be used on each sample. For Method 1, place 400 seeds on blotters moistened with 0.055% (500 ppm) GA_3, prechill for 60 days (2-5° C), and germinate for 14 days (15 or 10/20° C). Post-test viability determination of ungerminated seeds is required (sec. 4.9k). As an alternative to Method 1, conduct a TZ test on 400 seeds. For Method 2, plant 400 seeds on water-moistened blotters and germinate with light for 28 days; count normal seedlings. Refer to 4.7d for calculation and

reporting of results.

(Final wording of sections 4.7-d and 4.8-n is dependent upon whether the companion proposal to change the rule for firecracker penstemon is adopted with this proposal.)

SUPPORTING EVIDENCE:

Increases in the collection, cultivation, and planting of the seeds of a growing number of penstemon species necessitates an evaluation of existing and potential rules for testing seeds in this genus. The AOSA has adopted rules for eight species. Detailed information describing germination requirements for no less than 40 species can be found in existing literature (Allen and Meyer 1990, Kitchen and Meyer 1991, Meyer 1992, Meyer and Kitchen 1994, Meyer, et al. 1995). Rather than submitting numerous near-duplicate, but separate proposals, we propose that a single rule incorporating widely effective methods for this genus be adopted by the AOSA to be applied to seeds of all species of penstemon not specifically listed in other rules.

Allen and Meyer (1990) found 15° C to be the optimal, constant temperature for germination of nondormant seeds of three species of penstemon. This temperature regime is recommended in the AOSA rules for seven of eight penstemon species and is an effective post-prechill germination temperature for other penstemon species (Kitchen and Meyer 1991). A temperature regime of 10/20° C has also been used successfully (Meyer 1992, Meyer and Kitchen 1994, Meyer et al. 1995). This rule proposal would make either temperature regime acceptable.

Primary seed dormancy is highly variable in the genus *Penstemon.* Differences in dormant seed percentage as well as the complexity of dormancy breaking treatments required to render seeds nondormant vary greatly among and within species (Kitchen and Meyer 1991, Meyer 1992, Meyer and Kitchen 1994, Meyer et al. 1995). Thus, a generalized rule that clearly reveals both seed-lot viability and dormant seed percentage would be of greatest value. Therefore, this proposal for a *Penstemon* spp. rule includes two methods, similar in approach to those previously accepted for green needlegrass and Penland's penstemon (sec. 4.8-k and sec.4.8-m).

For numerous species of penstemon, chill-responsive seeds require 16 to 24 weeks of prechill before germination will occur (table 1). In addition, a tendency for a portion of seeds to not respond to prechill treatments is common among several species of penstemon. For example, Meyer (1992) observed that the mean prechill-responsive seed percentage (24 weeks) for 20 freshly harvested firecracker penstemon collections was just 77.8 percent. For one collection, only 32 percent of viable seeds germinated after 24 weeks of prechill. Similar results have been observed for other penstemon species (table 1).

Treatments using the growth hormone, gibberellic acid (GA_3) are effective in reducing and sometimes eliminating prechill requirement for penstemon seeds (Kitchen and Meyer 1991, Laufmann and Weisner 1996, table 1). Kitchen and Meyer (1991) observed germination response

for 27 collections, representing 16 species of penstemon, to 250 ppm GA_3 used as a blotter-wetting agent. Mean germination was 64% compared to 20% for the non-GA_3 controls. Acting together, prechill and GA_3 had a synergistic effect, reducing the length of prechill needed to reach a minimum 75% germination by 4 to 12 weeks. For example, a collection of *P. cyananthus* seeds required 16 weeks prechill to reach 75% germination without GA_3, but when GA_3 was used as a blotter-wetting agent prior to chilling, only 4 weeks of prechill were needed to pass the same threshold. One collection of the high elevation species, *P. whippleanus*, failed to respond to 16 weeks of prechill (6% germination); however when GA_3 was combined with 8 weeks prechill, germination was 84%. Penstemon germination responses to prechill/GA_3 treatments are similar to those observed for a variety of landscape plants (Abdalla and McKelvie 1980) and native perennials (McDonough 1976). Finally, after testing concentration of 50 to 1000 ppm, we have found no significant improvements in penstemon germination percentage for GA_3 concentrations in excess of 500 ppm.

In summary, we propose a generic rule for all penstemon species that do not have specific rules. This rule is not meant to replace existing rules nor to preclude the possible adoption of new rules for species that may not be adequately served by this rule. This proposed rule employs methods that have broad application for this genus and will allow for the examination of both seed viability and dormancy. A moderate prechill treatment in combination with GA_3 at an effective concentration is a relatively simple and effective method for breaking seed dormancy in seeds of even some of the most stubborn penstemon species.

Copies of relevant literature citations have been sent to the Rules Committee and are available from the authors upon request.

Table 1. Germination for 24 wildland seed collections representing 15 species of *Penstemon* in response to 0, 8, 16, and 24 weeks of moist prechill and GA_3 (250 ppm). Prechill was at 2° C and incubation was for 4 weeks at either 15 or 10/20° C. Germination is expressed as a percent of total viable seeds. Data are used by permission from Kitchen and Meyer (1991), Meyer and Kitchen (1994), and Meyer et al. (1995).

Species	Weeks of Prechill 0	8	16	24	GA_3
	germination percentage				
P. acuminatus	0	3	57	68	---
P. ambiguus (1)	19	9	8	28	---
(2)	2	2	1	0	---
(3)	47	4	7	---	100
P. confusus	1	33	84	74	---
P. cyananthus (1)	5	10	71	--	56
(2)	0	7	53	54	---

P. cyaneus		0	1	3	35	---
P. dolius		0	8	36	38	---
P. fremontii	(1)	0	1	72	---	19
	(2)	3	14	60	66	---
P. goodrichii		1	0	58	46	---
P. humilis	(1)	0	4	84	---	62
	(2)	4	65	77	---	49
P. leiophyllus	(1)	6	28	62	---	100
	(2)	1	3	71	84	---
P. linariodes	(1)	0	0	13	12	---
	(2)	0	1	11	7	---
P. pachyphyllus		71	43	65	---	92
P. scariosus		0	6	37	44	---
P. subglaber	(1)	5	2	14	---	91
	(2)	0	2	37	36	---
	(3)	3	5	64	---	75
P. whippleanus		*0*	*1*	*6*	---	*42*

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DATE OF PROPOSAL:

October 14, 1997

Withdrawn

Proposal #53

PROPOSAL

Addition of *Hesperostipa comata*--needle-and-thread grass to the Rules

PRESENT RULE:

New rule.

PROPOSED RULE:

2.4, Table 1.Weights for working sample of agricultural, vegetable and herb, flower, and tree and shrub seeds

Kind of seed	Minimum weight for purity analysis	Minimum weight for noxious-weed seed or bulk examination	Approximate number of seeds per gram	Approximate number of seeds per ounce
AGRICULTURAL SEEDS	Grams	Grams	Number	Number
Hesperostipa comata (Trin. & Rupr.) Barkworth needle-and-thread grass	15	150	100-350 (200)	2,800-9,900

4.10, Table 3. Methods of testing for laboratory germination.

Kind of seed	Substrata	Temperature ° C	First count days	Final count days	Additional Directions
Hesperostipa comata (Trin. & Rupr.) Barkworth needle-and-thread grass	P	15-25;	10	21	Dark. Prechill 14 days at 2-5° C. Seed treatment with fungicide may be necessary for some seed lots. Ungerminated seeds: see sec. 4.2e and 4.9k. Use TZ as an alternative.

SUPPORTING EVIDENCE:

Needle-and-thread grass (*Hesperostipa comata*) is widespread in the deserts, prairies, and mountains of western North America. Seeds are harvested for commercial sale from wildland populations in several states. This rule proposal is based on results of a study titled, "An Investigation of Seed Dormancy and Germination Requirements for Needle-and-thread (*Stipa comata*)," funded and supported in part by the AOSA. Prior to this study, little was known about the germination requirements for this species and how they may vary geographically. At the time this rule proposal was submitted, detailed results were being prepared for publication in JOST. Copies of the manuscript draft can be obtained from the author.

We assembled 22 needle-and-thread grass seed collections, including nine commercial lots, representing 6 states. Weights of fully developed seeds varied more than three-fold (100-350 seeds/g). Laboratory experiments were conducted to evaluate variability in optimal germination temperature, primary dormancy, and germination response to prechill (14-56 days). Additional tests were conducted on five collections identified as having a large dormant-seed fraction. Procedures used were similar to those previously accepted and currently used for green needlegrass (AOSA); acid scarification (concentrated H_2SO_4), and growth hormone (GA_3). Results were compared to those derived from TZ tests.

Maximum mean germination percentage for the 22 seed lots after 21 days of incubation occurred at 15/25° C (table 1). Germination response to 10/20° C and 20/30° C was significantly less for most collections. After-ripened seed lots were less temperature sensitive and had generally higher germination percentages than did fresh lots. Germination response to prechill was mixed. Seven collections responded positively to a 2-week prechill treatment compared to their no-prechill response. Response to longer prechill periods was frequently negative.

Although acid scarification (5 and 10 min. soak) was effective in reducing seed dormancy it also reduced mean viability. These effects were not equal for all collections tested, indicating considerable variation in external seed morphology. For the four seed lots tested, acid-caused mortality ranged from 8 to 100%. The GA_3 treatment (500 ppm) was generally effective in breaking dormancy for a large fraction of seeds in each lot tested.

Mean seed-lot viability for the 22 collections, as determined by TZ test, was 87% (range 65-95%). Viability percentage of unchilled seeds germinated at 15/25° C (mean 81%) was significantly lower than values determined by TZ test for four of 22 seed lots. However, viability values of seed lots that were prechilled for 2 weeks and then germinated at 15/25° C were consistent with those from TZ tests (mean 89%).

Germination rate of unchilled seeds was relatively slow at all temperatures. With several collections, fungal growth was associated with both viable and dead seeds. We attribute apparent losses in seedling viability to rapid fungal growth at the higher temperatures coupled with slow germination rates. Germination rate of prechilled seeds was considerably faster than unchilled

seeds, minimizing or eliminating this problem.

A referee sample was sent to eight states seed labs. We conducted concurrent germination and TZ tests for comparison. Four labs responded and results are summarized in table 2. Purity results were consistent among labs (mean 89.72%). Total viable (germ + dorm) values for three of the four labs were similar to our results. Results from TZ tests were consistently higher than viability estimates generated by germination tests. We attribute this difference to difficulty in evaluating germinants due to fungal damage. Fairly extensive fungal growth for this lot was reported by the labs and observed in our test. For this reason, we have added the clause, "Seed treatment with fungicide may be necessary for some seed lots," to the 'Additional Directions' column of table three.

In summary, needle-and-thread grass seeds are highly variable in size, initial dormancy, and response to prechill, acid scarification, and GA_3 treatments. This variability reflects the wide range of habitats and climatic patterns to which populations of the species are adapted. It also presents problems in developing a uniform procedure for seed testing. The rule proposed here employs those treatments we found to be effective in promoting germination of needle-and-thread grass seeds on a broad selection of seed lots without endangering viability. A significant percentage of viable seeds will generally remain ungerminated at the end of the germination test, consequently, post-test evaluation of ungerminated seeds is essential.

Table 1. Germination responses of 22 needle-and-thread collections to germination temperature and prechill treatments (2° C). Incubation was for 21 days. Incubation temperature following prechill was 15/25° C. Germination percentages are expressed as a fraction of total viable seeds.

Collection (County, State)	Germination Temperature (C)					Days of Prechill (2° C)			
	15	10/20	15/25	25	20/30	14	28	42	56
	Germination Percentage								
Mohave (1), AZ	79	79	84	61	52	92	80	78	87
Mohave (2), AZ	87	76	72	52	51	64	79	87	85
Weld, CO	07	09	47	14	09	95	90	88	83
Butte, ID	19	44	47	25	28	65	63	48	43
Clark (1), ID	73	90	96	99	97	84	84	93	88
Clark (2), ID	21	56	51	23	14	50	50	39	32
Elmore (1), ID	02	08	14	04	09	29	15	13	10
Elmore (2), ID	03	00	03	01	03	04	01	02	08
Lemhi, ID	01	06	16	06	09	12	10	05	05

Unknown, MT	23	46	55	34	37	42	57	60	70
Richland, MT	45	83	92	78	86	85	65	85	84
Elko, NV	28	49	45	16	11	77	56	36	27
Beaver, UT	27	50	46	04	12	69	64	75	83
Duchesne, UT	14	25	34	04	10	33	22	15	28
Emery, UT	54	53	71	43	36	63	54	54	63
Iron, UT	49	52	67	38	36	59	48	52	43
Juab, UT	12	21	30	08	09	45	45	44	46
Kane, UT	59	45	73	28	34	33	26	37	29
Millard, UT	58	68	76	48	72	68	66	66	65
Sevier, UT	49	46	62	48	40	68	59	71	73
Utah, UT	07	12	11	08	08	24	16	28	31
Washington, UT	94	99	93	90	98	96	99	100	97
means	37	46	54	33	35	57	52	53	54

Table 2. Germination, dormancy, TZ evaluation, and purity for a referee sample of needle-and-thread grass seeds as determined by four state seed labs and the Forest Service, Shrub Sciences Laboratory.

Lab	Germination	Total Dormant	Viable	Abnormal	TZ	Purity
	---------- Percentage ----------					
1	47	10	57	10	80	85.96
2	38	17	55	9	71	90.29
3	48	29	77	6	81	91.94
4	44	14	58	3	87	90.71
F.S.	43	15	58	7	79	-------

Proposal #53

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Proposal #54

PROPOSAL

Addition of *Achnatherum thurberianum*--Thurber needlegrass to the Rules

PRESENT RULE:

New rule.

PROPOSED RULE:

2.4, Table 1.Weights for working sample of agricultural, vegetable and herb, flower, and tree and shrub seeds

Kind of seed	Minimum weight for purity analysis	Minimum weight for noxious-weed seed or bulk examination	Approximate number of seeds per gram	Approximate number of seeds per ounce
AGRICULTURAL SEEDS	**Grams**	**Grams**	**Number**	**Number**
***Achnatherum thurberianum* (Piper) Barkworth Thurber needlegrass**	**8**	**80**	**300**	**8,500**

4.10, Table 3. Methods of testing for laboratory germination.

Kind of seed	Substrata	Temperature ° C	First count days	Final count days	Additional Directions
***Achnatherum thurberianum* (Piper) Barkworth Thurber needlegrass**	**P**	**10-20; 15-25**	**10**	**21**	**Dark. Ungerminated seeds: see sec. 4.2e And 4.9k. ~~Use TZ as an alternative.~~**

SUPPORTING EVIDENCE:

Thurbers needlegrass (*Achnatherum thurberianum*) is an important bunchgrass native to semiarid regions of the Pacific Northwest. Seeds of this species are commonly requested by land management agencies that conduct revegetation and restoration plantings of disturbed lands. Consequently, we initiated an investigation of germination requirements for this species. Before

this study, little was known of those requirements. Seeds of the related species, Indian ricegrass (*Oryzopsis hymenoides*), green needlegrass (*Stipa viridula*), and needle-and-thread grass (*Hesperostipa comata*) are known to have complex dormancy characteristics that often require multiple treatments before germination is possible (see AOSA handbook- Rules For Testing Seeds and a companion proposal).

We assembled 52 collections of Thurber needlegrass seed from 28 Idaho and Oregon sources over a 6 year period. Mean seed weight was 325 seeds/g. Laboratory experiments were conducted to determine optimal germination temperature, variability in primary dormancy, and response to light and prechill treatments (35 and 70 days). At the time this rule proposal was submitted, results of this work were being prepared for publication. Draft copies of the manuscript may be obtained from the author.

Ten seed collections were used in an experiment to determine optimal germination temperature and response to light. Germination percentages (21-day) for 10/20° C and 15/25° C were significantly higher than those for 20/30° C (table 1). Light (12-hour photoperiod) produced significantly lower germination percentages than those produced by dark controls for eight of 10 collections. After-ripened seeds had lower dormancy and were generally less sensitive to temperature and light.

All 52 collections were used in an experiment to determine primary dormancy and the effect of prechill on germination percentage. Mean germination for the unchilled control was 80%. Again, fresh seed lots had higher dormancy percentages than did lots collected from the same populations and stored for 1 or more years. After-ripening changed germinability over a period of from 1 to 4 years. Response to prechill varied among collections. Mean germination percentage (21-day at 10/20° C) after a 35-day prechill was 87%. Although many collections had significant increases in response to this prechill treatment, the most dormant sources had significantly lower germination percentages than was observed in the no-chill control, suggesting that cold-induced secondary dormancy had been initiated. The longer prechill treatment (70 days) produced similar results (mean germination 89%).

Viability did not differ significantly among treatments. Results of TZ tests were comparable to the sum of germ plus dorm values from all germination tests.

A referee sample was sent to eight state seed labs. We conducted concurrent germination and TZ tests for comparison. Four labs responded and results are summarized in table 2. Purity values were consistent for three of four labs. The high value for Lab 3 was probably due to failure to distinguish the similar looking seeds of bottlebrush squirreltail (*Elymus elymoides*) (approximately 20%) from the test species. This probably affected the dormancy values also. Total viable (germ + dorm) values for three of the four labs were consistent with those from our test. Lab 4 reported that seeds were accidentally discarded before dormancy (and viability) of ungerminated seeds could be determined. Total viable percentages as determined by TZ test were quite uniform and only slightly higher than those resulting from the germination test. Unfortunately, the instructions

for the referee called for a 14 day prechill; thus differing from the proposed rule. Therefore, we retested the same lot with out a prechill and achieved a slightly higher germination percentage than when seeds received a prechill treatment, suggesting that cold-induced secondary dormancy may have suppressed germination in the referee.

In summary, most collections of Thurber needlegrass seeds had a relatively small dormant fraction when germinated at an optimal temperature without light. Seed dormancy diminishes over a 1 to 4 year period. Dormant seeds are not always responsive to prechill treatments and cold-induced secondary dormancy is a risk. Therefore, we recommend a simple rule for this species with a mandatory post-test viability evaluation. A TZ test is a suitable substitute for viability determination.

Table 1. Germination responses for 10 lots of Thurber needlegrass seed collected from 6 sites across three years. Germination conditions were 10/20, 15/25, and 20/30° C in dark and 15/25° C in light (12 hour photoperiod) for 21 days. The test was conducted in 1996, 18 months after the 1995 collections were made. Results are expressed as percent of total viable seeds.

Collection Site	Year	10/20-D	15/25-D	15/25-L	20/30-D
		germination percentage			
1	93	97	100	99	94
1	95	68	63	28	13
2	93	99	99	99	70
2	95	68	84	37	16
3	95	95	92	15	41
4	95	52	64	16	9
5	94	68	83	17	14
5	95	54	41	12	2
6	94	91	92	52	49
6	95	82	74	24	5
Mean	--	77	79	40	31

Table 2. Germination, dormancy, TZ evaluation, and purity results for a referee sample of Thurber needlegrass seeds as determined by four state seed labs and the Forest Service, Shrub Sciences Laboratory.

Lab	Germination	Dormant	Total Viable	Abnormal	TZ	Purity
1	59	20	79	98	8	75.8
2	45	42	87	91	3	77.7
3	70	10	80	90	3	98.9
4	48	?	?	96	1	79.4
FS-1	63	19	82	93	4	-----
FS-2*	73	9	82	---	4	-----

*Second test with no prechill.

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Proposal #55

PROPOSAL

Addition of *Balsamorhiza sagittata*--arrowleaf balsamroot to the Rules

PRESENT RULE:

New rule.

PROPOSED RULE:

2.4, Table 1.Weights for working sample of agricultural, vegetable and herb, flower, and tree and shrub seeds

Kind of seed	Minimum weight for purity analysis	Minimum weight for noxious-weed seed or bulk examination	Approximate number of seeds per gram	Approximate number of seeds per ounce
FLOWER SEEDS	**Grams**	**Grams**	**Number**	**Number**
***Balsamorhiza sagittata* (Pursh) Nutt. arrowleaf balsamroot**	**25**	**250**	**100**	**2,800**

4.10, Table 3. Methods of testing for laboratory germination.

Kind of seed	Substrata	Temperature ° C	First count days	Final count days	Additional Directions
***Balsamorhiza sagittata* (Pursh) Nutt. arrowleaf balsamroot**	**B**	**5-15**	**7**	**14**	**Prechill 70 days at 2° C. TZ may also used: see sec. 4.9 k(2).**

SUPPORTING EVIDENCE:

Seeds of arrowleaf balsamroot are usually sold at high purity (95%+). The seed unit is an achene and is generally free of appendages that might be considered inert material. Mean seed weights

were determined using four, 100-seed replications for each of 10 seed lots. Among lots, seed size ranged from 64 to 124 seeds per gram. Our weights are somewhat heavier than values cited in the literature (AOSA 1985).

Germination for unchilled seeds is generally below 10 percent across a wide range of temperature regimes (Young and Evans 1979). Optimal temperatures for germination of chilled seeds include 5, 10, and 5/15° C temperature regimes (Young and Evans 1979). Germination of fully chilled seeds at 5/15° C is effectively complete after 7 days of treatment (data not shown). However, we recommend a final count on day 14. The additional growth that occurs during the second week of the test will facilitate full evaluation of seedling normality. Post-test viability evaluation of ungerminated seeds is essential.

The length of prechill required to break dormancy varies among seed lots and is affected by seed age. In laboratory trials using fresh seeds (< 60 days from harvest) we observed full germination (>90 percent) for four of seven entries after 70 days of prechill (2° C) (table 1). Full germination for any one lot required as few as 56 and as many as 84 days of prechill. Similar effective prechilling periods are cited in the literature (Young and Evans 1979, AOSA 1985). Arrowleaf balsamroot prechill requirements are shorter for after-ripened seeds. Using test procedures identical to those used to test the same seed-lots fresh, we retested seven lots after 3 years of dry storage (20° C) and observed that 56 days of prechill was adequate to achieve a mean germination of 94 percent, approximately doubling the mean germination response to that treatment of the same seed lots when tested fresh. (table 1).

Gibberellic acid (GA_3) has been successfully used to reduce or eliminate the need for prechilling for species with long prechill requirements (McDonough 1976, Abdalla and McKelvie 1980, Kitchen and Meyer 1991). We assessed the effectiveness of GA_3 in reducing prechill requirement for arrowleaf balsamroot seeds by comparing the effects of GA_3 solution (200 ppm) and water as blotter wetting agents prior to prechill treatments of 0, 14, 28, and 42 days. Within prechilling treatments, germination percentages were not significantly ($p < 0.05$) affected by the presence of GA_3 as compared to the water controls (data not shown). Subsequently, we concluded that GA_3 treatments are probably not effective in reducing chilling requirement for seeds of this species.

A tetrazolium (TZ) test using 1 percent tetrazolium solution produced viability estimates that were not significantly different than the sum of germination and dormant percentages. Seeds were allowed to imbibe overnight and were then cut length-wise before being placed in TZ solution for 18 to 24 hours before evaluation. We recommend a TZ test as an alternative to the germination test.

A regional referee has been conducted to evaluate the procedures of this proposal. Results were not available before submission of this proposal but were forwarded to the rules committee upon completion. Copies are available from the author upon request.

Table 1. Germination for seven wildland collections of arrowleaf balsamroot seeds in response to 0, 28, 56, 70, and 84 days of moist prechill (2° C) tested fresh (<60 days from harvest) and after 3 years of after-ripening (20° C). Post-chill germination was at 5/15° C (12 hr alternating) for 14 days. Germination percentages were adjusted to reflect only viable seeds. Within a collection, numbers followed by the same letter are not significantly different at the $p < 0.05$ level (SNK).

Collection	Seed Age at Time of Test (yrs.)	Days of Prechill 0	28	56	70	84
		------ germination percentage ------				
Glenn's Ferry, ID	0	0e	7d	88b	100a	100a
	3	1e	24c	96b	---	100a
Lewiston, ID	0	0d	1d	40c	90b	99a
	3	0d	28c	96a	---	100a
Black's Creek, ID	0	0d	5d	22c	75b	99a
	3	0d	21c	80b	---	100a
I-84 Rest Stop, ID	0	1c	7c	43b	93a	94a
	3	10c	35b	96a	---	100a
Hyde Park, UT	0	0e	7d	64c	95b	100a
	3	1e	64c	100a	---	100a
Springville, UT	0	0d	1d	40c	81b	97a
	3	1d	36c	97a	---	100a
Hobblecreek, UT	0	0e	1e	16d	58c	94b
	3	0e	15d	94b	---	100a
Mean	0	0f	4f	45d	85c	98a
	3	2f	32e	94b	---	100a

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Proposal #56

PROPOSAL

Change in the rule for *Kochia prostrata*--forage kochia

PRESENT RULE:

4.10, Table 3. Methods of testing for laboratory germination.

Kind of seed	Substrata	Temperature ° C	First count days	Final count days	Additional Directions (See sec. 4.2 and 4.9)
Kochia prostata **forage kochia**	**P**	**20**	**4[a]**	**14[b]**	**Ungerminated seeds: see sec. 4.2e and 4.9k**

PROPOSED RULE:

4.10, Table 3. Methods of testing for laboratory germination.

Kind of seed	Substrata	Temperature ° C	First count days	Final count days	Additional Directions
Kochia prostrata **forage kochia**	**P**	**20**	**4**	**7**	**Prechill 14 days. Ungerminated seeds: see sec. 4.2e and 4.9k**

SUPPORTING EVIDENCE:

The existing rule for testing forage kochia seed germination was developed with seed-lots representing a single germplasm (the cultivar 'Immigrant"). Additional germplasms of this highly variable species are now beginning to be used. How well the existing rule might work with the seeds of these new germplasms is unknown. In addition, problems occur applying the existing rule to some seed lots of 'Immigrant' forage kochia. This is due in part to the fact that, under laboratory conditions, seeds of this species rapidly succumb to fungal infection. Evaluating seedling fitness can be difficult at the conclusion of the 14-day germination test. Alternative test conditions that increase germination rate and/or reduce fungal growth would improve accuracy in testing this species.

We evaluated the effect of a short (14-day) prechill treatment on seed dormancy and germination

rate for five seed-lots of 'Immigrant' and two each of two advanced germplasms of forage kochia, for a total of nine seed-lots (table 1). Three seed lots had been stored at -15° C for 4 years. The other six were fresh lots (< 4 mos. old). Treatments were 14 days at 20° C (existing rule) and prechill at 2° C for 14 days followed by 7 days at 20° C (proposed rule). Results were compared to those of TZ tests.

The 14-day prechill was found to be highly effective in breaking dormancy and in shortening germination time for forage kochia seeds (table 1). Mean germination was 99% of viable after prechill compared to 73% using the existing rule. Seedlings from prechilled seeds germinated rapidly and were generally more vigorous than those tested using the existing rule. First count (day-4) mean germination of prechilled seeds was 97 percent of viable. Thus, a 7-day test appears to be quite adequate for seedling evaluation if it is preceded by 14 days of prechill. Because of the rapid germination rate and the shortened incubation time, fungal growth had negligible impact on seedling evaluation when compared to results using the existing rule. Mean viable seed percentages based on the proposed germination test (85%) compared more favorably to those determined by TZ (88%) than do viability percentages derived from the existing rule (81%).

The proposed rule worked equally well for all germplasm considered.

Table 1. Germination and viability of nine seed-lots of forage kochia seeds using the existing AOSA rule (no prechill, 14 days at 20° C), a proposed rule (14 days prechill/7 days at 20 ° C), and TZ test. Germination percentages were adjusted to reflect only viable seeds.

Germplasm	Seed Germination		Seed Viability		
	No Prechill	Prechill	No Prechill	Prechill	TZ
	------ percentage ------		---------- percentage ----------		
'Immigrant'-92	49	100	89	98	95
'Immigrant'-96a	47	98	90	91	96
'Immigrant'-96b	82	100	66	70	68
'Immigrant'-96c	51	100	85	98	89
'Immigrant'-96d	53	100	86	91	98
U13-92	95	96	59	62	71
U13-96	95	98	79	87	93

U20-92	87	100	78	78	88
U20-96	100	100	94	87	93

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DATE OF PROPOSAL:
October 14, 1997

Proposal Amended

Proposal #57

Present Rule:

3.5 Fluorescence test of ryegrass. – A fluorescence test shall be made on all samples of ryegrass for which the percentage of perennial ryegrass (Lolium perenne) and/or Italian ryegrass (L. multiflorum) is to be reported. The seedlings shall be grown on filter paper and the number of fluorescent seedlings determined under ultraviolet light at the end of the germination period.[a]

[a]For description of method and apparatus for determining fluorescence in ryegrass see the article in the AOSA Newsletter 37 (3): 20-27, 1963. The formula appearing above is to be used instead of the one given in the article cited.

Proposed Rule:

3.5 Fluorescence test of ryegrass. -- A fluorescence test shall be made on all samples of ryegrass for which the percentage of perennial ryegrass (Lolium perenne) and /or Italian ryegrass (L. multiflorum) is to be reported. The seedlings shall be grown on filter paper and the number of fluorescent seedlings determined under ultraviolet light at the end of the germination period.[a]

[a]For description of method and apparatus for determining fluorescence in ryegrass see the *Cultivar Purity Testing Handbook, contribution no. 33 to the Handbook on Seed Testing, AOSA, 1991, Fluorescent Test, C. Annual (Lolium multiflorum) and Perennial (Lolium perenne) Ryegrass.*

Supporting Evidence:

The AOSA Newsletter from 1963 is obsolete whereas the Cultivar Purity Testing Handbook is a living document that is easily attainable for new and returning analysts. The methods and apparatus stated in the Cultivar Purity Testing Handbook are essentially the same as those printed in the 1963 AOSA Newsletter.

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Date of Proposal:

October 11, 1997 revised December 28, 1997

Passed

Proposal #58

RULE CHANGE PROPOSAL

Move the pure seed unit of *Triticum spelta* from subsection 2.6.b(1) to subsection 2.6.b(4) which includes spikelet groups that disarticulate as units with attached rachis and internodes.

PRESENT RULE

2.6 Seed unit.

b. Seed units in the grass family (for descriptions and illustrations of grass seed units, see AOSA Newsletter 70(1):49-59, 1996) include the following:

(1) Caryopses and single florets;

(2) Single floret spikelets in *Agrostis, Alopecurus,* and *Zoysia*; and multiple florets or spikelets in *Anthoxanthum, Arrhenatherum, Avena, Axonopus, Bouteloua, Brachiaria, Chloris, Echinochloa, Ehrharta, Holcus, Hordeum, Melinis, Oryza, Panicum, Paspalum, Phalaris, Poa, Setaria and Zea*;

(3) Spikelets which may have attached rachis segments, pedicels and sterile spikelets in *Andropogon, Bothriochloa ischaemum, Schizachyrium scoparium, Sorghastrum* and *Sorghum*;

(4) Spikelet groups that disarticulate as a unit in *Hilaria jamesii;* spikelet groups that disarticulate as units with attached rachis and internodes in *Andropogon* spp., *Bothriochloa ischaemum, Schizachyrium scoparium, Elymus elymoides, Bouteloua curtipendula* and *Sorghastrum nutans*;

(5) Fascicles of *Cenchrus ciliaris* and *Pennisetum*, consisting of bristles and spikelets;

(6) Burs of *Buchloe dactyloides*;

(7) Bulblets of *Poa bulbosa*;

PROPOSED RULE

2.6 Seed unit.

b. Seed units in the grass family (for descriptions and illustrations of grass seed units, see AOSA Newsletter 70(1):49-59, 1996) include the following:

(1) Caryopses and single florets;

(2) Single floret spikelets in *Agrostis, Alopecurus,* and *Zoysia*; and multiple florets or spikelets in *Anthoxanthum, Arrhenatherum, Avena, Axonopus, Bouteloua, Brachiaria, Chloris, Echinochloa, Ehrharta, Holcus, Hordeum, Melinis, Oryza, Panicum, Paspalum, Phalaris, Poa, Setaria and Zea*;

(3) Spikelets which may have attached rachis segments, pedicels and sterile spikelets in *Andropogon, Bothriochloa ischaemum, Schizachyrium scoparium, Sorghastrum* and *Sorghum*;

(4) Spikelet groups that disarticulate as a unit in *Hilaria jamesii;* spikelet groups that disarticulate as units with attached rachis and internodes in *Andropogon* spp., *Bothriochloa ischaemum, Schizachyrium scoparium, Elymus elymoides, Bouteloua curtipendula, Sorghastrum nutans* and *Triticum spelta*;

(5) Fascicles of *Cenchrus ciliaris* and *Pennisetum*, consisting of bristles and spikelets;

(6) Burs of *Buchloe dactyloides*;

(7) Bulblets of *Poa bulbosa*;

SUPPORTING EVIDENCE

Unless specifically identified in one of subsections 2.6.b(2) through 2.6.b(7), seed units of the Poaceae are considered to fall into subsection 2.6.b(1) – caryopses and single florets. *Triticum spelta* currently falls into this category. The proposal is to move the pure seed unit of *T. spelta* from subsection 2.6.b(1) to subsection 2.6.b(4) which includes spikelet groups that disarticulate as units with attached rachis and internodes. The seed unit in harvested seed of *T. spelta* consists of an entire spikelet, including the glumes, with one or more attached rachis segments (Bailey, 1949; Hitchcock, 1950). The spikelet normally contains two fertile florets plus several distal sterile florets (see attached drawing). This structure clearly does not fit under 2.6.b(1) and to remove the fertile florets from the spikelet during a purity analysis would be very laborious. The seed unit structure is similar to that of *Elymus elymoides* and should be included with it in under 2.6.b(4). By listing *T. spelta* in 2.6.b(4) the need to manually remove the florets from the spikelet to obtain pure seed is eliminated. The International Rules for Seed Testing (ISTA,1996) was amended in 1996 to recognize the multiple seed unit and attached rachis segment of *T. spelta.* Acceptance of this proposal will harmonize the ISTA and AOSA Rules for this factor.

References:

Bailey, L. H., 1949. *Manual of Cultivated Plants.* MacMillan Company, New York. 1116 pp. Page 146.

Hitchcock, A. S., 1950. *Manual of the Grasses of the United States*, 2nd Edition. USDA Miscellaneous Publication 200, Washington, 1051 pp. Page 243.

ISTA, 1996. *International Rules for Seed Testing.* Seed Sci. & Technol., 24, Supplement, Rules, 1996. Pure Seed Definition 33, page 139.

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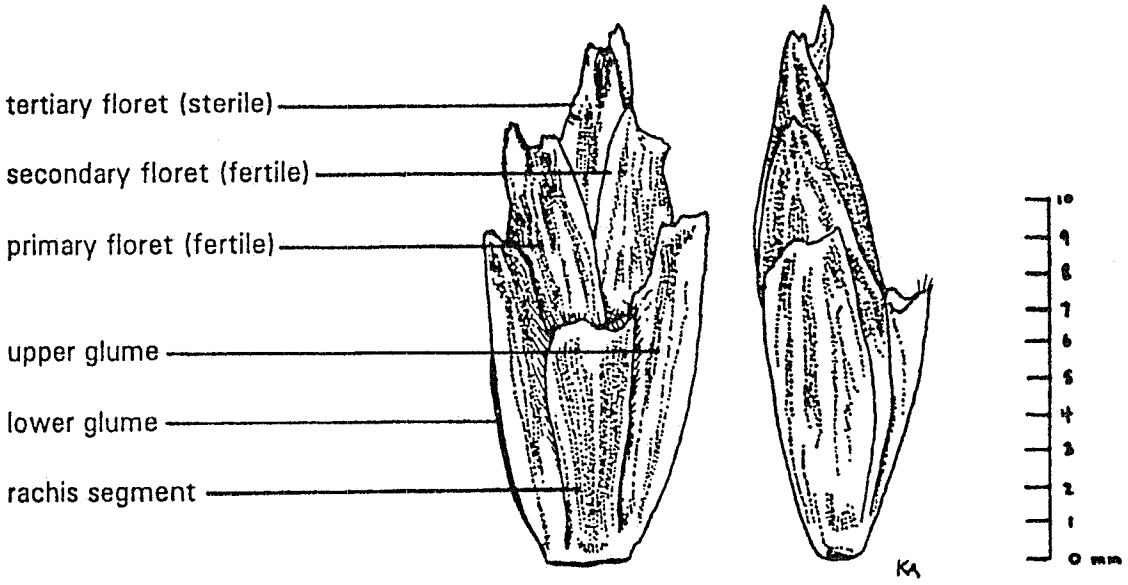
DATE OF PROPOSAL

October 14, 1997.

Triticum spelta L.

Seed Unit



spikelet ventral view

spikelet lateral view

Proposal #58

6/25/98 Withdrawn
BT

Proposal #59

Rules Proposal

To adjust the minimum weight for purity analysis for 24 tree species in Table 1 based on seed counts from 1980 to present.

Present Rule

Table 1. Weights for working sample of agricultural, vegetable and herb, flower, and tree and shrub seeds

Kind of seed	Minimum weight for purity	Approximate number of seeds per	Approximate number of seeds per
		analysis[a]	gram[b] ounce[c]
TREE and SHRUB SEEDS	Grams	Number	Number
Abies concolor (Gordon & Gleninning) Hildebrand white fir	75	35	995
Abies grandis (D. Don) Lindley grand fir	50	50	1450
Abies procera Rehder noble fir	80	30	915
Calocedrus decurrens (Torrey) Florin incense cedar	75	32	900
Cornus florida L. flowering dogwood	300	10	280
Larix occidentalis Nuttall western larch	8	315	8940
Liquidamber styraciflua L. sweetgum	15	180	5130
Liriodendron tulipifera L. yellow poplar	80	31	875
Pinus caribaea Morelet Caribbean pine	40	67	1900
Pinus clausa (Chapman) Vasey sand pine	15	165	4700
Pinus contorta Loudon (incl. var. *latifolia* Engelmann) shore pine, lodgepole pine	10	225-300	6400-8440
Pinus echinata Miller shortleaf pine	25	105	3000
Pinus elliottii Engelmann slash pine	70	30	905
Pinus monticola D. Don western white pine	40	60	1690
Pinus palustris Miller longleaf pine	250	9	265

Table 1. Weights for working sample of agricultural, vegetable and herb, flower, and tree and shrub seeds

Kind of seed	Minimum weight for purity analysis[a]	Approximate number of seeds per gram[b]	Approximate number of seeds per ounce[c]
TREE and SHRUB SEEDS	Grams	Number	Number
Pinus ponderosa P. & C. Lawson ponderosa pine, western yellow pine	90	25	750
Pinus resinosa Aiton red pine, Norway pine	20	1153	260
Pinus strobus L. eastern white pine	40	60	1690
Pinus sylvestris L. Scotch pine	15	155	4420
Pinus taeda L. loblolly pine	60	40	1150
Pinus virginiana Miller Virginia pine, scrub pine	20	115	3260
Platanus occidentalis L. American sycamore	6	425	12000
Pseudotsuga menziesii (Mirbel) Franco var. *menziesii* green douglas fir	25	95	2630
Tsuga heterophylla (Rafinesque) Sargent western hemlock	4	655	18600

Proposed Rule

1. Weights for working sample of agricultural, vegetable and herb, flower, and tree and shrub seeds

Kind of seed	Minimum weight for purity analysis[a]	Approximate number of seeds per gram[b]	Approximate number of seeds per ounce[c]
TREE and SHRUB SEEDS	Grams	Number	Number
Abies concolor (Gordon & Gleninning) Hildebrand white fir	85	30	855
Abies grandis (D. Don) Lindley grand fir	70	38	1070
Abies procera Rehder noble fir	95	26	750
Calocedrus decurrens (Torrey) Florin incense cedar	90	29	815
Cornus florida L. flowering dogwood	200	13	375
Larix occidentalis Nuttall western larch	10	291	8260
Liquidamber styraciflua L. sweetgum	10	247	7010
Liriodendron tulipifera L. yellow poplar	65	43	1215
Pinus caribaea Morelet Caribbean pine	45	55	1560
Pinus clausa (Chapman) Vasey sand pine	25	101	2875
Pinus contorta Loudon (incl. var. *latifolia* Engelmann) shore pine, lodgepole pine	11	227	6455
Pinus echinata Miller shortleaf pine	30	88	2505
Pinus elliottii Engelmann slash pine	100	26	735
Pinus monticola D. Don western white pine	50	53	1500
Pinus palustris Miller longleaf pine	230	11	315
Pinus ponderosa P. & C. Lawson ponderosa pine, western yellow pine	100	25	720
Pinus resinosa Aiton red pine, Norway pine	25	110	3130

Table 1. Weights for working sample of agricultural, vegetable and herb, flower, and tree and shrub seeds

Kind of seed	Minimum weight for purity	Approximate number of seeds per	Approximate number of seeds per
		analysis[a]	gram[b]	ounce[c]
TREE and SHRUB SEEDS	Grams	Number	Number
Pinus strobus L.			
eastern white pine	50	54	1525
Pinus sylvestris L.			
Scotch pine	20	140	3990
Pinus taeda L.			
loblolly pine	65	37	1065
Pinus virginiana Miller			
Virginia pine, scrub pine	25	106	3000
Platanus occidentalis L.			
American sycamore	8	307	8715
Pseudotsuga menziesii (Mirbel) Franco var. *menziesii*			
green douglas fir	30	92	2610
Tsuga heterophylla (Rafinesque) Sargent			
western hemlock	6	459	13025

Supporting Evidence

The average weight of 2500 seed was calculated based on seed counts and purities on all samples received at the National Tree Seed Laboratory since 1980. The number of samples with the seed count test, the average seed count, the number of samples with the purity test, and the average purity data is listed in the following table, along with the average weight of 2500 seed in the samples before the purity test. The first column gives the number of samples that the average seed per pound in the second column is base on. The third column gives the number of samples that the average purity in fourth column is based on.

Species	Number Sd/lb	Average Sd/lb	Number Purity	Average Purity	2500 seed Weight
Abies concolor					
white fir	57	13700	50	0.97	85.33
Abies grandis					
grand fir	63	17119	73	0.97	68.29
Abies procera					
noble fir	132	11968	144	0.99	95.71
Calocedrus decurrens					
incense cedar	20	13050	20	0.99	87.77

Species	Number Sd/lb	Average Sd/lb	Number Purity	Average Purity	2500 seed Weight
Cornus florida					
flowering dogwood	43	5968	13	0.99	191.93
Larix occidentalis					
western larch	22	132145	26	0.89	9.64
Liquidamber styraciflua					
sweetgum	101	112130	98	0.91	11.11
Liriodendron tulipifera .					
yellow poplar	43	19468	38	0.89	65.45
Pinus caribaea					
Caribbean pine	80	24943	75	0.98	46.39
Pinus clausa					
sand pine	228	45965	212	0.99	24.92
Pinus contorta (incl. var. *latifolia*)					
shore pine, lodgepole pine	60	103279	27	0.99	11.09
Pinus echinata					
shortleaf pine	331	40093	282	0.99	28.57
Pinus elliottii					
slash pine	3500	11791	3124	0.99	97.15
Pinus monticola					
western white pine	51	24012	46	0.98	48.19
Pinus palustris					
longleaf pine	1256	5073	1167	0.97	230.45
Pinus ponderosa					
ponderosa pine, western yellow pine	333	11540	231	1.00	98.27
Pinus resinosa					
red pine, Norway pine	99	50059	99	0.99	22.88
Pinus strobus					
eastern white pine	742	24417	620	0.94	49.41
Pinus sylvestris					
Scotch pine	49	63795	40	0.98	18.14
Pinus taeda					
loblolly pine	7317	17025	6888	1.00	66.61
Pinus virginiana					
Virginia pine, scrub pine	214	48021	186	0.98	24.10
Platanus occidentalis					
American sycamore	124	139433	110	0.96	8.47
Pseudotsuga menziesii var. *menziesii*					
green douglas fir	789	41724	684	0.94	28.91
Tsuga heterophylla					
western hemlock	50	208432	50	0.99	5.50

Example

The minimum weight for purity analysis of *Abies concolor* is 75 grams. Based on seed counts on 57 samples, 2500 seeds weigh 85.33 grams. This figure is adjusted 3% higher to account for impurities in the sample, based on purity tests on 50 samples yielding an averge purity of 97%. The minimum weight for purity analysis should be 85 grams.

Summitted by

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Date of Proposal

10-20-97