Passed

Rule Change Proposal No. 14

Purpose: To add seed and working sample weights to Table 1 for 4 species.

PRESENT RULE

New Rule Table 1. Weights for working samples.

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
Impatiens walleriana Hooker f. impatiens	2	20	1,610	45,644
Myosotis ~~alpestris~~ sylvatica F.W. Schmidt garden forget-me-not	2	20	1,565	44,368
Platycodon grandiflorus (Jacquin) A. de Candolle balloon flower	2	20	1,155	32,744
Portulaca grandiflora Hooker portulaca	0.3	3	9,709	275,250

SUPPORTING EVIDENCE

Seed data obtained according to the AOSA seed weight determination method. (Appendix 4)

SUBMITTED BY

The participants of the 1999 Northeast Seed Analyst Workshop: MD State Seed Lab, NC Dept. of Agriculture, OH Seed Improvement, PA State Seed Lab, USDA Seed Examination Facility, VA State Seed Lab, Johnny's Selected Seeds, and the USDA AMS Seed Regulatory and Testing Branch

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DATE OF PROPOSAL

October 15, 2000.
Revised December 14, 2000

Species:	*Impatiens walleriana*													
		100 seed weight (grams)												
Lot No.	Variety	1	2	3	4	5	6	7	8	mean	variance	SD	Var. Coeff.	
1		0.0548	0.0565	0.0609	0.0587	0.0573	0.0610	0.0584	0.0603	0.0585	0.000005	0.0022	3.7918	
2		0.0875	0.0846	0.0911	0.0872	0.0909	0.0821	0.0853	0.0830	0.0865	0.000011	0.0034	3.8770	
3		0.0787	0.0744	0.0754	0.0769	0.0742	0.0765	0.0780	0.0788	0.0766	0.000003	0.0018	2.3839	
5		0.0731	0.0712	0.0706	0.0709	0.0689	0.0646	0.0710	0.0700	0.0700	0.000006	0.0025	3.5625	
6		0.0601	0.0584	0.0591	0.0581	0.0576	0.0525	0.0570	0.0586	0.0577	0.000005	0.0023	3.9709	
7		0.0546	0.0537	0.0534	0.0550	0.0556	0.0546	0.0526	0.0557	0.0544	0.000001	0.0011	2.0017	
8		0.0517	0.0569	0.0580	0.0574	0.0579	0.0560	0.0567	0.0576	0.0565	0.000004	0.0021	3.6450	
9		0.0534	0.0552	0.0543	0.0589	0.0582	0.0581	0.0540	0.0563	0.0561	0.000005	0.0021	3.8158	
10		0.0624	0.0638	0.0667	0.0605	0.0643	0.0644	0.0618	0.0619	0.0632	0.000004	0.0020	3.0968	
11		0.0588	0.0621	0.0640	0.0618	0.0602	0.0586	0.0602	0.0614	0.0609	0.000003	0.0018	2.9634	
12		0.0581	0.0554	0.0574	0.0562	0.0566	0.0567	0.0520	0.0555	0.0560	0.000003	0.0018	3.2982	
13		0.0582	0.0616	0.0583	0.0584	0.0585	0.0553	0.0575	0.0589	0.0583	0.000003	0.0017	2.9647	
14		0.0545	0.0528	0.0508	0.0516	0.0506	0.0518	0.0538	0.0498	0.0520	0.000003	0.0016	3.1335	
									Mean	0.0621				
Species:	*Myosotis alpestris*													
		100 seed weight (grams)												
Lot No.	Variety	1	2	3	4	5	6	7	8	mean	variance	SD	Var. Coeff.	
1		0.0750	0.0718	0.0701	0.0702	0.0701	0.0721	0.0710	0.0714	0.0715	0.000003	0.0016	2.2785	
2		0.0526	0.0544	0.0550	0.0522	0.0542	0.0559	0.0551	0.0556	0.0544	0.000002	0.0013	2.4728	
3		0.0641	0.0630	0.0643	0.0648	0.0657	0.0625	0.0614	0.0629	0.0636	0.000002	0.0014	2.1831	
4		0.0657	0.0672	0.0646	0.0623	0.0671	0.0652	0.0655	0.0671	0.0656	0.000003	0.0017	2.5204	
5		0.0561	0.0530	0.0547	0.0536	0.0549	0.0537	0.0546	0.0554	0.0545	0.000001	0.0010	1.8712	
6		0.0615	0.0564	0.0564	0.0585	0.0571	0.0570	0.0562	0.0556	0.0573	0.000004	0.0019	3.2906	
7		0.0577	0.0571	0.0549	0.0564	0.0561	0.0552	0.0564	0.0553	0.0561	0.000001	0.0010	1.7322	
8		0.0699	0.0663	0.0666	0.0658	0.0703	0.0703	0.0640	0.0678	0.0676	0.000006	0.0024	3.4812	
9		0.0678	0.0669	0.0697	0.0666	0.0683	0.0691	0.0676	0.0694	0.0682	0.000001	0.0012	1.6884	
10		0.0642	0.0634	0.0645	0.0631	0.0633	0.0639	0.0632	0.0636	0.0637	0.000000	0.0005	0.7923	
11		0.0692	0.0689	0.0684	0.0679	0.0664	0.0679	0.0669	0.0692	0.0681	0.000001	0.0010	1.5282	
12		0.0769	0.0764	0.0755	0.0749	0.0761	0.0752	0.0752	0.0764	0.0758	0.000001	0.0007	0.9504	
									Mean	0.0639				

Species: *Platycodon grandiflorus*

100 seed weight (grams)

Lot No.	Variety	1	2	3	4	5	6	7	8	mean	variance	SD	Var. Coeff.
1		0.0833	0.0822	0.0838	0.0836	0.0812	0.08	0.0806	0.0829	0.0822	0.000002	0.0014	1.7581
2		0.081	0.0841	0.0826	0.0833	0.0825	0.0817	0.0791	0.0826	0.08211	0.000002	0.0015	1.8680
3		0.0878	0.088	0.088	0.0853	0.0875	0.0864	0.0884	0.0893	0.08759	0.000002	0.0012	1.4069
4		0.0792	0.0804	0.0783	0.0816	0.0806	0.0813	0.0824	0.0815	0.08066	0.000002	0.0014	1.6763
5		0.0854	0.0799	0.0849	0.0855	0.0821	0.0826	0.0862	0.0868	0.08418	0.000006	0.0024	2.8340
6		0.085	0.0843	0.0855	0.0827	0.0877	0.0872	0.0859	0.0826	0.08511	0.000004	0.0019	2.2038
7		0.0851	0.0816	0.0816	0.0891	0.0867	0.0849	0.0826	0.0888	0.08505	0.000009	0.0030	3.5279
8		0.0813	0.0827	0.0816	0.0835	0.0878	0.0839	0.0809	0.0842	0.08324	0.000005	0.0022	2.6647
9		0.078	0.0789	0.0788	0.0798	0.0777	0.0777	0.0785	0.0797	0.07864	0.000001	0.0008	1.0485
10		0.0922	0.0925	0.097	0.0997	0.0944	0.0988	0.0976	0.0971	0.09616	0.000008	0.0028	2.9239
11		0.0964	0.0955	0.1005	0.0977	0.097	0.0962	0.1002	0.1018	0.09816	0.000005	0.0023	2.3878
12		0.0982	0.0968	0.095	0.0952	0.0909	0.0949	0.0966	0.0975	0.09564	0.000005	0.0023	2.3679
									Mean	0.08656			

Species: *Portulaca grandiflora*

100 seed weight (grams)

Lot No.	Variety	1	2	3	4	5	6	7	8	mean	variance	SD	Var. Coeff.
1		0.0109	0.0112	0.0101	0.0107	0.0106	0.0106	0.0106	0.0107	0.0107	0.000000	0.0003	2.9089
2		0.0093	0.0093	0.0097	0.0088	0.0098	0.0093	0.0093	0.0092	0.0093	0.000000	0.0003	3.2853
3		0.0111	0.0112	0.0114	0.0113	0.0115	0.0111	0.0113	0.0108	0.0112	0.000000	0.0002	1.9328
4		0.0103	0.0103	0.0110	0.0106	0.0106	0.0108	0.0105	0.0106	0.0106	0.000000	0.0002	2.2258
5		0.0101	0.0113	0.0105	0.0109	0.0106	0.0112	0.0106	0.0104	0.0107	0.000000	0.0004	3.8045
6		0.0098	0.0089	0.0096	0.0100	0.0096	0.0096	0.0099	0.0093	0.0096	0.000000	0.0004	3.6745
7		0.0105	0.0116	0.0110	0.0108	0.0111	0.0110	0.0110	0.0108	0.0110	0.000000	0.0003	2.8710
8		0.0104	0.0102	0.0102	0.0105	0.0100	0.0101	0.0103	0.0100	0.0102	0.000000	0.0002	1.7701
9		0.0101	0.0095	0.0101	0.0097	0.0101	0.0104	0.0104	0.0096	0.0100	0.000000	0.0003	3.4865
10		0.0101	0.0098	0.0101	0.0094	0.0097	0.0101	0.0099	0.0100	0.0099	0.000000	0.0002	2.5030
									Mean	0.0103			

Passed

Rule Change Proposal No. 15

Purpose: To add seed and working sample weights for *Heliopsis helianthoides*

PRESENT RULE

New Rule Table 1. Weights for working samples.

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
Heliopsis helianthoides (L.) Sweet heliopsis	10	100	262	7,428

SUPPORTING EVIDENCE

Seed data obtained according to the AOSA seed weight determination method. (Appendix 4)

SUBMITTED BY

Tanis Cuff, WI Crop Improvement and Ellen Chirco, NYS Seed Testing Laboratory

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DATE OF PROPOSAL

September 26, 2000
Revised December 14, 2000

Species: *Heliopsis helianthoides* - false sunflowe													
		100 seed weight (grams)											
Lot No.	Variety	1	2	3	4	5	6	7	8	mean	variance	SD	Var. Coeff.
1		0.3858	0.4058	0.3888	0.4155	0.4092	0.4123	0.3999	0.4158	0.4041	0.000136	0.0116	2.8820
257		0.3201	0.3183	0.3268	0.3182	0.316	0.3304	0.3353	0.32	0.3231	0.000047	0.0069	2.1309
7523		0.2968	0.3278	0.3142	0.3138	0.3033	0.3185	0.3188	0.3137	0.3134	0.000092	0.0096	3.0537
8027		0.3599	0.376	0.3614	0.3647	0.3679	0.3495	0.3341	0.35	0.3579	0.000170	0.0130	3.6419
8257		0.3234	0.3088	0.3097	0.3049	0.3231	0.3386	0.3111	0.3342	0.3192	0.000158	0.0126	3.9317
4250		0.3643	0.355	0.3661	0.3626	0.3704	0.3565	0.3448	0.361	0.3601	0.000063	0.0079	2.2014
2247		0.4142	0.402	0.3787	0.4182	0.4084	0.4209	0.4209	0.3906	0.4067	0.000237	0.0154	3.7860
TC '96		0.4419	0.4257	0.4668	0.4221	0.442	0.4336	0.434	0.4261	0.4365	0.000203	0.0143	3.2677
Ag. 190		0.4801	0.5198	0.5114	0.4922	0.4925	0.4721	0.4998	0.5061	0.4968	0.000252	0.0159	3.1977
Ag. 297		0.3382	0.3459	0.3323	0.3231	0.3552	0.3333	0.3504	0.3535	0.3415	0.000133	0.0115	3.3782
Ag. 323		0.4802	0.4652	0.4403	0.4518	0.4719	0.4603	0.4557	0.4723	0.4622	0.000166	0.0129	2.7884
1970		0.3429	0.3693	0.3433	0.3388	0.3358	0.352	0.3359	0.3273	0.3432	0.000163	0.0128	3.7171
1644	Summer Sun	0.4229	0.3893	0.4142	0.4095	0.418	0.4046	0.3897	0.415	0.4079	0.000158	0.0126	3.0840
0.3778	Summer Sun	0.3778	0.376	0.3665	0.3714	0.3702	0.3748	0.3617	0.3594	0.3697	0.000045	0.0067	1.8137
									Mean	0.3816			

Passed

Rule Change Proposal No. 16

Purpose: To adopt a more efficient method of purity testing for Hard Fescue and Sheep Fescue.

Present Rule:

2.6 **Seed unit.** - The seed unit is the structure usually regarded as a seed in planting practices and in commercial channels. The seed unit may consist of one or more of the following structures:

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

(1) Caryopses and single florets.

Proposed Rule:

2.6 **Seed unit.** - The seed unit is the structure usually regarded as a seed in planting practices and in commercial channels. The seed unit may consist of one or more of the following structures:

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

(8) Multiple units as defined in section 2.12;

2.12 **Multiple unit procedure**

a. Multiple units: The following methods shall be used only for the species included in the following table when multiple units are present in a sample. These methods are applicable to the species listed when they occur in mixtures or singly.

b. Definition: *this section remains unchanged.*

c. Procedures for determining multiple units: *this section remains unchanged.*

Table of factors to apply to multiple units[a]

Percent of single units of each species	Hard Fescue	Sheep Fescue	Chewing Fescue	Red & Creeping Red Fescue	Orchard grass	Crested Wheatgrass[b]	Pubescent Wheatgrass	Intermediate Wheatgrass	Tall Wheatgrass[c]	Western Wheatgrass[c]	Smooth Brome
50 or below	-	-	91	80	80	70	66	72	-	-	72
50.01-55.00	-	-	91	81	81	72	67	74	-	-	74
55.01-60.00	-	-	91	82	81	73	67	75	-	-	75
60.01-65.00	-	-	91	83	82	74	67	76	-	-	76
65.01-70.00	-	-	91	84	82	75	68	77	-	60	78
70.01-75.00	-	-	91	86	82	76	68	78	-	66	79
75.01-80.00	-	-	91	87	83	77	69	79	50	67	81
80.01-85.00	-	-	91	88	83	78	69	80	55	68	82
85.01-90.00	-	-	91	89	83	79	69	81	65	70	83
90.01-100.00	86	82	91	90	84	79	70	82	70	74	85

[a] The factors represent the percentages of the multiple unit weight which are considered pure seed. The remaining percentage is regarded as inert matter.

[b] includes both *Agropyron cristatum* and *A. desertorum*.

[c] Dashes in table indicate that no factors are available at the levels shown. For evaluation refer to AOSA Newsletter 60(1):10 (February 1986).

Supporting Evidence:

In order to find a more efficient method for purity testing of hard and sheep fescue the AOSA Purity Subcommittee conducted a referee study (Meyer, in press). In the study four methods were used to test these species, Method 1 was the current AOSA method, Method 2 was the method recently adopted by AOSA for testing ryegrass, tall fescue and meadow fescue, Method 3 was a factor method similar to that used by AOSA for testing red and chewings fescue, and Method 4 was the ISTA method for testing similar grass species. Although the data showed there was significant variation in the results due to factors such as lab, lot, and method for the samples tested, Methods 2 and 3 produced nearly identical results. Both of these methods produced results of approximately 0.2% higher pure seed than Method 1 (AOSA Method) for both species, an amount well within the allowable AOSA pure seed tolerance for chaffy seed. As expected, Method 4 (ISTA Method) deviated the most from Method 1, but results were within AOSA tolerance. All four methods had similar within method variation. Although for the majority of labs involved, use of one or more of the alternative methods produced more consistent results across all lots than Method 1, overall laboratory accuracy for the majority of labs was better using Method 1.

Method 3 (factor method) showed a marked time savings (35% hard fescue, 41% sheep fescue) over Method 1(AOSA Method) and required less physical manipulation of the seed units. Method 3 also eliminates the possibility of creating additional inert matter by the inadvertent removal of portions of the fertile floret (i.e., rachilla, palea, lemma) during the physical separation process, and the potential of damaging the embryo.

The study was limited to seed lots available in the market place, pure seed range from 96 - 99.50%, therefore the factor method for these species would only apply to lots with single seed unit content above 90%.

Reference

Meyer, D.J.L. In press. Comparison of four methods of purity testing for *Festuca brevipila* R. Tracey and *F. ovina* L. Seed Technology.

Submitted By:
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Date: October 12, 2000; revised December 11, 2000

Passed

RULE CHANGE PROPOSAL No. 17

Purpose of Proposal

To remove the Solanaceae family from the "Miscellaneous" section of the AOSA *Seedling Evaluation Handbook* and to create two new sections, "Solanaceae, Nightshade Family I – Pepper, tomato and husk tomato," and Solanaceae II, other species. These sections will be addressed here as two separate rule proposals; this first one deals with Solanaceae I.

Present Rule

AOSA *Seedling Evaluation Handbook*, p. 91

25. MISCELLANEOUS AGRICULTURAL AND HORTICULTURAL

Apiaceae, carrot family – anise, caraway, carrot, celery, celeriac, chervil, coriander, cumin, dill, parsley, parsnip
Boraginaceae, borage family – borage
Cannabinaceae, hemp family – hemp
Dichondraceae, dichondra family – dichondra
Geraniaceae, geranium family – alfilaria
Lamiaceae, mint family – balm, catnip, rosemary, sage, summer savory, sweet basil, sweet marjoram, thyme
Pedaliaceae, benne family – sesame
Rosaceae, rose family – little burnet
Solanaceae, nightshade family – belladonna, eggplant, tomato, husk tomato, pepper, tobacco
Valerianaceae, valerian family – cornsalad

Proposed Rule

25. MISCELLANEOUS AGRICULTURAL AND HORTICULTURAL

Apiaceae, carrot family – anise, caraway, carrot, celery, celeriac, chervil, coriander, cumin, dill, parsley, parsnip
Boraginaceae, borage family – borage
Cannabinaceae, hemp family – hemp
Dichondraceae, dichondra family – dichondra
Geraniaceae, geranium family – alfilaria
Lamiaceae, mint family – balm, catnip, rosemary, sage, summer savory, sweet basil, sweet marjoram, thyme
Pedaliaceae, benne family – sesame
Rosaceae, rose family – little burnet
* Solanaceae, nightshade family – kinds other than pepper, tomato and husk tomato
Valerianaceae, valerian family – cornsalad

* Would be removed if both proposals for Solanaceae pass.

(See following proposed 3 pages of Seedling Evaluation Handbook.)

SOLANACEAE, NIGHTSHADE FAMILY I – Pepper, tomato and husk tomato

Capsicum spp., vegetable and ornamental pepper
Lycoperiscon esculentum var. *esculentum*, tomato
Physalis pubescens, husk tomato
Physalis spp., physalis

GENERAL DESCRIPTION

Seedling type: Epigeal dicot.

Food reserves: Cotyledons which expand and become thin, leaf-like and photosynthetic; fleshy endosperm.

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

Root system: A long primary root, usually with root hairs. Secondary or adventitious roots usually do not develop within the test period unless the primary root has been damaged.

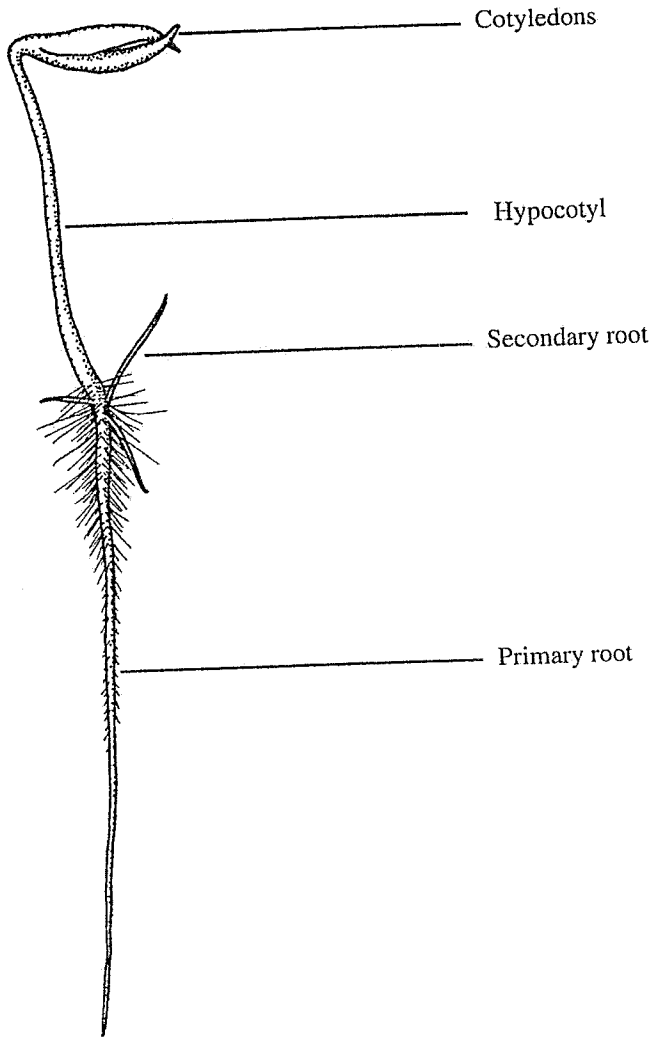


Fig. 1 Pepper

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 (see note 1).

Epicotyl:

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

Hypocotyl:

- deep open cracks 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 (see note 2; for seed coat – bound roots in *Capsicum* spp., see note 3).

Seedling:

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

NOTES

1. In all members of this group, unshed seed coats must be removed in order to evaluate the cotyledons. In *Capsicum* spp., there can be a problem with seed coats adhering to the cotyledons, which often causes mechanical injury to the cotyledons. This can be caused by the inflexible seed coat and a less than optimum moisture after radicle emergence. Testing in rolled paper towels can reduce this problem, but see note 3.

2. A normal root system may include a damaged or missing primary root as long as there are at least two strong secondary or adventitious roots present and the hypocotyl is near normal length.

3. In *Capsicum* spp., the primary root may become bound up in the seed coat at the base of the hypocotyl, which may prevent the formation of a completely developed primary root and/or secondary roots. The frequency of this bound root condition varies with different test methods. While the analyst should classify most seedlings with a bound primary root to be normal, a test method should be used which is known to avoid the bound primary root condition in pepper. Placing pepper seeds in rolled towels which are slanted at a 45° angle until the first count is made may help to reduce the bound root problem. See Peterson 2000 in References for further information.

REFERENCES

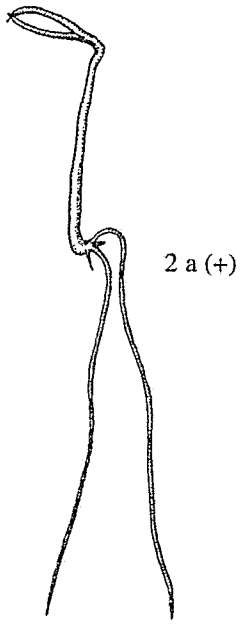
Ertsey, K. J. 1978. The assessment of abnormal root types in *Lycopersicon lycopersicum* and the role of secondary roots in the development of the plants. Seed Sci. & Technol., 6(3):735-747.

Miguel, M. C. 1978. Report of the germination committee working group on evaluation of seedlings with root damage. 1974-1977. Seed Sci. & Technol., 6(1):203-212

Peterson, P. and E. Harris. April 2000. Seedling Evaluation of Bound Primary Roots in Pepper (*Capsicum* spp.) Solanaceae. California Dept. of Food and Agriculture. (This paper is available from the California State Seed Lab and will be submitted to *Seed Technology.*)

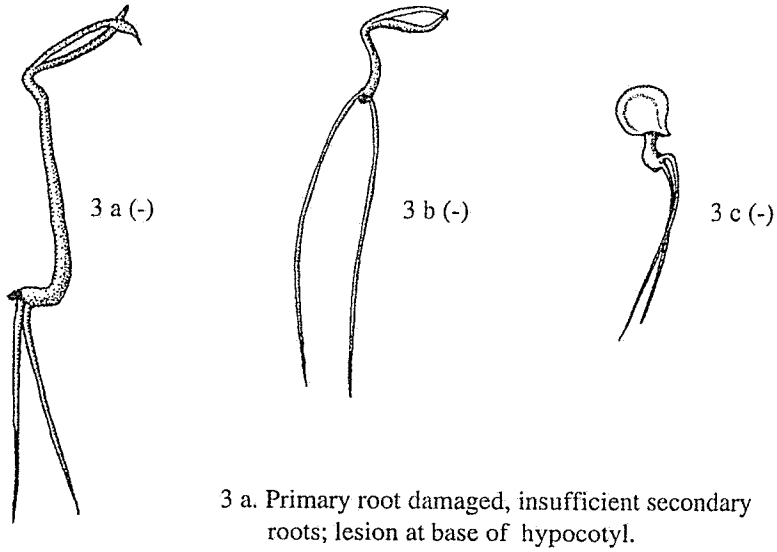
USDA. 1952. Manual for Testing Agricultural and Vegetable Seeds. Agriculture Handbook No. 30. p. 171.

Fig. 2 Root defects (normal).



2 a. Primary root damaged, sufficient secondary roots.

Fig. 3 Root and hypocotyl defects (abnormal).

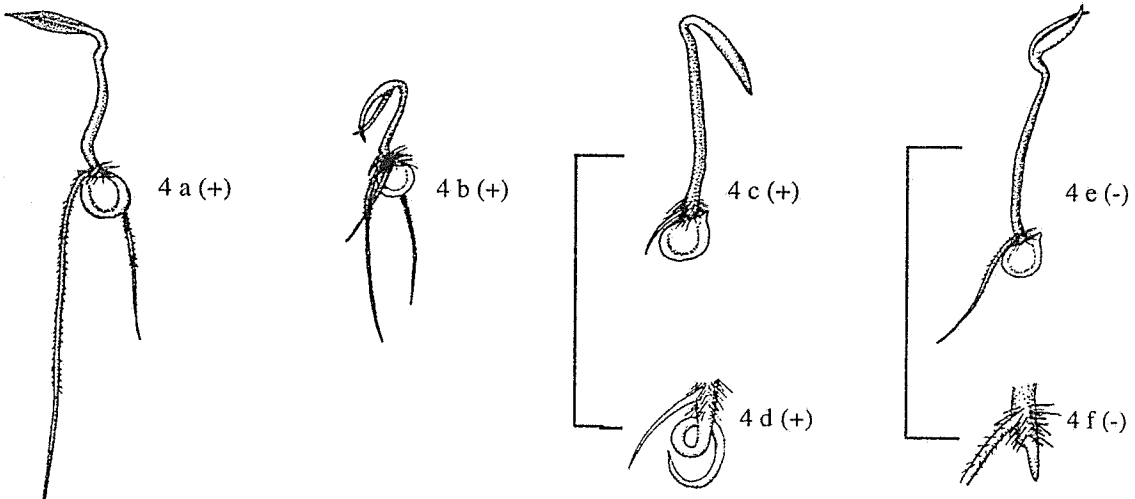


3 a. Primary root damaged, insufficient secondary roots; lesion at base of hypocotyl.

3 b. Hypocotyl short, thickened, with lesion at base; primary root missing.

3 c. Hypocotyl short, thickened; primary root damaged; seed coat not shed.

Fig. 4 Bound roots (pepper, substratum T).



4 a. Primary root bound in seed coat, sufficient secondary roots.
4 b. Primary root bound in seed coat, secondary roots present. Extend test if root system is questionable.
4 c. Primary root present, bound in seed coat (see note 3).
4 d. Seed coat removed to expose root.
4 e. Primary root damage, bound in seed coat; insufficient secondary roots (see note 3).
4 f. Seed coat removed to expose root.

Supporting Evidence

In this description of the seedling evaluation of pepper, tomato, and husk tomato, no changes have been made to the way they are already being evaluated in Section 25, "Miscellaneous Agricultural and Horticultural." They have simply been removed and given their own section, in order to facilitate the evaluation of these species. Evaluation of root development in the Solanaceae has been different between AOSA and ISTA Rules. ISTA has required a primary root, whereas AOSA has allowed for the development of sufficient secondary roots.

The following persons and/or groups have contributed to the development of this rule proposal:

AOSA Germination and Dormancy Subcommittee, June 2000 Annual Meeting.
California Seed Analysts and Seed Researchers. April 1999 Spring Workshop.
Front Range Seed Analysts. July 2000 meeting.
Peterson, Paul and Elaine Harris. "Seedling Evaluation of Bound Primary Roots in Pepper (*Capsicum* spp.) Solanaceae" – presented at CSASR Spring Workshop April 2000.
Drawings were prepared by Deborah Meyer, Senior Seed Botanist, California Department of Food & Agriculture, and were created from photographs evaluated in the CSASR Workshop as well as from live material.

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Date of Proposal

October 12, 2000

Passed

Rule Change Proposal No. 18

Purpose of Proposal

To remove the Solanaceae family from the "Miscellaneous" section of the AOSA *Seedling Evaluation Handbook* and to add flower species which are listed in the AOSA *Rules for Testing Seeds*, but are not currently covered in the AOSA *Seedling Evaluation Handbook*. This proposal would address the rest of Solanaceae not covered in the previous rule proposal; the new section would be entitled "Solanaceae, Nightshade Family II – Kinds other than pepper, tomato and husk tomato."

Present Rule

AOSA *Seedling Evaluation Handbook*, p. 91

25. MISCELLANEOUS AGRICULTURAL AND HORTICULTURAL

Apiaceae, carrot family – anise, caraway, carrot, celery, celeriac, chervil, coriander, cumin, dill, parsley, parsnip
Boraginacaeae, borage family – borage
Cannabinaceae, hemp family – hemp
Dichondraceae, dichondra family – dichondra
Geraniaceae, geranium family – alfilaria
Lamiaceae, mint family – balm, catnip, rosemary, sage, summer savory, sweet basil, sweet marjoram, thyme
Pedaliaceae, benne family – sesame
Rosaceae, rose family – little burnet
Solanaceae, nightshade family – belladonna, eggplant, tomato, husk tomato, pepper, tobacco
Valerianaceae, valerian family – cornsalad

Proposed Rule

25. MISCELLANEOUS AGRICULTURAL AND HORTICULTURAL

Apiaceae, carrot family, anise, caraway, carrot, celery, celeriac, chervil, coriander, cumin, dill, parsley, parsnip
Boraginaceae, borage family – borage
Cannabinaceae, hemp family – hemp
Dichondraceae, dichondra family – dichondra
Geraniaceae, geranium family – alfilaria
Lamiaceae, mint family – balm, catnip, rosemary, sage, summer savory, sweet basil, sweet marjoram, thyme
Pedaliaceae, benne family – sesame
Rosaceae, rose family – little burnet
*Solanaceae, nightshade family – pepper, tomato, husk tomato
Valerianaceae, valerian family – cornsalad

* Would be removed if both proposals for Solanaceae pass.

(See following 2 pages.)

SOLANACEAE, NIGHTSHADE FAMILY II – Kinds other than pepper, tomato, and husk tomato

Atropa bella-donna, belladona
Browallia spp., bush violet
Brugmansia arborea, angel's trumpet
Nicotiana alata, flowering tobacco
Nicotiana x *sanderae*, nicotiana
Nicotiana tabacum, tobacco
Nierembergia spp., cupflower
Petunia spp., petunia
Salpiglossis sinuata, painted-tongue
Schizanthus spp., butterfly flower
Solanum melongena, eggplant
Solanum spp., solanum

GENERAL DESCRIPTION

Seedling type: Epigeal dicot.

Food reserves: Cotyledons which expand and become thin, leaf-like and photosynthetic. Fleshy endosperm.

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

Root system: A primary root; secondary roots or root hairs may develop within the test period for some species.

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 the cotyledons are intact).

Hypocotyl:

- deep open cracks extending into the conducting tissue.
- malformed, such as markedly shortened, curled, or thickened.
- watery (see note 1).

Root:

- weak, stubby or missing primary root regardless of the presence of secondary or adventitious roots (see notes 2 and 3).
- primary root with lesions.

Seedling:

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

NOTES

1. The appearance of glassy-looking hypocotyls may be the result of unfavorable laboratory conditions, such as too much moisture during the germination test.
2. Secondary or adventitious roots may develop within the test period for some species. This would be considered normal as long as the primary root is also present.
3. The primary roots in some of the small-seeded species in this group (e.g. *Petunia*) may appear to be stunted. These seedlings are counted as normal as long as there is sufficient root and/or root hairs to hold the seedlings upright and as long as everything else appears to be normal.

Supporting Evidence

The seedling evaluation description in this group of Solanaceae species is in agreement with the evaluation of these species as described in the ISTA *Handbook of Seedling Evaluation.* Drawings are not available at this time.

The following persons and/or groups have contributed to the development of this rule proposal:

AOSA Germination and Dormancy Subcommittee, June 2000 Annual Meeting.
Atkins, Barbara. 1999. Personal communication. STA Laboratories, Longmont, Colorado.
California Seed Analysts and Seed Researchers. April 1999 Spring Workshop.

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Date of Proposal

October 12, 2000

Passed

Rule Change Proposal No. 19

Purpose of Proposal

To add Caryophyllaceae, Primulaceae, Scrophulariaceae, and Violaceae to the AOSA *Seedling Evaluation Handbook.* Many members of these families are found in the AOSA *Rules for Testing Seeds*, but no AOSA seedling evaluation descriptions are currently available for them.

Present Rule

New Rule.

Proposed Rule

CARYOPHYLLACEAE, PINK FAMILY

Cerastium tomentosum, snow-in-summer
Dianthus x *allwoodii*, sweet wivelsfield
Dianthus barbatus, sweet-william
Dianthus caryophyllus, carnation
Dianthus chinensis, China pinks
Dianthus deltoides, maiden pinks
Dianthus plumarius, grass pinks
Gypsophila elegans, long-petaled baby's-breath
Gypsophila pacifica, Pacific baby's-breath
Gypsophila paniculata, perennial baby's-breath
Gypsophila repens, baby's-breath
Lychnis chalcedonica, Jerusalem-cross
Lychnis coronaria, rose campion
Lychnis viscaria, clammy campion
Sagina subulata, pearlwort
Saponaria ocymoides, rock saponaria
Silene armeria, sweet-William catchfly
Vaccaria hispanica, cow-cockle

GENERAL DESCRIPTION

Seedling type: Epigeal dicot.

Food reserves: Leaf-like cotyledons and perisperm.

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

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

ABNORMAL SEEDLING DESCRIPTION

Cotyledons:
- less than half of the original cotyledon tissue remaining attached (see note 1).
- 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 extending into the conducting tissue.
- malformed, such as markedly shortened, curled or thickened (see note 2).
- watery (see note 5).

Root:
- weak, stubby or missing primary root; secondary roots will not compensate for a defective primary root (see note 3).

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

NOTES

1. In certain species (e.g. *Dianthus*), the seedling may produce three cotyledons instead of two. This should be considered normal as long as the sprout is otherwise normal.
2. The hypocotyl may show minor twisting due to processing damage. If not too severe, such a seedling would be considered to be normal.
3. For *Dianthus* spp., older seed lots may show declining vigor, which is indicated by shortened roots and/or hypocotyl. These seedlings would be considered normal as long as the growth is proportional and adequate to support the seedling.
4. In *Dianthus* spp., there may be a lot of mechanical damage, leading to abnormal seedlings. Cotyledons may become caught up in the seed coat; it is important to remove the seed coat for evaluation of the cotyledons, which may be broken due to the mechanical damage.
5. In some species (e.g. *Dianthus*), problems with watery hypocotyls may occur if test conditions are too wet.

PRIMULACEAE, PRIMROSE FAMILY I - Cyclamen

Cyclamen africanum, cyclamen

GENERAL DESCRIPTION

Seedling type: Epigeal dicot.

Food reserves: Fleshy endosperm; minor reserves in the cotyledon.

Shoot system: swollen tuberous hypocotyl and a single cotyledon (normally there is no second cotyledon) borne on a petiole, the terminal bud lying at its base.

Root system: Several seminal roots, developing more or less simultaneously at the distal end of the hypocotyl.

ABNORMAL SEEDLING DESCRIPTION

Cotyledons:
- cotyledon petiole broken or split (see note 2).

Epicotyl:
- missing (may be assumed to be present if cotyledon petiole is intact).

Hypocotyl:
- not forming a tuber.
- split, constricted, spindly, glassy.

Root:
- none, or only one seminal root.
- stunted or stubby.

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

NOTES

1. The cotyledon petiole should be examined at the point of entry into the seed coat for signs of decay.
2. Normally there is no second cotyledon. The dark green, heart-shaped blade of the single cotyledon is not usually evident during the prescribed test period.

REFERENCES

Bekendam, J. and R. Grob. 1979. Handbook for Seedling Evaluation, Second Edition. International Seed Testing Association, Zurich, Switzerland.

PRIMULACEAE, PRIMROSE FAMILY II – Kinds other than Cyclamen

Anagallis arvensis, scarlet pimpernel
Anagallis monelli, anagallis
Primula spp., primrose

GENERAL DESCRIPTION

Seedling type: Epigeal dicot.

Food reserves: Leaf-like cotyledons and 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.

ABNORMAL SEEDLING DESCRIPTION

Cotyledons:
- less than half of the original cotyledon tissue remaining attached.
- less than half of the original cotyledon tissue remaining free of necrosis or decay.
- seed coat tightly adhering to cotyledons.

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

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

Root:
- weak, stubby or missing primary root (secondary roots will not compensate for a defective primary root).
- primary root tip blunt.

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

SCROPHULARIACEAE, FIGWORT FAMILY

Antirrhinum spp., snapdragon
Calceolaria spp., calceolaria
Collinsia heterophylla, chinese-houses
Digitalis spp., foxglove
Linaria spp., linaria
Mimulus x *hybridus*, tiger monkeyflower
Nemeisia spp., nemesia
Penstemon barbatus, beardlip penstemon
Penstemon eatonii, firecracker penstemon
Penstemon palmeri, Palmer penstemon
Penstemon penlandii, Penland's beardtongue
Penstemon strictus, Rocky Mountain Penstemon
Penstemon spp., penstemon
Pseudolysimachion spicatum, spike speedwell
Torenia fournieri, blue wishbone-flower
Veronica austriaca, Hungarian speedwell

GENERAL DESCRIPTION

Seedling type: Epigeal dicot.

Food reserves: Fleshy endosperm and leaf-like 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 or root hairs may develop within the test period.

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 (see note 1).

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

Hypocotyl:
- deep open cracks extending into the conducting tissue.
- malformed, such as markedly shortened, curled or thickened.
- watery (see note 3).

Root:
- none.
- weak, missing or stubby primary root (secondary roots will not compensate for a defective primary root).

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

NOTES

1. Seedlings with unshed seed coats may have decayed or damaged cotyledons. The seed coat must be removed for evaluation of the cotyledons.
2. The use of gibberellic acid (GA_3) is recommended for breaking dormancy in certain species (see Table 3 and sections 4.8m, 4.8p, and 4.9k(4) of AOSA Rules).
3. In certain species (e.g. *Antirrhinum* spp.), watery or glassy seedlings may be the result of lack of light during germination. Watery sprouts are considered abnormal if not caused by test conditions.

VIOLACEAE, VIOLET FAMILY

Viola cornuta, viola
Viola tricolor, pansy

GENERAL DESCRIPTION

Seedling type: Epigeal dicot.

Food reserves: Cotyledons which expand and become thin, leaf-like and photosynthetic; endosperm.

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

Root system: A primary root with root hairs usually developing within the test period.

ABNORMAL SEEDLING DESCRIPTION

Cotyledons:
- less than half of the original cotyledon tissue remaining attached (see note 1).
- less than half of the original cotyledon tissue free of necrosis or decay (see note 2).

Epicotyl:
- missing (may be assumed to be present if cotyledons are intact).
- decayed at growing point.

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

Root:
- weak, stubby or missing primary root (secondary roots will not compensate for a defective primary root; see note 3).

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

NOTES

1. Seedlings in this group may produce three cotyledons instead of two. Such a seedling should be considered normal as long as the sprout is otherwise normal.
2. Seedlings with unshed seed coats may have decayed cotyledons. The seed coat must be removed for evaluation. If the seed coat cannot be removed, the seedling is classified as abnormal.
3. Certain cultivars of pansy may have a characteristically short primary root. This should be considered normal as long as the proportions between the root and the hypocotyl are balanced.

Supporting Evidence

All seedling evaluations in this proposal are in agreement with ISTA's *Handbook for Seedling Evaluation* (1979).

Drawings are not available at this time.

The following persons and/or groups have contributed to the development of this rule proposal:

Atkins, Barbara. 1999. Personal communication. STA Laboratories, Longmont, Colorado.
Hall, Jane. 2000. Personal communication. Precision Seed Testing, Arvada, Colorado
ISTA Flower Seed Committee – worksheets
ISTA 1979 *Handbook for Seedling Evaluation.*
Joint AOSA/SCST Flower Seed Committee – Flower Seed Evaluation Working Groups Questionnaire 2000.
Mary, Ellen. 2000. Personal communication. Tangent Seed Lab, Tangent, Oregon.
Rizvi, Syed. 1996. Seedling Evaluation – Produced in cooperation with Novartis Seeds.

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Date of Proposal

October 12, 2000
Revised December 17, 2000

Passed

Rule Change Proposal No. 20A

PURPOSE OF PROPOSAL

Proposal A. (See also proposal B to be voted on if this proposal fails.)The purpose of this proposal is to add the new Tetrazolium Testing Handbook to section 4.9 k. (2) listing references for TZ testing methods, to correct the citation format of 4.9 k. (2) (a) and to amend section 7.

PRESENT RULE

4.9 k. (2) Tetrazolium test (TZ) – Principles and procedures are found in the following literature:

a. GRABE, D.F. ed. 1970. Tetrazolium testing handbook for agricultural seeds. Handbook on Seed Testing, AOSA Contrib. No. 29:1-62.

b. International Seed Testing Association. 1999. International Rules for Seed Testing, Annexe to chapter 6. Biochemical test for viability. Seed Sci. and Technol. 27 (Supplement): 201-244.

7. TETRAZOLIUM TESTING

Methods for conducting tetrazolium tests on agricultural seeds are outlined in AOSA Handbook No. 29: *Tetrazolium Testing Handbook for Agricultural Seeds*.

PROPOSED RULE

4.9 k. (2) Tetrazolium test (TZ) – Principles and procedures are found in the following literature:

(a) GRABE, D.F. (ed.) 1970. Tetrazolium Testing Handbook for Agricultural Seeds. Contribution No. 29 to the Handbook on Seed Testing, AOSA.

(b) International Seed Testing Association. 1999. Biochemical test for viability. Seed Sci.Technol. 27, (supplement): 201-244.

(c) PETERS, J. (ed.) 2000. Tetrazolium Testing Handbook. Contribution No. 29 to the Handbook on Seed Testing revised 2000. AOSA.

7. TETRAZOLIUM TESTING

Methods for conducting tetrazolium tests are outlined in the following references:

a. GRABE, D.F. (ed.) 1970. Tetrazolium Testing Handbook for Agricultural Seeds. Contribution No. 29 to the Handbook on Seed Testing. AOSA.

b. PETERS, J. (ed.) 2000. Tetrazolium Testing Handbook. Contribution No. 29 to the Handbook on Seed Testing revised 2000. AOSA.

SUPPORTING EVIDENCE

Citation format follows the style manual: http://www.asa-cssa-sssa.org/style98/ as recommended by the Rules committee.

Although the wording "Contribution No. 29 to the Handbook on Seed Testing" differs from citations of other handbooks (actually contributions) mentioned in the Rules, this is the correct title of the book. (The Rules committee may want to editorially correct the other references throughout the Rules)

Page numbers were left off of the (2000) Tetrazolium Testing Handbook citation because the family pages are not numbered and the designated style manual does not require page numbers for books.

The ISTA publication is included in 4.9k. (2), which deals with viability testing of ungerminated seed at the end of a germination test. It is omitted from section 7, which deals with all TZ tests. The ISTA publication states a specific number of seeds (400) to test for a "stand-alone" TZ test. AOSA publications recommend 200 seeds and also defer to state regulations that vary regarding the legal use of the tetrazolium test.

The following is an excerpt of a letter from Doug Ashton, Rules Committee Chairman, to the TZ subcommittee chairman, Annette Miller:

"At the AOSA business meeting in Ames, there was limited discussion of this (addition), and those present agreed that the new handbook should be added as a third reference, leaving the Grabe reference intact, since this is still used by some.

As a result of these discussions, I initiated discussion within the Rules Committee to determine if these changes could be made editorially, i.e. without the formal rule change proposal and voting procedure. The consensus from the Rules Committee is that these changes are more than editorial and require due consideration by the full membership."

SUBMITTED BY

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DATE OF PROPOSAL

September 21, 2000

Rule Change Proposal No. 20B

PURPOSE OF PROPOSAL

Proposal B. This proposal should be voted on if "Proposal A" fails. The purpose of this proposal is to add the new Tetrazolium Testing Handbook to section 4.9 k. (2) listing references for TZ testing methods, to correct the citation format of 4.9 k. (2) (a) and to amend section 7.

PRESENT RULE

4.9 k. (2) Tetrazolium test (TZ) – Principles and procedures are found in the following literature:

a. GRABE, D.F. ed. 1970. Tetrazolium testing handbook for agricultural seeds. Handbook on Seed Testing, AOSA Contrib. No. 29:1-62.

b. International Seed Testing Association. 1999. International Rules for Seed Testing, Annexe to chapter 6. Biochemical test for viability. Seed Sci. and Technol. 27 (Supplement): 201-244.

7. TETRAZOLIUM TESTING

Methods for conducting tetrazolium tests on agricultural seeds are outlined in AOSA Handbook No. 29: *Tetrazolium Testing Handbook for Agricultural Seeds.*

PROPOSED RULE

4.9 k. (2) Tetrazolium test (TZ) – Principles and procedures are found in the following literature:

(a) International Seed Testing Association. 1999. Biochemical test for viability. Seed Sci.Technol. 27, (supplement): 201-244.

(b) PETERS, J. (ed.) 2000. Tetrazolium Testing Handbook. Contribution No. 29 to the Handbook on Seed Testing revised 2000. AOSA.

7. TETRAZOLIUM TESTING

Methods for conducting tetrazolium tests are outlined in the *Tetrazolium Testing Handbook, Contribution No. 29 to the Handbook on Seed Testing revised 2000,* published by the AOSA.

SUPPORTING EVIDENCE

Citation format follows the style manual: http://www.asa-cssa-sssa.org/style98/ as recommended by the Rules committee.

Although the wording "Contribution No. 29 to the Handbook on Seed Testing" differs from citations of other handbooks (actually contributions) mentioned in the Rules, this is the correct title of the book. (The Rules committee may want to editorially correct the other references throughout the Rules)

Page numbers were left off of the (2000) Tetrazolium Testing Handbook citation because the family pages are not numbered and the designated style manual does not require page numbers for books.

The ISTA publication is included in 4.9k. (2), which deals with viability testing of ungerminated seed at the end of a germination test. It is omitted from section 7, which deals with all TZ tests. The ISTA publication states a specific number of seeds (400) to test for a "stand-alone" TZ test. AOSA publications recommend 200 seeds and also defer to state regulations that vary regarding the legal use of the tetrazolium test.

The following is an excerpt of a letter from Susan Maxon to the TZ subcommittee chairman, Annette Miller:

"The 1970 TZ handbook is out-of-print. In recent years, we've been adopting Rule proposals that eliminate references to out-of-print publications (e.g., USDA Handbook No. 30 and the AOSA Newsletter article by Vera Colbry on ryegrass fluoresence). Although it seemed like a good idea during the business meeting, I don't think enough consideration was given to the fact that reference to 2 versions of HB 29 would cause confusion. The revised TZ handbook includes many references, including the 1970 edition. So eliminating reference to the 1970 edition in the Rules and replacing it with the 2000 edition would not mean that the 1970 edition couldn't be used as an additional resource for TZ testing. Therefore, I recommend that a formal Rule proposal be written to address this issue. My preference is to add reference to the 2000 edition and delete reference to the 1970 version."

SUBMITTED BY

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DATE OF PROPOSAL

September 21, 2000

Passed

Rule Change Proposal No. 21

PURPOSE: This proposal amends one species and adds two species to Table 1.

PRESENT RULE

Table 1. Weights for working samples.

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
Dimorphotheca sinuata de Candolle African-daisy	5	50	415-800 (530)	11,765-22,680 (15,025)

PROPOSED RULE

Table 1. Weights for working samples.

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
Dimorphotheca sinuata de Candolle African-daisy cape-marigold, blue-eyed				
stick type seed	5	50	459	13,013
flake type seed	4	40	597	16,925 .
Gilia leptantha Parish gilia, blue	2	20	1211	34,331
Malcolmia maritima (L.) R. Br. stocks, Virginian	1	10	2199	62,341

SUPPORTING EVIDENCE

Appendix 4 weight determination method used. *Dimorphotheca sinuata* stick and flake types are cleaned and marketed separately. The drastic morphologic differences justify having separate seed count data.

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DATE OF PROPOSAL September 18, 2000, Amended December 8, 2000

Species: *Dimorphotheca sinuata* DC. - **stick** type seed

100 seed weight

Lot No.	1	2	3	4	5	6	7	8	mean	variance	SD	Var. Coeff.
1	0.2224	0.2134	0.2130	0.2116	0.2145	0.2071	0.2116	0.2125	0.2133	1.8457E-05	0.004296	2.014492
2	0.2111	0.1918	0.2017	0.2021	0.1991	0.1950	0.1999	0.2003	0.2001	3.19336E-05	0.005651	2.823725
3	0.2229	0.2106	0.2117	0.2205	0.2223	0.2200	0.2130	0.2153	0.2170	2.45827E-05	0.004958	2.28444
4	0.2500	0.2450	0.2362	0.2446	0.2468	0.2560	0.2381	0.2549	0.2465	5.08057E-05	0.007128	2.892194
5	0.1908	0.1896	0.1925	0.1912	0.1794	0.1952	0.1896	0.1886	0.1896	2.12584E-05	0.004611	2.431634
6	0.2076	0.2113	0.2003	0.2105	0.2055	0.2053	0.2021	0.1964	0.2049	2.59107E-05	0.00509	2.484567
7	0.2334	0.2354	0.2271	0.2370	0.2210	0.2224	0.2143	0.2252	0.2270	6.18879E-05	0.007867	3.465969
9	0.2630	0.2750	0.2767	0.2615	0.2704	0.2782	0.2612	0.2696	0.2695	4.76743E-05	0.006905	2.5625
11	0.1908	0.1981	0.1907	0.1990	0.2011	0.1901	0.1894	0.1944	0.1942	2.13657E-05	0.004622	2.380178
								mean	0.2180			

Species: *Dimorphotheca aurantiaca* DC.-**flake** type seed - African daisy

Lot No.	1	2	3	4	5	6	7	8	mean	variance	sd	var. coeff.
402	0.1657	0.1505	0.1560	0.1501	0.1623	0.1508	0.1514	0.1514	0.1548	0.000037	0.0060	3.9087
402a	0.1462	0.1556	0.1593	0.1518	0.1463	0.1504	0.1475	0.1572	0.1518	0.000026	0.0051	3.3585
403	0.1860	0.1837	0.1856	0.1874	0.1909	0.1850	0.1839	0.1788	0.1852	0.000012	0.0034	1.8603
403a	0.1903	0.1935	0.1806	0.1905	0.1855	0.1891	0.1860	0.1807	0.1870	0.000022	0.0047	2.5054
2313	0.2018	0.1795	0.1884	0.1952	0.1886	0.1894	0.1938	0.1902	0.1909	0.000041	0.0064	3.3720
2314	0.1960	0.1971	0.1912	0.1949	0.2070	0.2064	0.1937	0.2060	0.1990	0.000041	0.0064	3.2120
4283	0.1733	0.1618	0.1753	0.1605	0.1615	0.1713	0.1656	0.1724	0.1677	0.000036	0.0060	3.5894
5463	0.1391	0.1378	0.1394	0.1358	0.1373	0.1396	0.1455	0.1418	0.1395	0.000009	0.0030	2.1479
4467	0.1604	0.1529	0.1558	0.1514	0.1548	0.1528	0.1565	0.1468	0.1539	0.000016	0.0040	2.6021
2312	0.1967	0.1861	0.1914	0.1891	0.1955	0.1912	0.1908	0.1888	0.1912	0.000012	0.0035	1.8238
4754	0.1479	0.1439	0.1354	0.1425	0.1473	0.1439	0.1434	0.1422	0.1433	0.000015	0.0038	2.6686
no number	0.1438	0.1495	0.1491	0.1468	0.1418	0.1473	0.1562	0.1449	0.1474	0.000019	0.0044	2.9863
								mean	0.1676			

Species: *Gilia leptantha* Parish

100 seed weight

Lot No.	1	2	3	4	5	6	7	8	mean	variance	SD	Var. Coeff.
1	0.0877	0.0871	0.0831	0.0845	0.0818	0.0847	0.0846	0.0808	0.084288	5.66125E-06	0.002379	2.822884
2	0.0865	0.0820	0.0795	0.0833	0.0849	0.0830	0.0807	0.0886	0.083563	9.04554E-06	0.003008	3.599198
3	0.0750	0.0734	0.0746	0.0779	0.0757	0.0734	0.0717	0.0708	0.0741	5.09696E-06	0.002258	3.048298
4	0.0852	0.0855	0.0867	0.0841	0.0850	0.0847	0.0866	0.0846	0.0853	8.68571E-07	0.000932	1.092581
5	0.0851	0.0816	0.0837	0.0823	0.0864	0.0919	0.0849	0.0873	0.0854	1.05914E-05	0.003254	3.810828
6	0.0855	0.0835	0.0838	0.0800	0.0823	0.0854	0.0813	0.0808	0.082825	4.26786E-06	0.002066	2.49427
7	0.0811	0.0875	0.0795	0.0833	0.0784	0.0830	0.0824	0.0841	0.082413	8.02411E-06	0.002833	3.437204
8	0.0825	0.0824	0.0831	0.0810	0.0847	0.0824	0.0860	0.0825	0.083075	2.43929E-06	0.001562	1.895127
								mean	0.0826			

Species: *Malcolmia maritima* (L.) R. Br.

100 seed weight

Lot No.	1	2	3	4	5	6	7	8	mean	variance	SD	Var. coeff.
1	0.0448	0.0429	0.0422	0.0404	0.0416	0.0444	0.0422	0.0442	0.042838	2.34839E-06	0.001532	3.577349
2	0.0436	0.0467	0.0441	0.0454	0.0437	0.0459	0.0435	0.0443	0.04465	1.44E-06	0.0012	2.68757
3	0.0434	0.0439	0.0443	0.0444	0.0462	0.0429	0.0452	0.0431	0.044175	1.23929E-06	0.001113	2.52005
4	0.0441	0.0448	0.0407	0.0465	0.0447	0.0450	0.0449	0.0453	0.0445	2.82571E-06	0.001681	3.777497
5	0.0453	0.0469	0.0478	0.0468	0.0468	0.0466	0.0474	0.0486	0.047025	9.27857E-07	0.000963	2.048386
6	0.0457	0.0426	0.0430	0.0433	0.0430	0.0455	0.0465	0.0417	0.043913	3.00982E-06	0.001735	3.950774
7	0.0452	0.0434	0.0432	0.0420	0.0443	0.0448	0.0454	0.0446	0.044113	1.34125E-06	0.001158	2.625386
8	0.0488	0.0505	0.0492	0.0468	0.0486	0.0486	0.0486	0.0495	0.048825	1.09357E-06	0.001046	2.141812
9	0.0425	0.0441	0.0426	0.0444	0.0422	0.0438	0.0452	0.0469	0.043963	2.49982E-06	0.001581	3.596434
10	0.0441	0.0436	0.0445	0.0462	0.0430	0.0432	0.0449	0.0453	0.04435	1.20286E-06	0.001097	2.472939
11	0.0465	0.0495	0.0456	0.0498	0.0492	0.0518	0.0488	0.0492	0.0488	3.76286E-06	0.00194	3.975017
12	0.0497	0.0459	0.0474	0.0499	0.0503	0.0478	0.0496	0.0485	0.048638	2.30839E-06	0.001519	3.123803
								mean	0.0454			

Passed

RULE CHANGE PROPOSAL No. 22

Purpose of Proposal

To remove the Apiaceae family from the "Miscellaneous" section of the AOSA *Seedling Evaluation Handbook* and to create a new section, "Apiaceae, Carrot Family." To add flower and herb species which are listed in the AOSA *Rules for Testing Seeds*, but are not currently covered in the AOSA *Seedling Evaluation Handbook.*

Present Rule

AOSA *Seedling Evaluation Handbook*, p. 91

25. MISCELLANEOUS AGRICULTURAL AND HORTICULTURAL

Apiaceae, carrot family – anise, caraway, carrot, celery, celeriac, chervil, coriander, cumin, dill, parsley, parsnip
Boraginaceae, borage family – borage
Cannabinaceae, hemp family – hemp
Dichondraceae, dichondra family – dichondra
Geraniaceae, geranium family – alfilaria
Lamiaceae, mint family – balm, catnip, rosemary, sage, summer savory, sweet basil, sweet marjoram, thyme
Pedaliaceae, benne family – sesame
Rosaceae, rose family – little burnet
Solanaceae, nightshade family – belladonna, eggplant, tomato, husk tomato, pepper, tobacco
Valerianaceae, valerian family – cornsalad

Proposed Rule

25. MISCELLANEOUS AGRICULTURAL AND HORTICULTURAL

Boraginaceae, borage family – borage
Cannabinaceae, hemp family – hemp
Dichondraceae, dichondra family – dichondra
Geraniaceae, geranium family – alfilaria
Lamiaceae, mint family – balm, catnip, rosemary, sage, summer savory, sweet basil, sweet marjoram, thyme
Pedaliaceae, benne family – sesame
Rosaceae, rose family – little burnet
Solanaceae, nightshade family – belladonna, eggplant, tomato, husk tomato, pepper, tobacco
Valerianaceae, valerian family – cornsalad

(See following 2 pages.)

APIACEAE, CARROT FAMILY

Anethum graveolens, dill
Anthriscus cerefolium, chervil
Apium graveolens, celery and celeriac
Carum carvi, caraway
Coriandrum sativum, coriander
Cuminum cyminum, cumin
Daucus carota subsp. *carota*, Queen Anne's lace
Daucus carota subsp. *sativus*, carrot
Foeniculum vulgare, fennel
Pastinaca sativa, parsnip
Petroselinum crispum, parsley
Pimpinella anisum, anise
Trachymene coerulea, blue lace flower

GENERAL DESCRIPTION

Seedling type: Epigeal dicot.

Food reserves: Endosperm which is fleshy and firm; long, narrow cotyledons which become leaflike and photosynthetic.

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

Root system: A long, slender primary root.

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:
- decayed at point of attachment.
- deep open cracks extending into the conducting tissue.
- malformed, such as markedly shortened, curled or thickened.
- watery.

Root:
- weak, stubby or missing primary root (secondary roots will not compensate for a defective primary root).

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

NOTES:

1. Seed units in the Apiaceae may be schizocarps (two-seeded) or mericarps (one-seeded). Frequent counts should be made on schizocarps, since growing seedlings will separate. Any schizocarp which produces at least one normal seedling is classified as normal; only one normal seedling per schizocarp is to be counted.

REFERENCES

Wellington, P. S. 1970. Evaluation of seedlings of the Umbelliferae. Proc. Int. Seed Test. Ass. Vol. 35(2):591-597.

Supporting Evidence

Drawings are not available at this time.

In this description of the evaluation of seedlings in the carrot family, the abnormal root description has changed from that of the "Miscellaneous" section of AOSA's *Seedling Evaluation Handbook.* The new description is in agreement with ISTA's *Handbook for Seedling Evaluation* for members of this family.

The following persons and/or groups have contributed to the development of this rule proposal:

AOSA Germination and Dormancy Subcommittee, June 2000 Annual Meeting.
Atkins, Barbara. 1999. Personal communication. STA Laboratories, Longmont, Colorado.

Submitted by

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Date of Proposal

October 12, 2000

Passed

Rule Change Proposal No. 23

Purpose of proposal: To add Balsaminaceae, the balsam family, to the AOSA *Seedling Evaluation Handbook.* Members of this family are found in the AOSA *Rules for Testing Seeds*, but no AOSA Seedling Evaluation description is currently available for this family.

Present Rule

New Rule

Proposed Rule

(See following 3 proposed pages of *Seedling Evaluation Handbook.* Please note that the vertical lines which are visible in the proposal will not appear in the final publication, and the drawings will be clearer.)

Supporting Evidence

The following persons and/or groups contributed to the development of this rule proposal:

Atkins, Barbara. 1999. Personal communication. STA Laboratories, Longmont, Colorado.

California Seed Analysts and Seed Researchers. April 1998. Spring Workshop.

Front Range Seed Analysts. July 2000 Meeting.

Gilbart, Gillian. 2000. Personal Communication. Goldsmith Seeds, Gilroy, California.

ISTA Flower Seed Committee. 1997-2000 (accepted and incorporated into their worksheet on Impatiens).

Joint AOSA/SCST Flower Seed Subcommittee. 1997-2000.

Submitted by

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Date of Proposal
October 12, 2000

BALSAMINACEAE, BALSAM FAMILY

Impatiens balsamina, balsam
Impatiens walleriana, impatiens

GENERAL DESCRIPTION

Seedling type: Epigeal dicot.

Food reserves: Cotyledons which expand and become photosynthetic.

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 one to many secondary roots which usually develop within the test period. The primary root is not always readily distinguishable from the secondary roots.

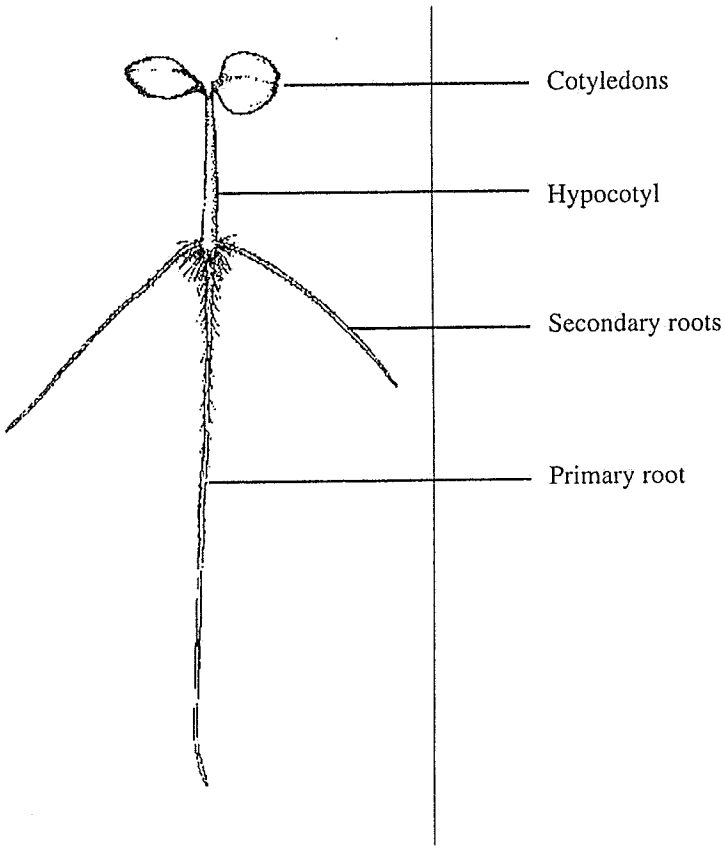


Fig. 1 Impatiens

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.
- curled, thickened or cupped, less than half normal size.

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

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

Root:
- none.
- weak, stubby or missing primary root with less than two strong secondary roots.

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

NOTES:

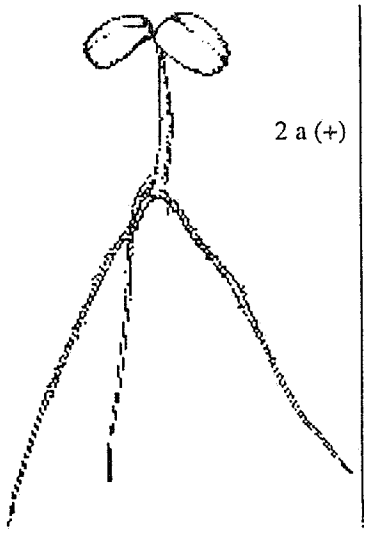
1. Some color forms will be dormant in temperatures above constant 27°C.

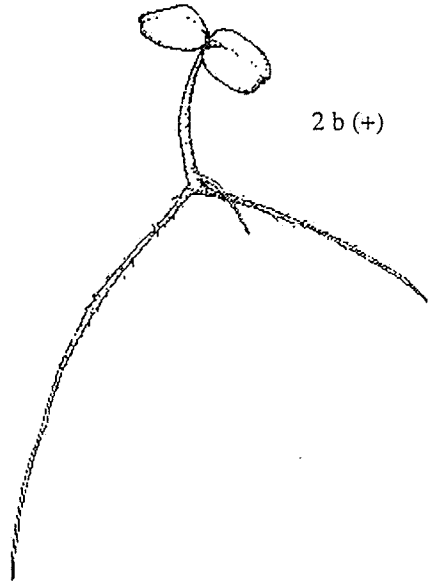
2. *Impatiens* seeds may exhibit some dormancy. Appropriate dormancy breaking procedures may be necessary. KNO_3 and prechill at 5°C are recommended for breaking dormancy.

3. Some *Impatiens* seem to develop multiple secondary roots in the initial growth period while others seem to have a predominately long primary root with secondary roots developing later. Both are normal growth patterns.

4. *Impatiens balsamina*, balsam, usually has multiple secondary roots during the initial growth period.

Fig. 2 Root defects (normal).

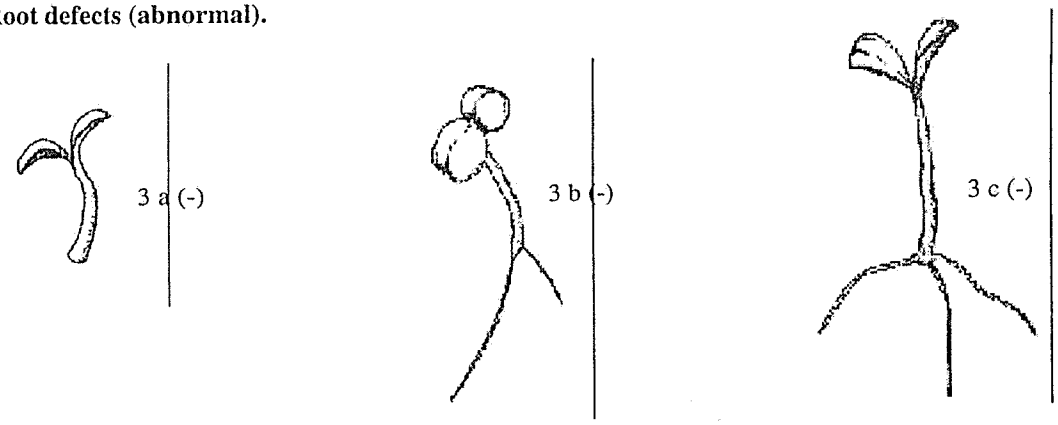




2 a. Primary root missing, three strong secondary roots.

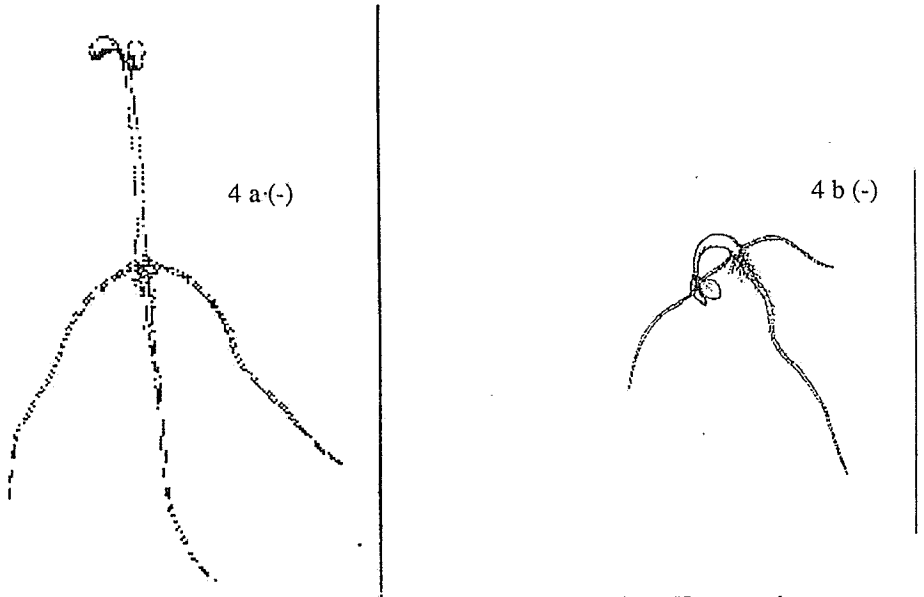
2 b. Primary root missing, two strong secondary roots.

Fig. 3 Root defects (abnormal).



3 a. Root missing.
3 b. Primary root missing with less than two strong secondary roots.
3 c. Primary root missing, insufficient secondary roots.

Fig. 4 Cotyledon and hypocotyl defects.



4 a. Cotyledons curled, thickened and cupped, less than half normal size. Hypocotyl watery.
4 b. Hypocotyl malformed, markedly shortened and curled.

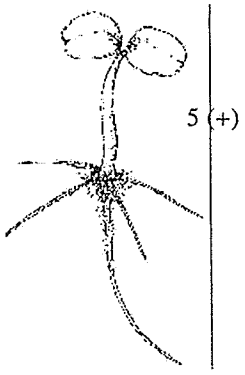


Fig. 5 Impatiens balsamina, balsam, with multiple sceondary roots.

Passed

Rule Change Proposal No. 24

PURPOSE: To modify the seedling description for the leaf and coleoptile of corn, to reduce variation among analysts and improve uniformity between AOSA and ISTA.

PRESENT and PROPOSED RULE: (New wording is underlined, deleted wording is stroked out.)

Seedling Evaluation Handbook

21. POACEAE, GRASS FAMILY III - Corn

Zea mays, corn

ABNORMAL SEEDLING DESCRIPTION

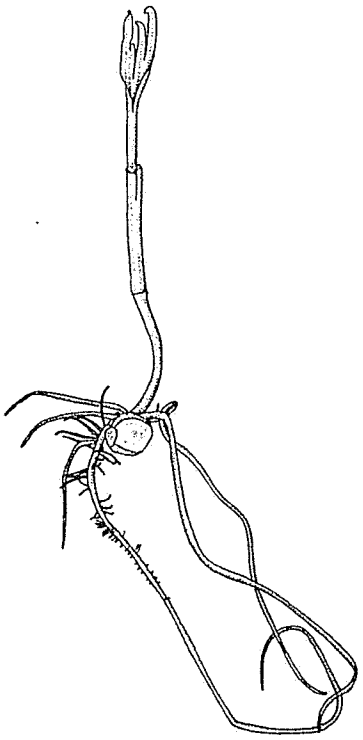
Shoot:
- missing.
- no leaf.
- leaf extending less than halfway up into the coleoptile (see note 3).
- leaf badly shredded or longitudinally split (see notes 1 ~~and 2~~).
- if the first leaf has emerged at time of evaluation, seedling is abnormal if the coleoptile has any of the following defects **together with** damage to the first leaf as defined in Figure 21.7. (See figure 21.7 and note 2.):
  - coleoptile split for more than one-third of the length from the tip
  - coleoptile strongly bent over.
  - coleoptile tip damaged or missing.
  - coleoptile split at any location below the tip.
- if first leaf has not emerged at time of evaluation (see note 2):
  - tip of coleoptile damaged or missing.
  - coleoptile split for more than one-third of the length from the tip
- leaf protruding below the tip of the coleoptile
- thin, spindly, pale or watery.
- deep open cracks in the mesocotyl.

NOTES

2. ~~Splitting from the tip of the coleoptile occurs naturally as a result of expansion of the leaves inside. The condition of the coleoptile is not to be considered as an evaluation factor on its own; however, damage to the coleoptile is a signal that the other shoot structures should be examined closely to determine if they have been damaged.~~

   Occassionally in the sand test and often in the rolled towel test, the leaf will not have emerged through the tip of the coleoptile by the end of the full germination period (7 days). If the leaf has not emerged at the time of final evaluation, seedlings with a split in the coleoptile for more than one-third of the length from the tip and seedlings with the

coleoptile tip missing or damaged must be classed abnormal. An exception to this rule may be made when it is clearly evident that the splitting is due to pressure caused by restricted growth within the substrate. When the first leaf has emerged through the tip of the coleoptile at the time of evaluation, it is possible to use damage to the leaf as evidence that damage to the coleoptile is significant. Seedlings with the coleoptile defects described in Figure 21.7a, may be classed as normal when the first leaf is intact or only slightly damaged as defined in Figure 21.7b.



Present

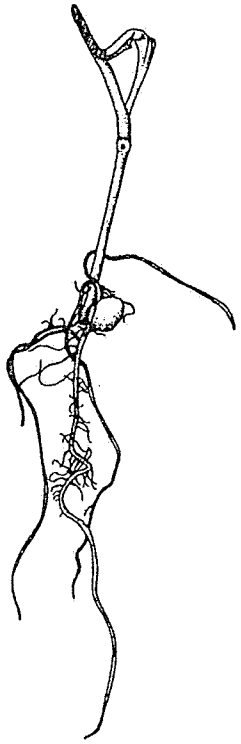
21.3 a (+)

21.3 a Leaf split at tip, seedling otherwise healthy.

Proposed

21.3 a (-)

21.3 a Leaf damaged, coleoptile tip damaged
(See also Fig. 21.7)



Present

21.4 c (+)

Proposed

21.4 c (-)

SUPPORTING EVIDENCE:

Since 1986, the difference between AOSA and ISTA in the evaluation of the coleoptile has been identified as a major concern for the international trading of corn seed. The AOSA Rules have essentially disregarded defects to the coleoptile, while the ISTA Rules have highlighted a range of coleoptile defects as being significant. To address these differences, a corn split coleoptile working group consisting of representatives from AOSA, SCST, and ISTA was formed at the 1989 ISTA meeting in Scotland. The objective of this working group was to classify coleoptile splits and then determine if these different classes of split coleoptiles were contributing to field stands based on field emergence studies. The results of this study indicated that most of the seedlings with coleoptile splits were contributing to field stands, except when the first leaf was damaged (Table 1).

Table 1. Correlation coefficients comparing various classes of corn split coleoptiles and field emergence. Gemination tests conducted in rolled towels and sand. Research conducted in 1990 and 1991 by the split coleoptile working group of AOSA, SCST and ISTA.

Seedling classification	Correlation coefficient	
----------1990--------Rolled Towel--------Sand----------		
normal (n)	0.39	0.21
n+mild split (ms)	0.51	0.40
n+ms+severe split (ss)	0.82	0.61
n+ms+ss+shredded leaf	0.70	0.67
----------1991----------		
normal (n)	0.75	0.77
n+mild split (ms)	0.80	0.83
n+ms+severe split (ss)	0.79	0.89
n+ms+ss+shredded leaf	0.65	0.87

These data indicated that unless the first leaf was damaged, the addition of seedlings classified as mild and severe split coleoptiles to the percentage of normal seedlings improved the correlation with stand establishment. However, the addition of shredded leaves to the percentage of normal, mild splits and severe splits, reduced the correlation with stand establishment. Based on these findings this proposed rule was developed. To test this proposed rule several referees were conducted. Results of the first referee indicated that the proposal required additional clarification as individuals were not interpreting damage to the first leaf the same. At a workshop for the working group held in Angers, France, a set of drawings was developed to better describe what was meant by damage to the first leaf and what was considered a split coleoptile. Another referee and workshop were conducted using the drawings. When using the drawings, the variation among individuals conducting the germination tests was less than when using the present AOSA or ISTA Rules (Tables 2 and 3). Equally important was the reduction in variation between AOSA and ISTA analysts using the proposed Rules as compared to AOSA and ISTA analysts using the present AOSA and ISTA Rules (Table 4).

Table 2. *Comparison of corn seed germination using AOSA, and ISTA Rules and comparing* the results using the proposed corn seed germination procedure. Germination tests were conducted using rolled towels and sand media. These results are from the working group workshop using the drawing for interpretation of leaf damage.

Sample # and media	Present Rules			Proposed Rule		
	AOSA analyst %	ISTA analyst %	Difference*	AOSA analyst %	ISTA analyst %	Difference*
5 Rolled towel	75	65	-10	72	73	+1
Sand	83	77	- 6	79	79	0
2 Rolled towel	85	76	- 9	82	80	- 2
Sand	90	80	-10	90	83	- 7
Total differences			35			10

Table 3. Comparison of corn seed germination using AOSA, ISTA Rules and comparing the results using the proposed corn seed germination procedure. Germination tests were conducted using rolled towels and sand media. These results are from the working group referee test conducted using the drawings for interpretation of leaf damage.

Sample # and media	Present Rules			Proposed Rule		
	AOSA analyst %	ISTA analyst %	Difference*	AOSA analyst %	ISTA analyst %	Difference*
6 Rolled towel	94	88	- 6	90	90	0
Sand	90	88	- 2	89	89	0
7 Rolled towel	90	88	- 2	86	88	+2
Sand	83	82	- 1	82	84	+2
11 Rolled towel	76	60	- 16	66	66	0
Sand	60	52	- 8	50	54	+4
12 Rolled towel	80	73	- 7	78	76	- 2
Sand	80	75	- 5	80	74	- 6
15 Rolled towel	84	74	- 10	78	79	+1
Sand	81	80	- 1	81	81	0
Total differences			58			17

*Difference means AOSA results minus ISTA results

Table 4. Mean comparison of corn percentage germination comparing present and proposed procedures and the results form AOSA analysts and ISTA analysts. Means were summed over five samples tested by all AOSA laboratories and all ISTA laboratories.

Seed analyst	Present Rule	Proposed Rule
ISTA	76a	79a
AOSA	82b	78a

Column means followed by letters in common are not statistically different based on Tukey's mean separation test P=0.05.

The workshop conducted in conjunction with the AOSA/SCST annual meeting in June of 2000 gave AOSA and SCST members an opportunity to evaluate the proposed rule for evaluation of split coleoptiles. The consensus of the participants and the results of the workshop indicated that the use of the drawings reduced variation among analysts as compared to the present AOSA Rule.

It is proposed to change the classification of the seedlings in the Seedling Evaluation Handbook Figures 21.3a and 21.4c from normal (+) to abnormal (-) to coincide with the proposed rule.

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AOSA/ISTA Harmonization Committee

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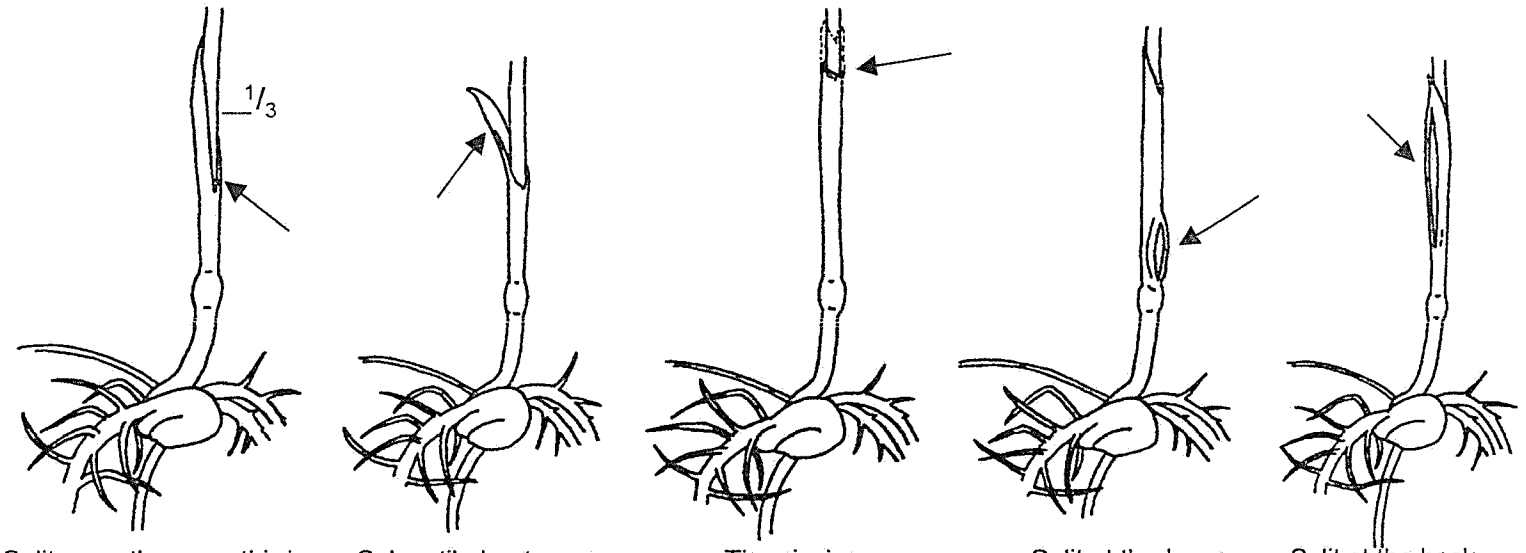
DATE OF PROPOSAL:

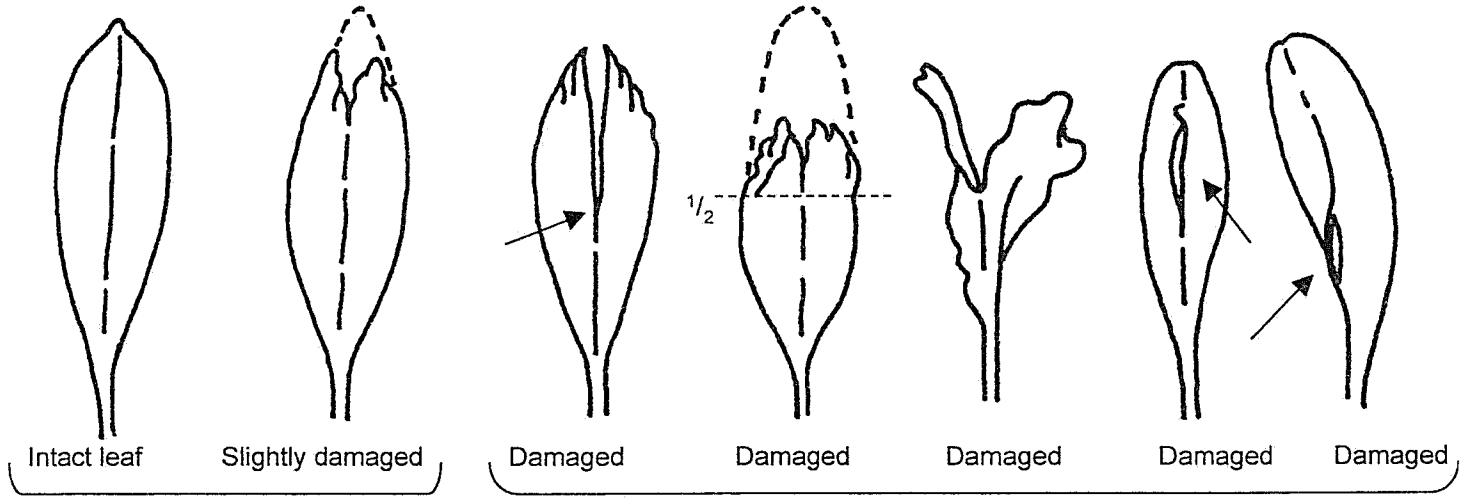
October 15, 2000

Figure 21.7 Coleoptile defects

21.7a Seedlings are normal if the first leaf is intact or only slightly damaged, as defined in Figure 21.7b.
Seedlings are abnormal if first leaf is damaged, as defined in Figure 21.7b



21.7b : Definition of intact, slightly damaged and damaged first leaf, for evaluation of seedlings with coleoptile defects.



Passed

Rule Change Proposal No. 25

PURPOSE OF PROPOSAL:

In the western United States, many forbs or wildflowers species are used for stabilization of disturbed sites, to improve forage for wildlife and livestock, and in the restoration of diverse natural communities. This proposal would update the classification of 12 species in the Uniform Classification of Weed and Crop Seeds (Handbook No. 25) to reflect their use in revegetation and rangeland plantings.

PRESENT RULE:

Uniform Classification of Weed and Crop Seeds (Handbook No. 25)

			Classification						
		Spp.	contaminating						
Scientific / Common name	Family	Class	A	F	H	R	S	T	V
Achillea millefolium --yarrow, common --yarrow, wolly	(Asteraceae)	F	W	C	W	C	W	W	W
Aster chilensis --aster, Pacific	(Asteraceae)	F	W	C	W	W	W	W	W
Aster glaucodes --aster, blueleaf	(Asteraceae)	F	W	C	W	C	W	W	W
Balsamorhiza sagittata --balsamroot, arrowleaved	(Asteraceae)	F	W	C	W	C	W	W	W
Eriogonum umbellatum --buckwheat, sulfur --sulfur flower	(Polygonaceae)	F	W	C	W	W	W	W	W
Gaillardia aristata --gaillardia, perennial --blanket-flower --firewheel	(Asteraceae)	F	W	C	W	W	W	W	W
Geranium viscosissimum --geranium, wild	(Geraniaceae)	F	W	C	W	W	W	W	W
Osmorhiza occidentalis --aniseroot, sweet	(Apiaceae)	F	W	C	W	C	W	W	W

Scientific / Common name	Family	Classification Spp. Class	contaminating A	F	H	R	S	T	V
Penstemon eatonii --beard's-tongue, red --penstemon, firecracker	(Scrophulariaceae)	F	W	C	W	C	W	W	W
Penstemon palmeri --penstemon, Palmer	(Scrophulariaceae)	F	W	C	W	C	W	W	W
Penstemon strictus --beard's-tongue, Rocky Mountain --penstemon, Rocky Mountain	(Scrophulariaceae)	F	W	C	W	C	W	W	W
Sanguisorba minor --burnet, little --burnet, small	(Rosaceae)	A	C	W	W	C	W	W	W

PROPOSED RULE:

Uniform Classification of Weed and Crop Seeds (Handbook No. 25)

Scientific / Common name	Family (added R)	Classification Spp. Class	contaminating A	F	H	R	S	T	V
Achillea millefolium --yarrow, common --yarrow, woolly	(Asteraceae)	F,R	W	C	W	C	W	W	W
Aster chilensis --aster, Pacific	(Asteraceae)	F,R	W	C	W	C	W	W	W
Aster glaucodes --aster, blueleaf	(Asteraceae)	F,R	W	C	W	C	W	W	W
Balsamorhiza sagittata --balsamroot, arrowleaved	(Asteraceae)	F,R	W	C	W	C	W	W	W
Eriogonum umbellatum --buckwheat, sulfur --sulfur flower	(Polygonaceae)	F,R	W	C	W	C	W	W	W

Scientific / Common name	Family	Classification						
		Spp.	contaminating					
		Class	A	F	H	R	S	T	V
Gaillardia aristata --gaillardia, perennial --blanket-flower --firewheel	(Asteraceae)	F,R	W	C	W	C	W	W	W
Geranium viscosissimum --geranium, wild	(Geraniaceae)	F,R	W	C	W	C	W	W	W
Osmorhiza occidentalis --aniseroot, sweet	(Apiaceae)	F,R	W	C	W	C	W	W	W
Penstemon eatonii --beard's-tongue, red --penstemon, firecracker	(Scrophulariaceae)	F,R	W	C	W	C	W	W	W
Penstemon palmeri --penstemon, Palmer	(Scrophulariaceae)	F,R	W	C	W	C	W	W	W
Penstemon strictus --beard's-tongue, Rocky Mountain --penstemon, Rocky Mountain	(Scrophulariaceae)	F,R	W	C	W	C	W	W	W
Sanguisorba minor --burnet, little --burnet, small	(Rosaceae)	A,R	C	W	W	C	W	W	W

SUPPORTING EVIDENCE:

Numerous species of forbs or wildflowers shrubs are used in revegetation and restoration plantings in the western United States (McArthur 1988, Roundy et al. 1997). Among other attributes, forbs provide erosion control and forage for wildlife and livestock. Each of the 15 species listed in this rule change are marketed regionally for these purposes (Granite Seed 2000, Stevenson Intermountain Seed 1990). In addition, there is abundant regional revegetation literature confirming conservation uses for these species. With this rule change, an *R* will be added to the F or *A* classification for plant material type. In addition, contaminating classification under *R* (Revegetation and Rangeland) will change from weed (*W*) to crop (C) as needed.

Literature Cited

Granite Seed Company. 2000. The granite seed catalog. Lehi, Utah. 81 p.

McArthur, E.D. 1988. New plant development in range management. In: Tueller, P.T., ed. Vegetation science applications to rangeland analysis and management. Boston: Kluwer Academic Publishers: 81-112.

Roundy, B. A.; N.L. Shaw; and D.T. Booth. 1997. Using native Seeds on Rangelands. In: Shaw, N.L. and B.A. Roundy, comps. Proceedings: Using seeds of native species on rangelands. Gen. Tech. Rep. INT-GTR-372. Ogden, UT: USDA Forest Service, Intermountain Research Station. 1-8.

Stevenson Intermountain Seed. 1990. Wholesale seed catalog. Ephraim, Utah. 20 p.

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DATE OF PROPOSAL:

October 15, 2000

Passed

Rule Change Proposal No. 26

PURPOSE OF PROPOSAL:

In the western United States, many shrub species are used for stabilization of disturbed sites, to improve forage for wildlife and livestock, and in the restoration of diverse natural communities. This proposal would update the classification of 15 species in the Uniform Classification of Weed and Crop Seeds (Handbook No. 25) to reflect their use in revegetation and rangeland plantings.

PRESENT RULE:

Uniform Classification of Weed and Crop Seeds (Handbook No. 25)

			Classification						
		Spp.	contaminating						
Scientific / Common name	Family	Class	A	F	H	R	S	T	V
Atriplex gardneri var. *utahensis* --saltbush	(Chenopodiaceae)	S	W	W	W	W	C	W	W
Cercocarpus betuloides var. *betuloides* --mountain-mahogany, birchleaf	(Rosaceae)	S	W	W	W	C	C	W	W
Cercocarpus ledifolius --mountain-mahogany, curlleaf	(Rosaceae)	S	W	W	W	C	C	W	W
Cercocarpus montanus var. *montanus* --mountain-mahogany, true	(Rosaceae)	S	W	W	W	C	C	W	W
Peraphyllum ramossissmum --squawapple	(Rosaceae)	S	W	W	W	W	C	W	W
Prunus virginiana --chokecherry	(Rosaceae)	S	W	W	W	W	C	W	W
Purshia glandulosa --bitterbrush, desert	(Rosaceae)	S	W	W	W	W	C	W	W
Rhus trilobata --sumac, oakbrush --sumac, skunkbrush	(Anacardiaceae)	S	W	W	W	W	C	W	W

Scientific / Common name	Family	Classification Spp. Class	contaminating A	F	H	R	S	T	V
Ribes aureum --currant, golden	(Grossulariaceae)	S	W	W	W	W	C	W	W
Ribes cereum --currant, wax --gooseberry	(Grossulariaceae)	S	W	W	W	W	C	W	W
Ribes montigenum --currant, gooseberry --gooseberry, mountain	(Grossulariaceae)	S	W	W	W	W	C	W	W
Rosa woodsii --rose, Woods'	(Rosaceae)	S	W	W	W	W	C	W	W
Sambucus cerulea --elderberry, blue	(Caprifoliaceae)	S	W	W	W	W	C	W	W
Sambucus racemosa subsp. *pubens* --elderberry, scarlet	(Caprifoliaceae)	S	W	W	W	W	C	W	W
Sarcobatus vermiculatus --greasewood, black	(Chenopodiaceae)	S	W	W	W	W	C	W	W

PROPOSED RULE:

Uniform Classification of Weed and Crop Seeds (Handbook No. 25)

Scientific / Common name	Family	Classification Spp. Class	contaminating A	F	H	R	S	T	V
Atriplex gardneri var. *utahensis* --basin saltbush --saltbush	(Chenopodiaceae)	R,S	W	W	W	C	C	W	W
Cercocarpus betuloides var. *betuloides* --mountain-mahogany, birchleaf	(Rosaceae)	R,S	W	W	W	C	C	W	W

		Classification							
		Spp.	contaminating						
Cercocarpus ledifolius --mountain-mahogany, curlleaf	(Rosaceae)	R,S	W	W	W	C	C	W	W
Cercocarpus montanus var. *montanus* --mountain-mahogany, true	(Rosaceae)	R,S	W	W	W	C	C	W	W
Peraphyllum ramossissmum --squawapple	(Rosaceae)	R,S	W	W	W	C	C	W	W
Prunus virginiana --chokecherry	(Rosaceae)	R,S	W	W	W	C	C	W	W
Purshia glandulosa --bitterbrush, desert	(Rosaceae)	R,S	W	W	W	C	C	W	W
Rhus trilobata --sumac, oakbrush --sumac, skunkbrush	(Anacardiaceae)	R,S	W	W	W	C	C	W	W
Ribes aureum --currant, golden	(Grossulariaceae)	R,S	W	W	W	C	C	W	W
Ribes cereum --currant, wax --gooseberry	(Grossulariaceae)	R,S	W	W	W	C	C	W	W
Ribes montigenum --currant, gooseberry --gooseberry, mountain	(Grossulariaceae)	R,S	W	W	W	C	C	W	W
Rosa woodsii --rose, Woods'	(Rosaceae)	R,S	W	W	W	C	C	W	W
Sambucus cerulea --elderberry, blue	(Caprifoliaceae)	R,S	W	W	W	C	C	W	W
Sambucus racemosa subsp. *pubens* --elderberry, scarlet	(Caprifoliaceae)	R,S	W	W	W	C	C	W	W

		Classification							
		Spp.	contaminating						
Sarcobatus vermiculatus --greasewood, black	(Chenopodiaceae)	R,S	W	W	W	C	C	W	W

SUPPORTING EVIDENCE:

Numerous species of shrubs are used in revegetation and restoration plantings in the western United States (McArthur 1988, Roundy et al. 1997). Among other attributes, shrubs provide erosion control, forage and cover for wildlife, and forage for livestock. Each of the 15 species listed in this rule change are marketed regionally for these purposes (Granite Seed 2000, Stevenson Intermountain Seed 1990). In addition, there is abundant regional revegetation literature confirming conservation uses for these species. With this rule change, an *R* will be added to the *S* classification for plant material type. In addition, contaminating classification under *R* (Revegetation and Rangeland) will change from weed (*W)* to crop (*C*). Several shrub genera are already classified in this manner (i.e. *Artemisia*, *Chrysothamnus*, *Ephedra*, *Grayia*), therefore this change results in greater uniformity in how this table is applied in shrub seed purity analysis.

Literature Cited

Granite Seed Company. 2000. The granite seed catalog. Lehi, Utah. 81 p.

McArthur, E.D. 1988. New plant development in range management. In: Tueller, P.T., ed. Vegetation science applications to rangeland analysis and management. Boston: Kluwer Academic Publishers: 81-112.

Roundy, B. A.; N.L. Shaw; and D.T. Booth. 1997. Using native Seeds on Rangelands. In: Shaw, N.L. and B.A. Roundy, comps. Proceedings: Using seeds of native species on rangelands. Gen. Tech. Rep. INT-GTR-372. Ogden, UT: USDA Forest Service, Intermountain Research Station. 1-8.

Stevenson Intermountain Seed. 1990. Wholesale seed catalog. Ephraim, Utah. 20 p.

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DATE OF PROPOSAL: October 15, 2000

Passed

Rule Change Proposal No. 27

PORPOSE OF PROPOSAL:

The purpose of this proposal is to update the entry for Rocky Mountain beeplant in the Uniform Classification of Weed and Crop Seeds (Handbook No. 25) to reflect its use in rangeland seedings, and add the same species to Tables 1 and 3 in **Rules for Testing Seeds** using appropriate supporting evidence for seed weights and germination response to dormancy breaking treatments. The results of an inter-laboratory referee are used as part of that evidence.

PRESENT RULE:

Uniform Classification of Weed and Crop Seeds (Handbook No. 25)

		Classification							
		Spp.	contaminating						
Scientific / Common name	Family	Class	A	F	H	R	S	T	V
Cleome serrulata	(Capparidaceae)	F	W	C	W	W	W	W	W
--beeplant, Rocky Mountain									

PROPOSED RULE:

Uniform Classification of Weed and Crop Seeds (Handbook No. 25)

		Classification							
		Spp.	contaminating						
Scientific / Common name	Family	Class	A	F	H	R	S	T	V
Cleome serrulata	(Capparidaceae)	F,R	W	C	W	C	W	W	W
--beeplant, Rocky Mountain									

RULES FOR TESTING SEEDS

Section 2.4, Table 1.Weights for working samples

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
Cleome serrulata Pursh Rocky Mountain beeplant	17	170	150	4,250

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

Kind of seed	Substrata	Temperature ° C	First count days	Final count days	Additional Directions
Cleome serrulata Pursh Rocky Mountain beeplant	P,TB	15;10-20	3	14	Prechill 56 days at 2-5° C. Ungerminated seeds see sec. 4.2e and 4.9k.

SUPPORTING EVIDENCE:

Rocky Mountain beeplant (*Cleome serrulata* Capparidaceae) is a robust annual forb native throughout the western United States (Welsh et al 1987). As an early seral species adapted to a broad range of plant community types, it is often used for short-term stabilization of disturbed sites (Granite Seed Company 2000). Because beeplant seeds are sought out by a variety of bird species (especially mourning doves), this species is also included in general wildlife improvement project plantings.

Beeplant seed-lots are generally cleaned to at least 95 % purity (Stevens et al. 1996). We collected data for 11 seed-lots (8 replications of 100 seeds each) to obtain a mean seed weight of 0.670 g per 100 seeds (Table 1). This was converted to 150 seeds per g which was in turn used to calculate working sample sizes proposed for Table 1 in the AOSA handbook **Rules for Testing Seeds**.

We conducted 2 laboratory germination experiments and an inter-laboratory referee to determine optimum germination conditions and response to prechill and GA_3 (GA) treatments on Rocky Mountain beeplant seed germination. In laboratory tests 4 replications of 25 seeds each were placed on top of moistened blotters in 100 x 15 mm petri dishes. Dishes were randomized in cardboard boxes, one for each treatment. Boxes were enclosed in plastic bags for moisture retention. Seeds were incubated for 28 days with weekly checks for germination.

In the first experiment, seed of 7 seed-lots were germinated in growth chambers with 15, 10/20, and 15/25° C (12 hr alternating) temperature regimes with no prechill treatment. Additional treatments were 14, 28, 42, and 56 days of prechill (2° C) followed by 28 days incubation at 15° C. In general, few seeds germinated without prechill. Mean germination at 15° C (no prechill) was 8 % of viable. Growth chamber malfunction made results for the 10/20° C treatment un-interpretable. Only 1 seed germinated in the 15/25° C treatment demonstrating germination

inhibition at warm temperatures. Germination responses to prechill treatments are found in Table 2. Mean germination response to 56 days of prechill was 73 % of viable. In general, significantly higher germination percentages were associated with increasingly longer prechill treatments (28 to 56 days). However, a leveling off of germination response between 42 and 56 days for some lots suggests that a fraction of the seed was not chill-responsive. Germination rate was rapid following the longer prechill periods (< 7 days for most seeds) and in some cases a large fraction of seeds initiated germination during prechill.

Methods for a second experiment using 11 seed-lots were similar to those of the first. Treatments included all combinations of 0, 28, and 56 days prechill with no GA and GA (500 ppm) solution used as the blotter wetting agent (total of 6 treatments). Incubation temperature was 10/20° C. Responses to prechill were similar to those observed in the first experiment. Mean germination percentage after 56 days prechill was 82 % of viable. No significant effect of GA was observed without prechill nor in combination with prechill treatments (data not shown).

Six laboratories participated in a referee for Rocky mountain beeplant. A prechill treatment of 56 days at 2-5° C followed by germination at 15 or 10/20° C for 14 days was recommended. Although response to the prechill treatment (56 days) varied somewhat among labs, values for percent total viable were quite consistent among labs and are within established tolerance guidelines (Table 3).

In conclusion, the proposed rule includes 2 incubation temperatures (15 and 10/20° C). Prechill (2-5° C) for 56 days is needed to break dormancy for most seed and should be used for germination tests of this species. Post-prechill incubation for 14 days allowed adequate time for germination. Because most seed-lots have a fraction not responsive to prechill, post-test evaluation of non-germinated seed is required.

Acknowledgment

This work was funded in part by a grant from the Utah Department of Agriculture and Food.

Literature Cited

Granite Seed Company. 2000. The granite seed catalog. Lehi, Utah. 81 p.

Stevens, R.; K.J. Jorgensen; S.A. Young; and S.B. Monsen. 1996. Forb and shrub seed production guide. Utah State University Extension, Logan, Utah. 51 p.

Welsh, S.L.; N.D. Atwood; L.C. Higgins; and s. Goodrich. 1987. A Utah flora. Brigham Young Univeristy, Provo, Utah. 894 p.

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DATE OF PROPOSAL: October 15, 2000

Table 1. Weight (grams) per 100 seeds of Rocky Mountain beeplant.

Lot No.	1	2	3	4	5	6	7	8	mean	s.d.
1	0.626	0.640	0.615	0.620	0.615	0.628	0.643	0.613	0.625	0.012
2	0.645	0.638	0.641	0.660	0.631	0.648	0.638	0.648	0.644	0.009
3	0.728	0.729	0.724	0.750	0.730	0.726	0.742	0.735	0.733	0.009
4	0.553	0.623	0.611	0.655	0.567	0.645	0.600	0.648	0.613	0.038
5	0.726	0.683	0.704	0.688	0.680	0.682	0.685	0.672	0.690	0.017
6	0.642	0.735	0.732	0.658	0.649	0.757	0.749	0.669	0.699	0.049
7	0.652	0.622	0.669	0.624	0.647	0.643	0.680	0.634	0.646	0.020
8	0.608	0.744	0.730	0.665	0.686	0.753	0.748	0.711	0.706	0.050
9	0.639	0.650	0.672	0.660	0.670	0.652	0.638	0.647	0.654	0.013
10	0.756	0.746	0.770	0.772	0.755	0.749	0.746	0.755	0.756	0.010
11	0.590	0.569	0.584	0.592	0.594	0.633	0.610	0.624	0.600	0.021
								mean	0.670	

Table 2. Germination response, expressed as percent of total viable seed (post-test determination), for 7 Rocky Mountain beeplant seed-lots in response to 0, 14, 28, 42, and 56 days of prechill (2° C). Within seed-lots, means followed by the same letter are not significantly different at the $p < 0.05$ level (SNK).

	Days of Prechill				
Seed-lot	0	14	28	42	56
1	13b	2c	24b	63a	78a
2	0d	1d	16c	70b	89a
3	14d	16d	41c	61b	82a
4	0d	0d	18c	47b	67a
5	24b	35b	72a	86a	86a
6	5c	6c	40b	65a	74a
7	0c	0c	4b	27a	32a
mean	8d	9d	31c	60b	73a

Table 3. Results of an inter-laboratory referee for Rocky Mountain beeplant.

Lab	Prechill Temp (degrees C)	Germ Temp (degrees C)	Percent Normal Germ.	Percent Dormant (Post test)	Percent Total Viable	TZ Test Total Viable
1	5	15	32	61	93	90
2	5	15	47	47	94	97
3	5	15	74	14	88	95
4	4	15	50	39	89	95
5	--	--	--	--	--	96
6	2	10/20	79	13	92	--
mean	--	--	56	35	91	95

Passed

Rule Change Proposal No. 28

PURPOSE OF PROPOSAL:

The purpose of this proposal is to update the entry for showy goldeneye in the Uniform Classification of Weed and Crop Seeds (Handbook No. 25) to reflect its use in rangeland plantings, and to add the same species to Tables 1 and 3 in **Rules for Testing Seeds** using apprpriate supporting evidence for seed weights and germination response to dormancy breaking treatments. The results of an inter-laboratory referee are used as part of that evidence.

PRESENT RULE:

Uniform Classification of Weed and Crop Seeds (Handbook No. 25)

		Classification							
		Spp.	contaminating						
Scientific / Common name	Family	Class	A	F	H	R	S	T	V
Heliomeris multiflora --goldeneye, showy	(Asteraceae)	F	W	C	W	W	W	W	W

PROPOSED RULE:

Uniform Classification of Weed and Crop Seeds (Handbook No. 25)

		Classification							
		Spp.	contaminating						
Scientific / Common name	Family	Class	A	F	H	R	S	T	V
Heliomeris multiflora --goldeneye, showy	(Asteraceae)	F,R	W	C	W	C	W	W	W

RULES FOR TESTING SEEDS

Section 2.4, Table 1.Weights for working samples

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
Heliomeris multiflora Nutt. showy goldeneye	1.3	13	1,961	55,588

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

Kind of seed	Substrata	Temperature ^{o} C	First count days	Final count days	Additional Directions
Heliomeris multiflora Nutt. showy goldeneye	TB,P	5-15;10-20 15	10	28	Light. Fresh: prechill at 2-5° C for 28 days. Ungerminated seeds see sec. 4.2e and 4.9k.

SUPPORTING EVIDENCE:

Showy goldeneye (*Heliomeris multiflora,* also known by *Vigueira multiflora*: Asteraceae) is a perennial forb native to much of the western United States (Welsh et al. 1987). It is found in association with sagebrush, pinyon/juniper, mountain brush, aspen, and spruce-fir communities and provides forage for wildlife and livestock. This species is used in wildflower mixes and in diverse-species plantings for wildlife improvement and restoration of degraded wildlands (Stevenson Intermountain Seed 1990). Seed for commercial sale are primarily collected from wildland stands. However, with recent development and publication of culture techniques (Stevens et al. 1996), agronomic production is expected to increase.

Although showy goldeneye seed are small they can be cleaned to purities of 90-95 % (Stevens et al. 1996). We collected data for 10 seed-lots (8 replications of 100 seeds each) to obtain a mean seed weight of 0.051 grams per 100 seeds (Table 1).

We conducted 2 laboratory germination experiments and an inter-laboratory referee to determine optimum germination conditions and a range of dormancy levels for this species. Two 7-month old seed-lots were used in an initial experiment to assess the effects of incubation temperature, light, and prechill (0, 4, 8, and 20 weeks) on germination percentage. Four replications of 25 seeds each were placed on top of moistened blotters in 100 x 15 mm petri dishes. Dishes were randomized in stacks and enclosed in plastic bags to retain moisture. Blanks (dishes with blotters but no seeds were placed on top of each stack to insure even light for all dishes. Dishes were examined weekly for 28 days when germinated seeds were counted and removed. The highest no-prechill germination response for both seed-lots (mean 53 %) was to 5/15° C with fluorescent light (12 hr alternating). Germination percentage in the same temperature regime in the dark (except when seed were examined) was significantly lower (mean 31 percent). Higher temperatures also produced lower germination percentages (10/20 = 33 % and 15/25 = 21 %).

Although it appeared to us that the 5/15 temperature regime was clearly preferred, our final

experiment and the inter-laboratory referee were conducted using at 10/20 and 15° C; incubation temperatures generally more available at most regulatory laboratories. In the second experiment, we examined the effects of prechill (0 and 28 days) and 500 ppm GA_3 (GA) on seed-lot germination using 3 after-ripened (19-month old) and 2 fresh (7-month old) seed-lots and the same basic procedures described for the first experiment. The GA solution was used as the blotter wetting agent for appropriate treatments. Results are found in Table 2. In general, GA produced a significant positive response for all 5 seed-lots with and without prechill. However, dormant seeds remained at the end of the test for each seed-lot (mean viability = 77 % in post-test evaluations). Only 1 seed-lot had a significant increase in germination percentage in response to prechill. Germination rate was much faster for all seed-lots after prechill when compared to the no-prechill control (rate data not shown).

Six laboratories participated in a referee for showy goldeneye (Table 3). Germination temperature was either 15 or 10/20° C for 14 days (with light). A second test used 500 ppm GA as a blotter wetting agent. A significant positive effect of GA on germination percentage was again observed although less dramatic than in our experiment. Values for normal germination varied by lab for both GA and no-GA treatments, however, values for total viable (normal germination + post-test dormant) are rather uniform (70-87 %) and with one exception, are within established tolerance guidelines. Two laboratories recommended that the 14-day germination period was inadequate for full germination.

In conclusion, the proposed rule includes 3 incubation temperature regimes, recognizing that the regime that produced the highest germination values in our experiments is not available or at least practical at many laboratories. Light produced improved germination and is recommended. An incubation period of 28 days will allow ample time for full germination of non-dormant seed. Finally, although not all seed-lots responded to a 28-day prechill, some fresh lots did and germination for all lots was much more rapid and uniform after prechill. Therefore, a recommendation of prechill for fresh seed-lots will appear under additional directions. Post-test evaluation of ungerminated seeds for dormant seed is also necessary.

Acknowledgment

This work was funded in part by a grant from the Utah Department of Agriculture and Food.

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DATE OF PROPOSAL: October 15, 2000

Table 1. Weight (grams) per 100 seeds of showy goldeneye.

Lot No.	1	2	3	4	5	6	7	8	mean	s.d.
1	0.043	0.042	0.047	0.043	0.048	0.048	0.046	0.042	0.045	0.003
2	0.070	0.074	0.073	0.067	0.072	0.070	0.071	0.075	0.072	0.003
3	0.050	0.047	0.051	0.044	0.049	0.051	0.054	0.046	0.049	0.003
4	0.055	0.058	0.056	0.053	0.059	0.052	0.056	0.055	0.056	0.002
5	0.045	0.043	0.045	0.044	0.047	0.048	0.044	0.047	0.045	0.002
6	0.053	0.050	0.052	0.049	0.053	0.053	0.052	0.051	0.052	0.002
7	0.057	0.056	0.057	0.055	0.055	0.056	0.056	0.056	0.056	0.001
8	0.049	0.047	0.046	0.046	0.046	0.049	0.050	0.047	0.048	0.002
9	0.042	0.038	0.041	0.037	0.044	0.044	0.043	0.041	0.041	0.003
10	0.044	0.044	0.037	0.036	0.038	0.043	0.045	0.041	0.041	0.004
								mean	0.051	

Table 2. Germination percentages for 5 showy goldeneye seed-lots in response to 28 days prechill and GA_3 (500 ppm) treatment combinations. Within collections, means followed by the same letter are not significantly different at the $p < 0.05$ level (SNK).

	No Prechill		28-day prechill	
Seed-lot	No GA	GA	No GA	GA
HC-97	38b	74a	52ab	67a
TF-97	38b	72a	33b	59a
YP-97	46c	77b	35c	91a
WR-98	19b	38a	19b	44a
U1-98	12c	55b	50b	76a
mean	31c	63a	38b	67a

Table 3. Results of an inter-laboratory referee for showy goldeneye.

Lab	Germ. Temp.	Treatment	Normal Germ. %	Dormant %	Total Viable %	TZ Viable %
1	10/20	No GA	50	30	80	
		GA	64	11	75	
2	15	No GA	48	22	70	95
		GA	60	27	87	
3	15	No GA	46	30	76	83
		GA	63	16	79	
4	15	No GA	38	43	81	88
		GA	63	18	81	
5	15	No GA				80
		GA				
6	15	No GA	63	14	77	77
		GA	76	1	77	
		No GA				
		GA				
Means		No GA	49	28	77	85
		GA	65	15	80	

Passed

Rule Change Proposal No. 29

PURPOSE OF PROPOSAL: The purpose of this proposal is to update the entry for Lewis flax in the Uniform Classification of Weed and Crop Seeds (Handbook No. 25) to reflectits use in rangeland plantings, and to add the same species to Tables 1 and 3 in **Rules for Testing Seeds** using appropriate supporting evidence for seed weights and germination requirements.

PRESENT RULE:

UNIFORM CLASSIFICATION OF WEED AND CROP SEEDS (Handbook No. 25)

Scientific / Common name	Family	Classification						
		Spp. Class	contaminating					
			A	F	H	R	S	T	V
			W	C	W	C	W	W	W
Linum lewisii	(Linaceae)	F							
---flax, Lewis									
---flax, prairie									

PROPOSED RULE:

UNIFORM CLASSIFICATION OF WEED AND CROP SEEDS (Handbook No. 25)

Scientific / Common name	Family	Classification						
		Spp. Class	contaminating					
			A	F	H	R	S	T	V
			W	C	W	C	W	W	W
Linum lewisii	(Linaceae)	F,R							
---flax, Lewis									
---flax, prairie									

RULES FOR TESTING SEEDS

Section 2.4, Table 1.Weights for working samples

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
Linum lewisii Pursh Lewis flax	6	60	360-530 (440)	10,200-15,000 (12,500)

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

Kind of seed	Substrata	Temperature ^{o} C	First count days	Final count days	Additional Directions
Linum lewisii Pursh Lewis flax	TB	15;10-20	10	28	Light. Paired tests. Prechill 28 days at 2-5° C. Ungerminated seeds see sec. 4.2e and 4.9k.

SUPPORTING EVIDENCE:

Lewis flax (*Linum lewisii* Pursh) is a native perennial forb found in semi-desert shrubland to spruce-fir and subalpine meadow habitats from Alaska to Mexico (Welsh et al. 1987). Although this taxon has been treated as a subspecies of the European blue flax (*Linum perenne* L.) recent work demonstrating distinct floral morphologies and clear reproductive isolation between European and North American populations argues in favor of the designation of separate species (Pendleton et al. 1993).

Although limited quantities of Lewis flax seed are commercially available now, considerable interest exists among seed growers and their customers in developing native germplasm(s) for use in restoration and wildlife improvement plantings. Advanced lines are being evaluated (Kitchen 1995) in response to these market demands. Initial field production of one line began in 2000. Subsequently, rules for testing seed of this species will be needed by 2001.

Although quite variable, Lewis flax seed is larger than seed of commercially available blue flax. In a study using seed from 13 western North America collections, the number of seeds per gram varied from 360 to 527 (mean = 440 seeds per gram) compared to 650 seeds per gram for 'Appar' blue flax (Kitchen 1995).

Germination studies using seeds collected from 21 western U.S.A. populations revealed high levels of intra-specific variability in germination behavior for Lewis flax (Meyer and Kitchen 1994). Laboratory germination for recently harvested seed in 15° C (12 hr. photoperiod) ranged from 17 to 100% after 28 days. A 28-day prechill treatment (1° C) significantly improved germination for 5 collections, reduced germination for 5 collections, and had no effect for the remaining 11 collections. Overall, seed-lot germination responses included distinct combinations of low to high dormancy with positive, negative, and neutral prechill effects. These differences reflect the variability in habitat at the collection sites and in the seed banking strategies associated with them. Seed dormancy in Lewis flax is significantly reduced with as little as 6 mo. after-ripening.

A paired test is recommended for this species due to highly variable levels of initial dormancy and germination response, especially by fresh seed. A prior knowledge of seed viability, dormant seed fraction, and probable response to prechill is critical for determining seeding rates for field production and wildland plantings. Results from two tests; one with and one without prechill can best provide this information. This approach is consistent with the general instructions given for paired tests in the AOSA handbook, RULES FOR TESTING SEEDS (see sec. 4.9*l*-[3]) with modifications adopted by the AOSA in 2000.

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Welsh, S.L.; N.D. Atwood; L.C. Higgins; and S. Goodrich. 1987. A Utah flora. Brigham Young University, Provo, UT. 894 p.

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DATE OF PROPOSAL:

October 15, 2000

Passed

Rule Change Proposal No. 30

PURPOSE: To add several flower species to Table 1 of the AOSA Rules.

PRESENT RULE

New Rule Table 1. Weights for working samples.

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
Cynoglossum amabile Stapf & Drummond Chinese forget-me-not	11	110	224	6,350
Dianthus caryophyllus L. carnation	5	50	519	14,714
Dianthus chinensis L. China pinks	2	20	1,012	28,690
Dianthus deltoides L. maiden pinks	0.5	5	4,785	135,655
Dianthus plumarius L. grass pinks	3	30	810	22,964
Lychnis chalcedonica L. Jerusalem cross Maltese cross	1	10	2,304	65,318

SUPPORTING EVIDENCE

Seed data obtained according to the AOSA seed weight determination method. (Appendix 4)

SUBMITTED BY

The participants of the 2000 Northeast Seed Analyst Workshop, D. Bitzel, P. Jackson, S Maxon, and L. Wiltison-Allen of USDA, AMS, L&S Division, C. Boettinger, J. Zook, A. Taylor of Pennsylavania Seed Lab., J. Beuerlein of Ohio Seed Improvement Assoc., N. Rossel of Johnny's Selected Seeds, A. Gebremichael, G. Kedzierski of Virginia Seed Lab., Y. Thompson and J. Letteer of Southern States Coop., Inc., S. Gregoire, C. Tolley, J. Wicksall of NY State Seed Lab., J. Cook of Harris Seed, R. Young of Seed Examination Facility of USDA, M. Thompson of East Amhurst, NY and B. Bassford, S. Wagner, N. Robins, N. Wilkinson, J. Blackwell-Parham, C. Schorr, D. Buschling, D. Crout, J. Miller and L. Capshaw of Maryland State Seed Lab.

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DATE OF PROPOSAL

October 31, 2000, Revised December 14, 2000

Species: *Cynoglossum amabile* - Chinese forget-me-not

Lot No.	Variety	100 seed weight (grams) 1	2	3	4	5	6	7	8	mean	variance	sd	var. coeff.
5729		0.4192	0.3961	0.3873	0.4046	0.3931	0.4054	0.4032	0.4226	0.4039	0.000149	0.0122	3.0176
4757		0.4640	0.4758	0.4311	0.4766	0.4620	0.4522	0.4603	0.4593	0.4602	0.000206	0.0144	3.1186
5649		0.5467	0.5331	0.5258	0.5327	0.5321	0.5245	0.5263	0.5289	0.5313	0.000050	0.0071	1.3314
4655		0.3804	0.3899	0.3839	0.3736	0.3667	0.3820	0.3850	0.3882	0.3812	0.000059	0.0077	2.0215
827		0.4865	0.4933	0.4976	0.4934	0.4662	0.4532	0.4660	0.4973	0.4817	0.000299	0.0173	3.5869
A	D. Grubisic	0.4456	0.4425	0.4686	0.4485	0.4740	0.4395	0.4329	0.4707	0.4528	0.000253	0.0159	3.5107
no #		0.4203	0.4412	0.4340	0.4161	0.4431	0.4331	0.4201	0.4343	0.4303	0.000104	0.0102	2.3666
828		0.4925	0.4964	0.4955	0.4894	0.4792	0.4609	0.4955	0.4607	0.4838	0.000231	0.0152	3.1435
4593		0.4555	0.4562	0.4736	0.4592	0.4470	0.4463	0.4345	0.4617	0.4543	0.000138	0.0117	2.5856
2791		0.4910	0.4797	0.4446	0.4492	0.4642	0.4860	0.4815	0.4716	0.4710	0.000290	0.0170	3.6155
7615		0.4106	0.3931	0.4016	0.3807	0.3909	0.4054	0.4104	0.4047	0.3997	0.000111	0.0105	2.6350
5RM		0.3993	0.4003	0.3865	0.3891	0.3966	0.3874	0.3955	0.4134	0.3960	0.000078	0.0088	2.2272
2926		0.4485	0.4480	0.4575	0.4546	0.4588	0.4637	0.4399	0.4360	0.4509	0.000092	0.0096	2.1218
									mean	0.4459			

Species: *Dianthus caryophyllus* - carnation

Lot No.	Variety	100 seed weight (grams) 1	2	3	4	5	6	7	8	mean	variance	sd	var. coeff.
46		0.1909	0.1867	0.1931	0.1979	0.1915	0.1966	0.1957	0.1959	0.1935	0.000014	0.0037	1.9206
335		0.1953	0.1993	0.2013	0.2049	0.2049	0.2002	0.1978	0.2099	0.2017	0.000022	0.0047	2.3107
3466		0.2213	0.2118	0.2189	0.2187	0.2177	0.2193	0.2262	0.2228	0.2196	0.000018	0.0042	1.9053
4488		0.1674	0.1676	0.169	0.1753	0.1674	0.1714	0.1747	0.17	0.1704	0.000010	0.0032	1.8753
5648		0.2106	0.2096	0.2047	0.206	0.202	0.2166	0.21	0.2044	0.2080	0.000022	0.0046	2.2340
5698		0.1982	0.1881	0.1943	0.1925	0.1896	0.1884	0.1961	0.2017	0.1936	0.000024	0.0049	2.5304
5967		0.1532	0.1458	0.1503	0.1504	0.1524	0.1431	0.1506	0.1547	0.1501	0.000015	0.0039	2.5676
6659		0.2064	0.1985	0.2016	0.201	0.1854	0.2024	0.1985	0.2053	0.1999	0.000042	0.0065	3.2528
6894		0.1981	0.1861	0.177	0.1812	0.1838	0.1778	0.1759	0.1818	0.1827	0.000051	0.0071	3.9016
8128		0.2107	0.2107	0.2137	0.217	0.2128	0.2213	0.2102	0.2176	0.2143	0.000016	0.0040	1.8711
8453		0.1861	0.1944	0.196	0.1962	0.1971	0.195	0.1984	0.1941	0.1947	0.000014	0.0037	1.9209
7036		0.1815	0.1868	0.1877	0.1851	0.1765	0.1757	0.1844	0.1792	0.1821	0.000021	0.0046	2.5319
									mean	0.1925			

Species: *Dianthus chinensis* - China pinks

Lot No.	Variety	100 seed weight (grams) 1	2	3	4	5	6	7	8	mean	variance	sd	var. coeff.
3		0.1017	0.1048	0.1023	0.1005	0.0956	0.0960	0.0987	0.0986	0.0998	0.000010	0.0032	3.1711
no #		0.1085	0.1057	0.1054	0.1029	0.1098	0.1075	0.1041	0.1090	0.1066	0.000006	0.0025	2.3142
1923		0.0873	0.0852	0.0818	0.0814	0.0820	0.0845	0.0820	0.0813	0.0832	0.000005	0.0022	2.6567
2874		0.1191	0.1103	0.1144	0.1155	0.1112	0.1136	0.1129	0.1178	0.1144	0.000009	0.0030	2.6603
5664		0.0819	0.0856	0.0796	0.0869	0.0838	0.0848	0.0872	0.0855	0.0844	0.000007	0.0026	3.0549
5699		0.1027	0.1056	0.1068	0.1050	0.1081	0.1055	0.1100	0.1078	0.1064	0.000005	0.0022	2.1026
5632		0.0943	0.0908	0.0954	0.0933	0.0940	0.0998	0.0927	0.0991	0.0949	0.000010	0.0031	3.2659
no #	Heddewigi pin	0.0985	0.0906	0.0965	0.1007	0.0924	0.0968	0.1015	0.0984	0.0969	0.000014	0.0038	3.9096
4488		0.1036	0.1005	0.1014	0.0985	0.1043	0.1001	0.1018	0.0928	0.1004	0.000013	0.0036	3.5698
1		0.1046	0.1003	0.1025	0.1018	0.1026	0.1017	0.0992	0.0974	0.1013	0.000005	0.0022	2.2094
									mean	0.0988			

Species: *Dianthus deltoides* - maiden pinks

100 seed weight (grams)

Lot No.	Variety	1	2	3	4	5	6	7	8	mean	variance	sd	var. coeff.
1		0.0156	0.0155	0.0151	0.0149	0.0155	0.0155	0.0150	0.0149	0.0153	0.000000	0.0003	1.9828
3811		0.0241	0.0237	0.0244	0.0227	0.0223	0.0226	0.0228	0.0230	0.0232	0.000001	0.0008	3.3068
143		0.0187	0.0200	0.0194	0.0204	0.0185	0.0186	0.0189	0.0183	0.0191	0.000001	0.0008	3.9775
3164		0.0224	0.0233	0.0232	0.0228	0.0219	0.0222	0.0230	0.0229	0.0227	0.000000	0.0005	2.1880
4147		0.0195	0.0184	0.0188	0.0179	0.0180	0.0183	0.0187	0.0187	0.0185	0.000000	0.0005	2.7497
4487		0.0235	0.0251	0.0231	0.0237	0.0236	0.0235	0.0241	0.0234	0.0238	0.000000	0.0006	2.5858
5995		0.0234	0.0225	0.0229	0.0218	0.0241	0.0241	0.0225	0.0219	0.0229	0.000001	0.0009	3.9267
6188		0.0245	0.0246	0.0254	0.0240	0.0256	0.0244	0.0250	0.0249	0.0248	0.000000	0.0005	2.1445
7529		0.0177	0.0192	0.0189	0.0194	0.0194	0.0194	0.0201	0.0191	0.0192	0.000000	0.0007	3.5636
7528		0.0192	0.0209	0.0206	0.0197	0.0201	0.0200	0.0202	0.0196	0.0200	0.000000	0.0005	2.7327
									mean	0.0209			

Species: *Dianthus plumarius* - grass pinks

100 seed weight (grams)

Lot No.	Variety	1	2	3	4	5	6	7	8	mean	variance	sd	var. coeff.
2629		0.1313	0.1318	0.1260	0.1263	0.1291	0.1205	0.1214	0.1272	0.1267	0.000017	0.0041	3.2728
3166		0.1629	0.1598	0.1614	0.1656	0.1599	0.1580	0.1622	0.1699	0.1625	0.000014	0.0038	2.3279
4491		0.1052	0.1023	0.1021	0.1009	0.0929	0.1058	0.1024	0.1025	0.1018	0.000016	0.0039	3.8734
7046		0.1399	0.1367	0.1349	0.1395	0.1446	0.1380	0.1368	0.1414	0.1390	0.000009	0.0031	2.2114
7564		0.1022	0.1068	0.1045	0.1044	0.1092	0.1073	0.0993	0.1026	0.1045	0.000010	0.0032	3.0500
3480		0.1050	0.0997	0.0993	0.1053	0.1087	0.1040	0.1007	0.0990	0.1027	0.000013	0.0035	3.4518
1920		0.1397	0.1290	0.1352	0.1328	0.1336	0.1343	0.1372	0.1336	0.1344	0.000010	0.0032	2.3453
1921		0.1232	0.1236	0.1220	0.1257	0.1218	0.1275	0.1322	0.1283	0.1255	0.000013	0.0036	2.8815
6190		0.1239	0.1275	0.1211	0.1264	0.1312	0.1224	0.1240	0.1299	0.1258	0.000013	0.0036	2.8459
6316		0.1324	0.1368	0.1396	0.1375	0.1316	0.1348	0.1394	0.1442	0.1370	0.000017	0.0041	3.0188
3479		0.0998	0.1007	0.1009	0.0984	0.0927	0.0994	0.0990	0.0956	0.0983	0.000008	0.0028	2.8545
									mean	0.1235			

Species: *Lychnis chalcedonica* - maltese cross, Jerusalem cross

100 seed weight

Lot No.	Variety	1	2	3	4	5	6	7	8	mean	variance	sd	var. coeff.
1451		0.0419	0.0432	0.0440	0.0427	0.0437	0.0441	0.0427	0.0427	0.0431	0.000001	0.0008	1.7736
3958		0.0477	0.0509	0.0520	0.0484	0.0504	0.0475	0.0495	0.0497	0.0495	0.000003	0.0016	3.1942
6060		0.0443	0.0468	0.0447	0.0456	0.0459	0.0432	0.0444	0.0475	0.0453	0.000002	0.0014	3.1352
7096		0.0484	0.0476	0.0474	0.0489	0.0472	0.0470	0.0480	0.0484	0.0479	0.000000	0.0007	1.3991
7099		0.0441	0.0448	0.0460	0.0439	0.0457	0.0456	0.0444	0.0450	0.0449	0.000001	0.0008	1.7317
7468		0.0366	0.0330	0.0362	0.0354	0.0368	0.0364	0.0364	0.0368	0.0360	0.000002	0.0013	3.5405
7551		0.0471	0.0456	0.0460	0.0453	0.0439	0.0462	0.0472	0.0466	0.0460	0.000001	0.0011	2.3404
10019		0.0425	0.0427	0.0407	0.0416	0.0422	0.0431	0.0428	0.0438	0.0424	0.000001	0.0009	2.2317
7193		0.0357	0.0350	0.0363	0.0367	0.0362	0.0369	0.0366	0.0368	0.0363	0.000000	0.0006	1.7789
5683		0.0425	0.0435	0.0415	0.0448	0.0433	0.0428	0.0412	0.0425	0.0428	0.000001	0.0011	2.6749
									mean	0.0434			