

**TABLE 1**  
**MAXIMUM SEED LOT, SMALL SEED LOT, SUBMITTED SAMPLE**  
**AND WORKING SAMPLE QUANTITIES/SIZES**

**1A. Species used for forestry purposes in the UK**

Species	Maximum seed lot size	Small quantity seed lots*	Minimum submitted sample weight/size	Minimum working sample weight or submitted sample weight/size for very valuable seeds**
<b>CONIFER</b>				
<i>Abies grandis</i>	1000 kg	500g	100g	50g
<i>Larix decidua</i>	1000 kg	170g	35g	17g
<i>Larix x eurolepis</i>	1000 kg	160g	35g	16g
<i>Larix kaempferi</i>	1000 kg	100g	24g	10g
<i>Picea abies</i>	1000 kg	200g	40g	20g
<i>Picea sitchensis</i>	1000 kg	60g	12g	6g
<i>Pinus contorta</i>	1000 kg	90g	25g	9g
<i>Pinus nigra</i>	1000 kg	500g	100g	50g
<i>Pinus radiata</i>	1000 kg	800g	160g	80g
<i>Pinus sylvestris</i>	1000 kg	200g	40g	20g
<i>Pseudotsuga menziesii</i>	1000 kg	300g	60g	30g
<b>BROADLEAVED</b>				
<i>Acer platanoides</i>	500 kg	3500g	700g	350g
<i>Acer pseudoplatanus</i>	500 kg	3000g	600g	300g
<i>Alnus glutinosa</i>	1000 kg	40g	8g	4g
<i>Alnus incana</i>	1000 kg	20g	4g	2g
<i>Betula pendula</i>	300 kg	100g	10g	1g
<i>Betula pubescens</i>	300 kg	100g	10g	1g
<i>Carpinus betulus</i>	1000 kg	2500g	500g	250g
<i>Castanea sativa</i>	5000 kg	5000 seeds	500 seeds	500 seeds
<i>Fagus sylvatica</i>	5000 kg	6000g	1000g	600g
<i>Fraxinus excelsior</i>	1000 kg	2000g	400g	200g
<i>Populus spp.</i>	50 kg	20g	5g	2g
<i>Prunus avium</i>	1000 kg	4500g	900g	450g
<i>Quercus spp.</i>	5000 kg	5000 seeds	500 seeds	500 seeds
<i>Robinia pseudoacacia</i>	1000 kg	500g	100g	50g
<i>Tilia cordata</i>	1000 kg	900g	180g	90g
<i>Tilia platyphyllos</i>	1000 kg	2500g	500g	250g

\* From Schedule 11 of the Forest Reproductive Material (Great Britain) Regulations 2002

\*\* The Forestry Commission should be approached for permission to reduce the submitted sample weight for very valuable seed lots.

# Draft Tables for Seed Testing Guidelines

## 1B. Species not normally used for forestry purposes in the UK

Species	Maximum seed lot size	Small quantity seed lots	Minimum submitted sample weight/size	Minimum working sample weight or submitted sample weight/size for very valuable seeds*
<b>CONIFER</b>				
<i>Abies alba</i>	1000 kg	1200g	240g	120g
<i>Abies cephalonica</i>	1000 kg	1800g	360g	180g
<i>Abies pinsapo</i>	1000 kg	1600g	320g	160g
<i>Cedrus atlantica</i>	1000 kg	2000g	400g	200g
<i>Cedrus libani</i>	1000 kg	2000g	400g	200g
<i>Larix sibirica</i>	1000 kg	100g	25g	10g
<i>Pinus brutia</i>	1000 kg	500g	100g	50g
<i>Pinus canariensis</i>	1000 kg	300g	60g	30g
<i>Pinus cembra</i>	1000 kg	7000g	1000g	700g
<i>Pinus halepensis</i>	1000 kg	500g	100g	50g
<i>Pinus leucodermis</i>	1000 kg	600g	120g	60g
<i>Pinus pinaster</i>	1000 kg	1200g	240g	120g
<i>Pinus pinea</i>	1000 kg	10000g	1000g	1000g
<b>BROADLEAVED</b>				
<i>Fraxinus angustifolia</i>	1000 kg	2000g	400g	200g

\* The Forestry Commission should be approached for permission to reduce the submitted sample weight for very valuable seed lots.

## 1C. Common native tree and shrub species not covered by the regulations, for which seed test data is useful

Species	Suggested submitted sample weight	Suggested working sample weight
<b>CONIFER</b>		
<i>Juniperus communis</i>	40g	20g
<i>Taxus baccata</i>	320g	160g
<b>BROADLEAVED</b>		
<i>Cornus sanguinea</i>	300g	150g
<i>Corylus avellana</i>	500 fruits	400 fruits
<i>Crataegus monogyna</i>	400g	200g
<i>Cytisus scoparius</i>	40g	20g
<i>Euonymus europaeus</i>	200g	100g
<i>Ilex aquifolium</i>	200g	90g
<i>Malus sylvestris</i>	160g	80g
<i>Prunus padus</i>	360g	180g
<i>Prunus spinosa</i>	900g	450g
<i>Rosa</i> spp.	50g	25g
<i>Salix</i> spp.	5g	2g
<i>Sorbus</i> spp.	25g	10g
<i>Ulmus glabra</i> without wings	30g	15g

# Draft Tables for Seed Testing Guidelines

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## ABBREVIATIONS USED IN GERMINATION TABLES 2 and 3

- TP Seeds set to germinate on top of filter paper or other cellulose product which holds water.
- TS Seeds placed on top of, or lightly pushed into, sand which has been moistened to a previously determined standard moisture level.
- S Seeds placed into standard moistened sand and kept below the surface throughout the test.
- Pre-chill Where a pre-chill is recommended the seed is given a period under cold (usually at 0 to + 5°C) moist conditions. This is normally carried out on top of paper substrate arranged as for the germination test for a period of 21 days. Lots showing historically deep dormancy should be given 28 or even 35 days. Preferably the pre-chilled seed should be set to germinate side by side with non-pre-chilled seed. Pre-chilling is sometimes a requirement for freshly harvested seed of *Alnus* and *Betula spp.* which will not germinate in the dark without pre-chilling.
- 20 A temperature regime (°C) into which the seeds are placed to promote germination. The temperature may fluctuate between these limits without being held precisely at any temperature. The warmer temperature should be given for approximately 8 hours and the lower temperature about 16 hours. A continuous record must be kept of the temperature regime.
- 3-20 The temperature regime (°C) for seeds which have been stratified. The cooler temperature should be during the night for about 16 hours and the warmer temperature for about 8 hours during the day. Rosaceous seeds revert to a dormant condition even after chilling treatment if they are kept at a constant temperature in excess of 20°C for long periods.
- (1.5g) Figures in grams in brackets indicate the weight of seed to be used when testing seeds by the weighed replicate method.

# Draft Tables for Seed Testing Guidelines

**TABLE 2**  
**STANDARD GERMINATION TEST - RECOMMENDED TEST METHODS,**  
**GERMINATION CONDITIONS AND TREATMENTS**

**2A. Standard germination test for species used for forestry purposes in the UK**

Species	Working Sample	Substrate	Pre-chill	Temp °C	First Count Days	Final Count Days	Comments
<b>CONIFER*</b>							
<i>Abies grandis</i>	50g	TP	Yes	20	7	28	
<i>Larix decidua</i>	17g	TP		20	7	28	
<i>Larix x eurolepis</i>	16g	TP		20	7	28	
<i>Larix kaempferi</i>	10g	TP	Yes	20	7	28	
<i>Picea abies</i>	20g	TP		20	7	28	
<i>Picea sitchensis</i>	6g	TP	Yes	20	7	28	
<i>Pinus contorta</i>	9g	TP	Yes	20	7	28	
<i>Pinus nigra</i>	50g	TP		20	7	28	
<i>Pinus radiata</i>	80g	TP		20	7	28	
<i>Pinus sylvestris</i>	20g	TP		20	7	28	
<i>Pseudotsuga menziesii</i>	30g	TP	Yes	20	7	28	
<b>BROADLEAVED</b>							
<i>Robinia pseudoacacia</i>	50g	TP		20	7	21	Scarify using techniques described in section 4
<b>Stratified seed of</b>							
<i>Acer platanoides</i>	350g	TS		3-20	7	28	
<i>Acer pseudoplatanus</i>	300g	TS		3-20	7	28	
<i>Carpinus betulus</i>	250g	TS		3-20	7	56	
<i>Fagus sylvatica</i>	600g	TP/TS		3-20	7	42	
<i>Fraxinus excelsior</i>	200g	TS		3-20	7	35	
<i>Prunus avium</i>	450g	TS		3-20	7	70	
<i>Tilia cordata</i>	90g	TS		3-20	7	35	
<i>Tilia platyphyllos</i>	250g	TS		3-20	7	49	

## Draft Tables for Seed Testing Guidelines

### 2B. Standard germination test for species not normally used for forestry purposes in the UK

Species	Working Sample	Substrate	Pre-chill	Temp °C	First Count Days	Final Count Days	Comments
<b>CONIFER</b>							
<i>Abies alba</i>	120g	TP	Yes	20	7	28	
<i>Abies cephalonica</i>	180g	TP	Yes	20	7	28	
<i>Abies pinsapo</i>	160g	TP	Yes	20	7	28	
<i>Cedrus atlantica</i>	200g	TP	Yes	20	7	21	
<i>Cedrus libani</i>	300g	TP	Yes	20	7	21	
<i>Larix sibirica</i>	10g	TP		20	7	21	
<i>Pinus brutia</i>	50g	TP		20	7	21	
<i>Pinus canariensis</i>	30g	TP		20	7	21	
<i>Pinus halapensis</i>	50g	TP		20	7	21	
<i>Pinus leucodermis</i>	60g	TP		20	7	21	
<i>Pinus pinaster</i>	120g	TP		20	7	21	
<i>Pinus pinea</i>	1000g	TP		20	7	21	Light essential. Soak one day prior to test.

### 2C. Standard germination test for common native tree and shrub species not covered by the regulations, for which seed test data is useful

Species	Working Sample Weight	Substrate	Pre-chill	Temp °C	First Count Days	Final Count Days	Comments
<b>BROADLEAVED</b>							
<i>Cytisus scoparius</i>	20g	TP		20	7	28	Scarify using techniques described in section 4
<i>Ulmus glabra</i> without wings	15g	TP		20	7	28	
<b>Stratified seed of</b>							
<b>CONIFER</b>							
<i>Juniperus communis</i>	20g	TP/TS		3-15	14	28	
<i>Taxus baccata</i>	160g	TS		3-20	7	28	
<b>BROADLEAVED</b>							
<i>Cornus sanguinea</i>	150g	TS		3-20	7	49	
<i>Corylus avellana</i>	500 fruits	S		3-20	7	28	
<i>Crataegus monogyna</i>	200g	TS		3-20	7	28	
<i>Euonymus europaeus</i>	100g	TS		3-20	7	28	
<i>Ilex aquifolium</i>	90g	TS		3-20	7	28	
<i>Malus sylvestris</i>	80g	TS		3-20	7	28	
<i>Prunus padus</i>	180g	TS		3-20	7	28	
<i>Prunus spinosa</i>	450g	TS		3-20	7	28	
<i>Rosa</i> spp.	25g	TS		3-20	7	28	
<i>Sorbus</i> spp.	10g	TS		3-20	7	28	

# Draft Tables for Seed Testing Guidelines

**TABLE 3  
WEIGHED REPLICATE TESTS**

**3A. Weighted replicate test for species used for forestry purposes in the UK**

Species	Working Sample Weight	Substrate	Pre-chill	Weight of Replicate	Temp °C	First Count Days	Final Count Days	Comments
<b>CONIFER*</b>								
<i>Abies grandis</i>	50g	TP	Yes	2g	20	7	28	
<i>Larix decidua</i>	17g	TP		1g	20	7	28	
<i>Larix x eurolepis</i>	16g	TP		1g	20	7	28	
<i>Larix kaempferi</i>	10g	TP	Yes	0.7g	20	7	28	
<i>Picea abies</i>	20g	TP		0.8g	20	7	28	
<i>Picea sitchensis</i>	6g	TP	Yes	0.3g	20	7	28	
<i>Pinus contorta</i>	9g	TP	Yes	0.4g	20	7	28	
<i>Pinus nigra</i>	50g	TP		1.5g	20	7	28	
<i>Pinus radiata</i>	80g	TP		3g	20	7	28	
<i>Pinus sylvestris</i>	20g	TP		0.7g	20	7	28	
<i>Pseudotsuga menziesii</i>	30g	TP	Yes	1g	20	7	28	
<b>BROADLEAVED</b>								
<i>Alnus glutinosa</i>	4g	TP		0.10g	20	7	21	Prechill may be beneficial for newly harvested seed
<i>Alnus incana</i>	2g	TP		0.10g	20	7	21	
<i>Betula pendula</i>	1g	TP		0.10g	20	7	21	
<i>Betula pubescens</i>	1g	TP		0.10g	20	7	21	
<i>Populus spp.</i>	2g	TP		0.10g	20	3	10	

**3B. Weighted replicate test for common native tree and shrub species not covered by the regulations, for which seed test data is useful**

Species	Working Sample Weight	Substrate	Weight of Replicate	Temp °C	First Count Days	Final Count Days	Comments
<i>Salix spp.</i>	2g	TP	0.10g	20	7	14	

\* These species can be tested by using two replicates of 100 seeds or the weighed replicate method to reduce costs when the value of the seed lot does not justify the expense of carrying out a full test. Prior approval must be obtained from the Forestry Commission to test using two replicates of 100 seeds or the weighed replicate method. The approximate weight to use for each replicate in the weighed replicate test is given in the table.

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**TABLE 4**  
**VIABILITY TESTS: Recommended Methods**

**4A. Viability tests for species used for forestry purposes in the UK**

Cutting Test	Working Sample	Replicates for Normal Sized Seed Lots	Replicates for Small Sized Seed Lots
<i>Castanea sativa</i>	400 seeds	4 x 100 seeds *	4 x 25 seeds
<i>Quercus</i> spp.	400 seeds	4 x 100 seeds *	4 x 25 seeds

\* It is recommended that germination tests are performed on the 100 remaining seeds from the *Castanea* and *Quercus* samples as confirmation of the viability results as follows:

Species	Substrate	Temp °C	First Count Days	Final Count Days	Comments
<i>Castanea sativa</i>	TS	20	7	21	To assist germination, soak for up to 48 hours and push seeds deep into the medium.
<i>Quercus</i> spp.	TS	20	7	28	

**4B. Viability test for common native tree and shrub species not covered by the regulations, for which seed test data is useful.**

Cutting Test	Working Sample	Replicates for Normal Sized Seed Lots	Replicates for Small Sized Seed Lots
<i>Aesculus hippocastanum</i>	400 seeds	4 x 100 seeds	4 x 25 seeds
<i>Corylus avellana</i>	400 fruits	4 x 100 seeds	4 x 25 seeds

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**TABLE 5  
MODIFIED EXCISED EMBRYO OR TETRAZOLIUM TEST**

**5A. Modified excised embryo or tetrazolium test for species used for forestry purposes in the UK**

Species	Working Sample	Replicates for Normal Sized Seed Lots	Replicates for Small Sized Seed Lots
<i>Acer platanoides</i> *	350g	4 x 25	4 x 10
<i>Acer pseudoplatanus</i> *	300g	4 x 25	4 x 10
<i>Fagus sylvatica</i>	600g	4 x 50	4 x 25
<i>Fraxinus excelsior</i>	200g	4 x 50	4 x 25
<i>Prunus avium</i>	450g	4 x 25	4 x 10
<i>Tilia cordata</i>	90g	4 x 25	4 x 10
<i>Tilia platyphyllos</i>	250g	4 x 25	4 x 10

\* In these species, the green colour of the embryo masks the colour of the red stain in the tetrazolium test, and for this reason the modified excised embryo test is preferred.

**5B. Modified excised embryo and tetrazolium tests for species not normally used for forestry purposes in the UK**

Species	Working Sample	Replicates for Normal Sized Seed Lots	Replicates for Small Sized Seed Lots
<b>CONIFER</b>			
<i>Pinus cembra</i>	700g	4 x 50	4 x 25
<b>BROADLEAVED</b>			
<i>Fraxinus angustifolia</i>	200g	4 x 50	4 x 25

**5C. Modified Excised Embryo or Tetrazolium Tests for common native tree and shrub species not covered by the regulations, for which seed test data is useful**

Species	Working Sample	Replicates for Normal Sized Seed Lots	Replicates for Small Sized Seed Lots
<b>CONIFER</b>			
<i>Juniperus communis</i>	20g	4 x 25	4 x 10
<i>Taxus baccata</i>	60g	4 x 25	4 x 10
<b>BROADLEAVED</b>			
<i>Cornus sanguinea</i>	150g	4 x 25	4 x 10
<i>Crataegus monogyna</i>	200g	4 x 25	4 x 10
<i>Euonymus europaeus</i>	100g	4 x 25	4 x 10
<i>Ilex aquifolium</i>	90g	4 x 25	4 x 10
<i>Malus sylvestris</i>	80g	4 x 25	4 x 10
<i>Prunus padus</i>	180g	4 x 25	4 x 10
<i>Prunus spinosa</i>	450g	4 x 25	4 x 10
<i>Rosa</i> spp.	25g	4 x 25	4 x 10
<i>Sorbus</i> spp.	10g	4 x 25	4 x 10



# Draft Tables for Seed Testing Guidelines

## TABLE 6 TOLERANCES

### 6A. Maximum tolerated ranges between four or two replicates 100 seeds or two replicates of 50 seeds in a germination test (two-way test at 2.5% significance level)

This table indicates the maximum range (i.e. difference between the highest and lowest) in germination percentage, tolerable between replicates, allowing for random sampling variation only, at 0.025 probability. To find the maximum tolerated range, calculate the average percentage of the four or two replicates to the nearest whole number: if necessary, form 100 seed replicates by combining the sub-replicates of 50 or 25 seeds which were closest together in the germinator. Locate the average in column A or B of the table and read off the maximum tolerated range opposite in column C for four replicates of 100, column D for two replicates of 100 and column E for two replicates of 50.

The tolerances in columns C and D are extracted from Table G 1, columns D and L, in Miles (1963), column E has been calculated.

Average % germination	Average % germination	Maximum range for 4 replicates of 100 seeds (400 seeds total)	Maximum range for 2 replicates of 100 seeds (200 seeds total)	Maximum range for 2 replicates of 50 seeds (100 seeds total)
<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>	<b>E</b>
99	2	5	4	
98	3	6	5	
97	4	7	6	
96	5	8	6	
95	6	9	7	
94	7	10	8	
93	8	10	8	
92	9	11	9	
91	10	11	9	
90	11	12	9	
89	12	12	10	
88	13	13	10	
87	14	13	11	
86	15	14	11	
85	16	14	11	
84	17	14	11	
83	18	15	12	
82	19	15	12	
81	20	15	12	
80	21	16	13	
79	22	16	13	
78	23	16	13	
77	24	17	13	
76	25	17	13	
75	26	17	14	
74	27	17	14	
73	28	17	14	
69 to 72	29 to 32	18	14	
68	33	18	15	
67	34	18	15	
56 to 66	35 to 45	19	15	
55	46	20	15	
51 to 54	47 to 50	20	16	

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## 6B. Maximum tolerated range between four weighed replicates in a germination test

This table, based on the Poisson distribution, indicates the maximum range (i.e. maximum difference between the highest and lowest) in germination data tolerable between weighed replicates, allowing for random variation at 0.05 probability. To find the maximum tolerated range, calculate the sum of the numbers of seeds germinated in the four replicates. Locate the sum in column A of the table, and read off the maximum tolerated range in column B.

The tolerances are taken from the ISTA Rules, 2009 Edition, Table 13C.

Number of seeds germinated in the total weight of seed tested	Maximum range
A	B
0-6	4
7-10	6
11-14	8
15-18	9
19-22	11
23-26	12
27-30	13
31-38	14
39-50	15
51-56	16
57-62	17
63-70	18
71-82	19
83-90	20
91-102	21
103-112	22
113-122	23
123-134	24
135-146	25
147-160	26
161-174	27
175-188	28
189-202	29
203-216	30
217-230	31
231-244	32
245-256	33
257-270	34
271-288	35
289-302	36
303-321	37
322-338	38
339-358	39
359-378	40
379-402	41
403-420	42
421-438	43
439-460	44
>460	45

# Draft Tables for Seed Testing Guidelines

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## 6C. Maximum tolerated range for moisture testing using two replicates determinations

The table gives the maximum difference allowed between two replicate determinations of moisture. The allowed tolerance depends on seed size according to the thousand seed weight and the value of the moisture content determined.

The tolerances are taken from the ISTA Rules, 2009 Edition, Table 9B.

Seed size	Average moisture content determined		
	Less than 12%	12-25%	Greater than 25%
Small seeded species: Thousand seed weight less than 200g	0.3%	0.5%	0.5%
Large seeded species: Thousand seed weight greater than or equal to 200g	0.4%	0.8%	2.5%