Kew

PLANTS PEOPLE POSSIBILITIES

Improving the identification, handling and storage of "difficult" seeds

Using the viability equations
http://data.kew.org/sid/viability/

Objective

After this practical you will be able to use the viability equations to predict seed longevity under different storage conditions.

Remember that the results you get are estimates, and may have large confidence intervals, for example, Arabidopsis seeds stored at 5 % moisture content and -20 °C are predicted to remain viable for 1908 years (with a 95 % confidence interval of 1387 to 2430 years) (Hay *et al*, 2003).

Worked example 1

A seed bank plans to store a barley seed lot as an active collection at 5°C. The initial viability is 99.5% and the collection has been dried to 10% moisture content. When will viability have fallen to the regeneration standard of 85%?

Click on Predict storage time. Select *Hordeum vulgare* from the drop-down species list. The species constants and the reference source will appear. Input storage temperature°C (5) and emc (10). Input initial viability (99.5%) and final viability (85%). Click on Calculate. Seed viability will have fallen to 85% after 18 years storage under these conditions.

Predict Storage Time

Hordeum vulgare (Ellis & Roberts 1980b), (Dickie et al. 1990)

Ke	9.144	
Cw	5.342	
Ch	0.0329	
Cq	0.000478	
Known Seed Eq (mc)	10	calculate
Storage Temp °C	5	
Initial Viability (%)	99.5	
Final Viability (%)	85	
Calculate	Reset	
Days to lose 1 Probit:	**4222**	
Years to lose 1 Probit:	**12**	
Initial Viability (NEDs):	**2.6**	
Final Viability (NEDs):	**1.0**	
Storage Period Days:	**6500**	
Storage Period Years:	**18**	

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Question 1

a) If the collection had been dried to 6% mc and stored under the same temperature conditions, how much longer could it be stored until viability fell to the regeneration standard?

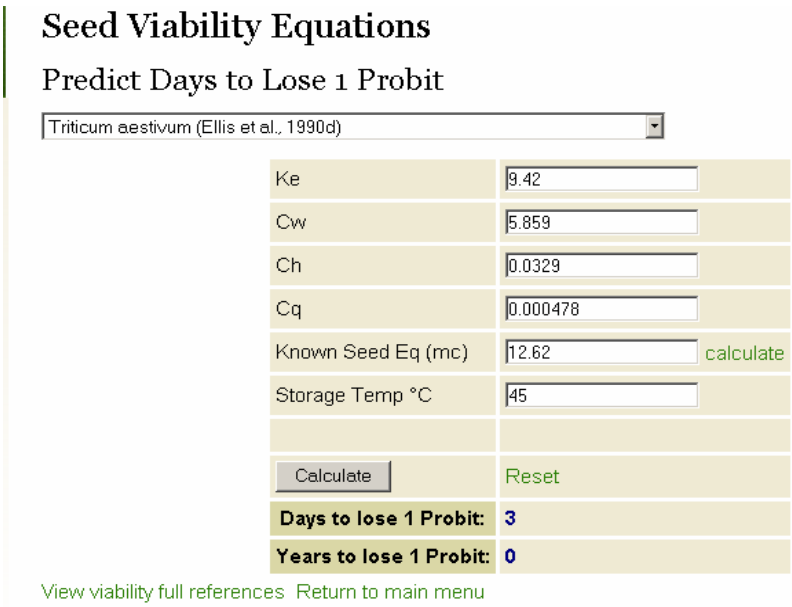
b) If the collection had been dried to 6% mc and stored for long-term conservation at at -20° C, how long could it be stored until viability fell to the regeneration standard?

Worked example 2

In the seed longevity practical exercise you estimated **σ** (time to lose 1 probit) from the plotted probit viability line. Check this estimate using the viability equations.

Click on Predict days to lose 1 probit . Select *Triticum aestivum* from the drop-down species list. The species constants and the reference source will appear. Input storage temperature°C (45) and emc (12.62). Click on the Calculate button.

Wheat seeds at 45°C and 70%eRH (12.62%mc) will lose 1 probit of viability in 3 days. How does this compare with your estimate of sigma (**σ**)?



Question 2

What is the value of **σ** (time to lose 1 probit) for the other moisture levels?

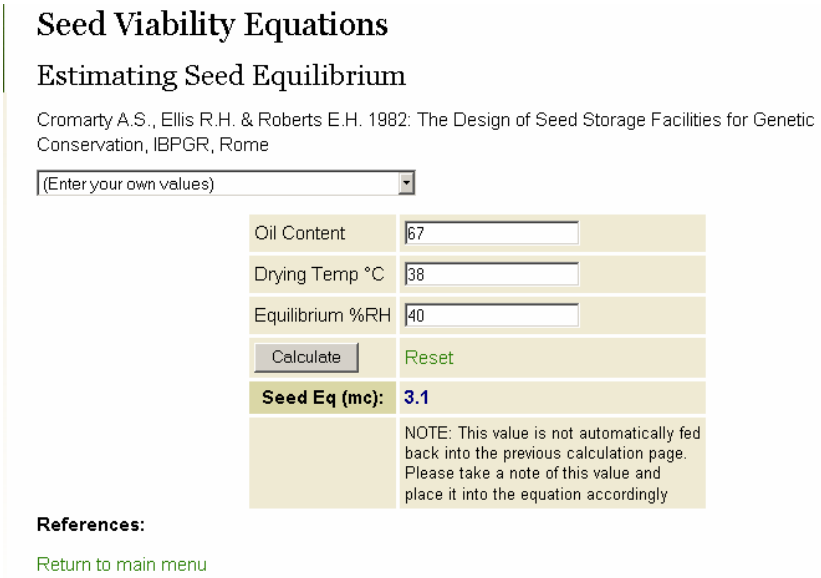
a) 60% eRH (11.14%mc) **σ** = ... days

b) 50% eRH (10.32%mc). **σ** = …. days

Worked example 3

You are a forest extension officer working with communities in Burkina Faso to collect and plant *Khaya senegalensis*, a multipurpose tree species, with a seed oil content of 67%. Seeds are shed during the month of May at an eRH of around 50%. Average climatic conditions **in the afternoon** in May are 38°C and 40%RH. You use ambient drying during the afternoon to reduce eRH to 40% and then store seeds at ambient temperature (12 month average: 29°C) in large plastic drums. An initial germination test shows that viability is 99%. What will the viability be after 12 months storage under these conditions?

Click on Predict Final Viability. Select *Khaya senegalensis* from the drop-down species list. The species constants and the reference source will appear. You do not know the Seed Eq (mc) so click on calculate. A new window will appear. Enter oil content (67), drying temp (38) and Equilibrium %RH (40) and click on calculate.


Seed Viability Equations

Estimating Seed Equilibrium

Cromarty A.S., Ellis R.H. & Roberts E.H. 1982: The Design of Seed Storage Facilities for Genetic Conservation, IBPGR, Rome

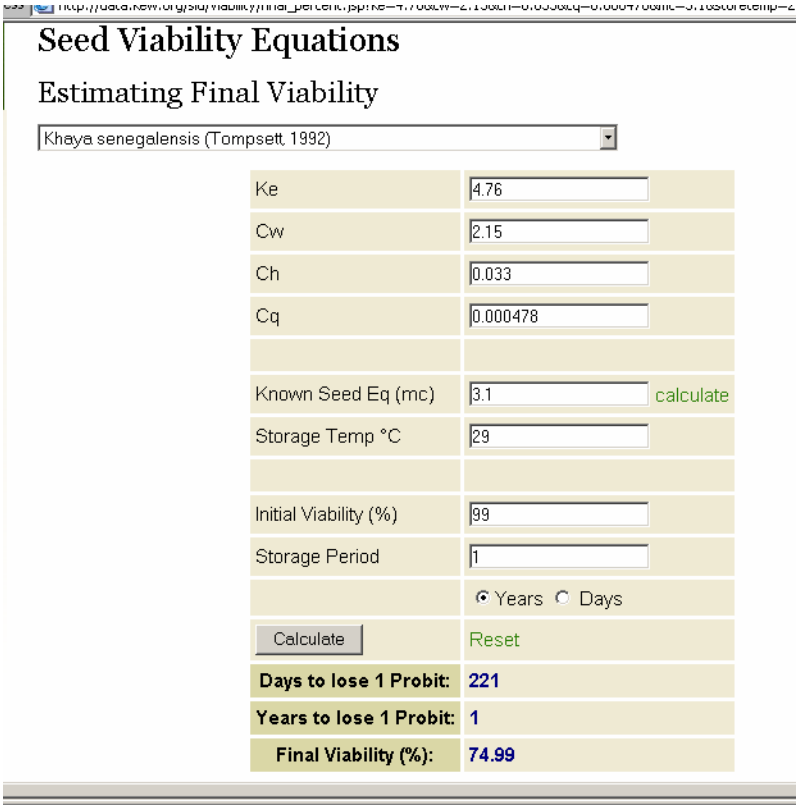
(Enter your own values)

Oil Content	67
Drying Temp °C	38
Equilibrium %RH	40
Calculate	Reset
Seed Eq (mc):	**3.1**
	NOTE: This value is not automatically fed back into the previous calculation page. Please take a note of this value and place it into the equation accordingly

References:

Return to main menu

Return to previous window and enter Seed Eq mc (3.1). Enter storage temperature (29), initial viability (99), storage period (1 year) and click on the Calculate button.



Question 3
If you could use charcoal to reduce eRH to 25% how would this affect seed longevity?