Worked examples using the SID Viability Calculator to make practical predictions from the seed viability equations

http://www.kew.org/sid/viability/index.html

Objective

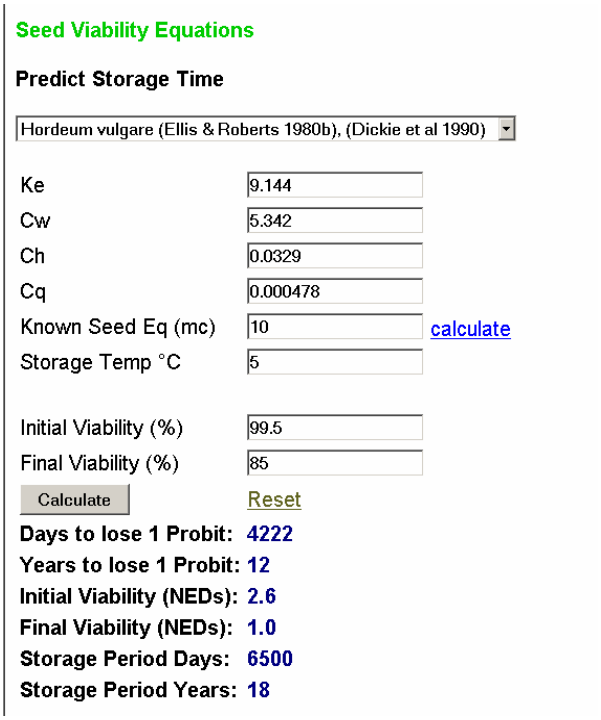
After this practical you will be able to use the viability equations to predict seed longevity under different storage conditions.

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%?

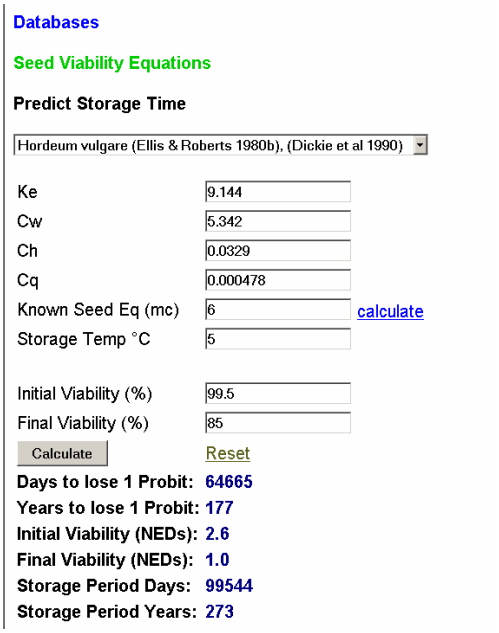
Click on Predict storage time. Select *Hordeum vulgare* from the drop-down species list. The species constants and the reference source will appear. Input storage temperature°C (5) and emc (10). Input initial viability (99.5%) and final viability (85%). Click on Calculate. Seed viability will have fallen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

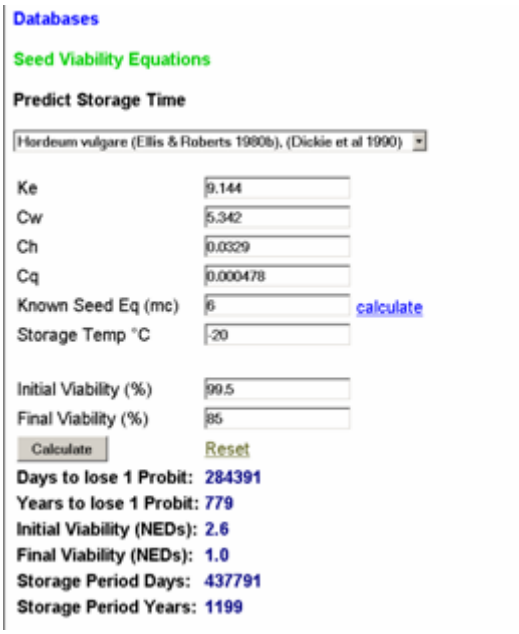


Question 1

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?



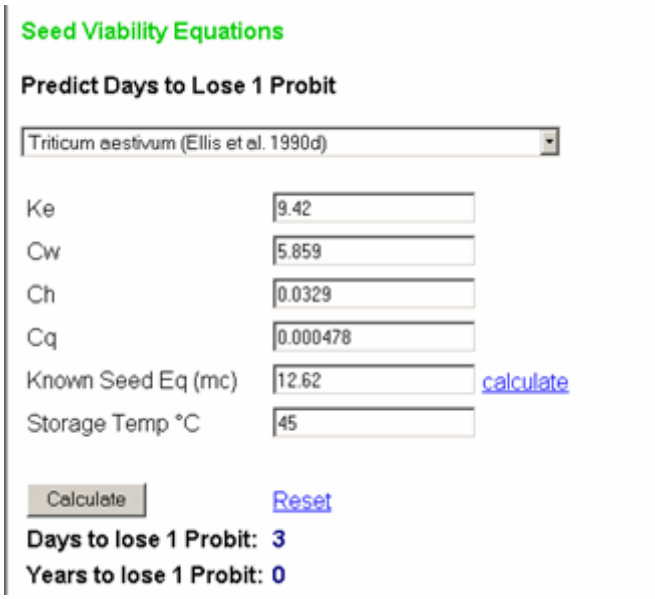


Worked example 2

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 visual estimate of sigma (**σ)** ?



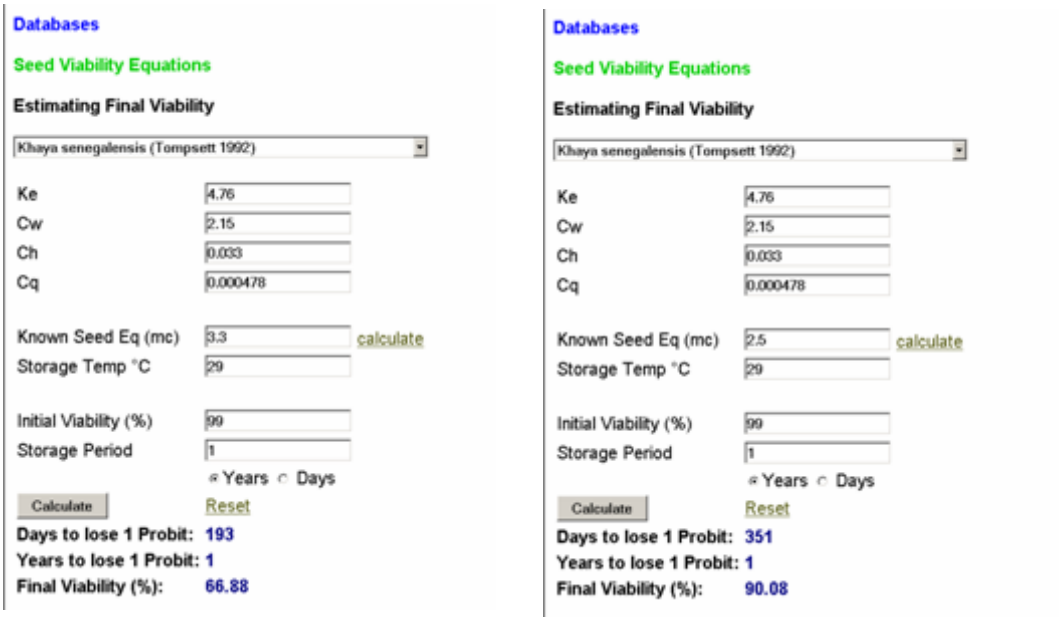
Question 2

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

a) 60% eRH (11.14%mc) **σ** = 6 days

b) 50% eRH (10.32%mc). **σ** = 11 days

Question 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 daily temperatures and RH in May are 32°C and 52% (65% am, 40% pm). 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? What is the rate of viability loss? If you could use charcoal to reduce eRH to 25% how would this affect seed longevity?

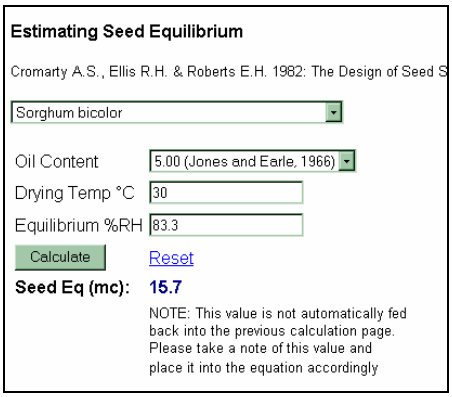


More SID Viability Calculator worked examples

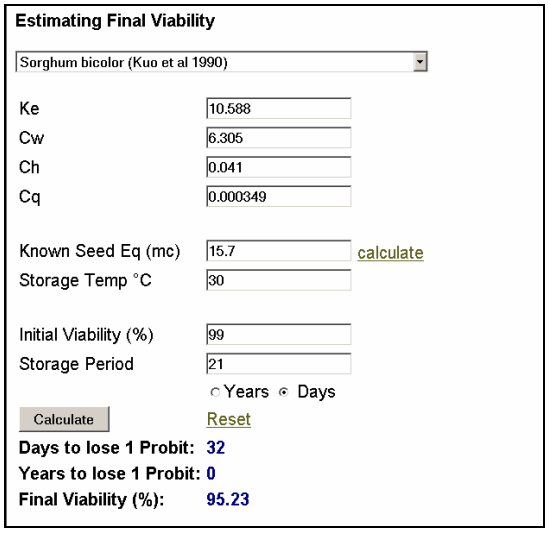
Viability monitoring of *Sorghum bicolor*

1. You are out in the field on a 3-week trip. On the first day of the trip you make a collection of sorghum. The seeds are fully ripe and have an eRH of 83.3%. Average daily temperatures and RH for the month are 30°C and 59% (78% am, 40% pm) respectively. Assuming that seeds are at maximum potential longevity (99%) when you collected them, what will seed viability be after holding the collection in a cloth bag, without any special treatment, for 3 weeks?

- Click on Predict final viability Select *Sorghum bicolor* from the drop-down species list. The species constants and the reference source will appear.
- Click on Calculate button to estimate seed equilibrium moisture content. Select *Sorghum bicolor* from the drop-down species list. Input drying temp (30°C) and equilibrium relative humidity (83.3%). The calculated emc (15.7%) will appear.

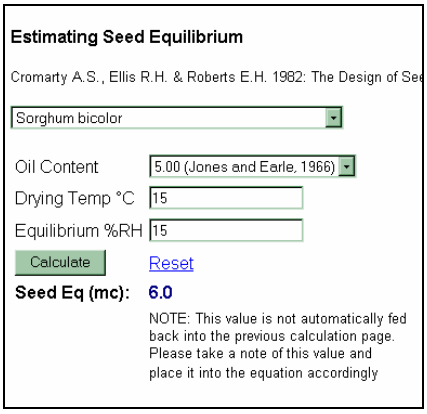


- Return to the previous screen and input emc (15.7), storage temperature (30°C), initial viability (99%) and storage period (21 days). The viability after 3 weeks in the field will have fallen to 95.23%.

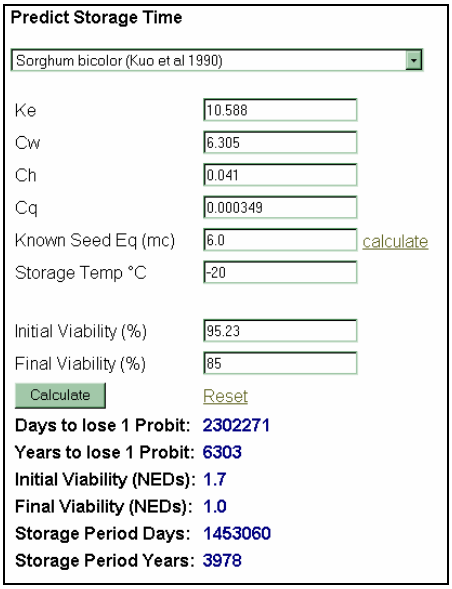


2. You return to the seed bank, dry the collection to 15% eRH and store it at -20°C. How long it will take for viability to fall to the regeneration standard of 85%?

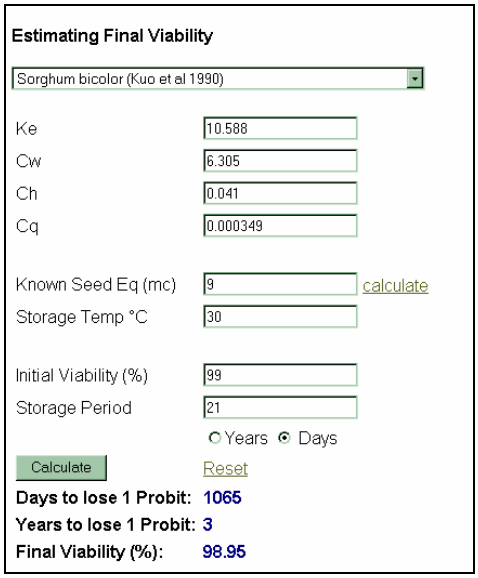
- Click on Predict storage time on main menu. Select *Sorghum bicolor* from the drop-down species list. The species constants and the reference source will appear.
- Calculate emc as before (drying temp is 15°C and eRH is 15%).

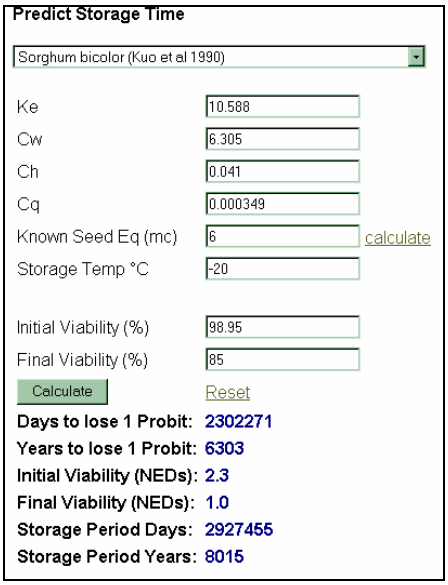


- Input storage temperature°C (-20°C) and emc (6.0%). Input initial viability (95.23%) and final viability (85%). Click on Calculate. The storage period to reach 85% viability is 3978 years.

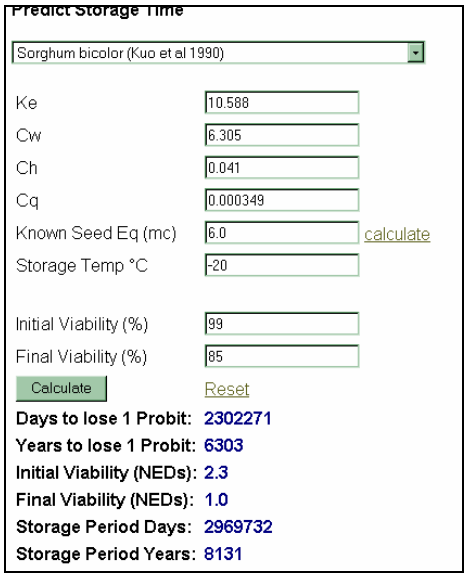


3. If, during your collecting trip, you had used ambient drying during the day (average afternoon RH is 40%) and sealed the collection at night what effect would this have had on seed longevity?





4. If you had sent the collection back to the seed bank immediately for drying, how long would it have taken to reach the regeneration standard?



Summary table

Note the effect of post-harvest handling on 'years to reach regeneration standard'.

	In field, no special treatment	In field, ambient drying to 40% eRH	Sent immediately to seed bank
% viability at time of collection (assumed)	99	99	99
Days to lose 1 probit under post harvest conditions	32	1065	-
% viability at time of banking (K_i, calculated)	95.23	98.95	99
Days to lose 1 probit under seed bank conditions	2,302,271	2,302,271	2,302,271
Years to reach regeneration std.	3978	8015	8131