Estimation of seed viability constants for tall wheatgrass, cocksfoot, rye, and sheep fescue to inform gene banking decisions

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Abstract

Stored seeds deteriorate over time and must be regenerated to ensure that the benefits of *ex situ* conservation are realized. Prediction of seed longevity is based on the seed viability equation. This equation has four constants which are species specific. The aim of this project is the estimation of these constants and prediction of regeneration frequency for *Elytrigia elongata, Dactylis glomerata, Festuca ovina, Secale cereal*, *and Secale montanum*. Seeds were equilibrated at 20, 40, and 60% RH and their moisture content was determined after equilibration. Seeds were then sealed in nylon pockets and stored at 30, 35, and 40° C. Germination was tested monthly. Seed viability constants (K_E , C_w , C_H , C_Q) were estimated and regeneration time was calculated for each species. High variation in seed longevity was observed both among the genus and species. *Elytrigia elongata* with K_E=6 and C_w=1.64 had the maximum seed longevity of all species evaluated; seeds stored in an active collection (8% mc, 5° C) would have to be regenerated after 131 years. The minimum seed longevity was obtained for *Festuca ovina* with K_E=4.3 and C_w=0.5; seeds stored in active collections would have to be regenerated after 33 years.

Keywords: seed longevity; regeneration time; seed storage; viability equation constants

Abbreviations:

mc: moisture content; RH: relative humidity

Eisvan, H.R.. 2014. 'Estimation of seed viability constants for tall wheatgrass, cocksfoot, rye and sheep fescue to inform gene banking decisions'. *Iranian Journal of Plant Physiology* 4 (4), 1145-1149.

Introduction

Due to genetic erosion, conservation of plant genetic resources has been significant. Of 2.3 million plant accessions which are conserved in the world, 97% of them are conserved as seed in *ex situ* collections (Plucknett et al., 1987). By conservation of these resources, plant genetic variation associated with beneficial traits will always be available (Gooding et al., 2003).

Seeds of most plants have orthodox behavior and seed deterioration is predictable if storage conditions are defined. Ellis and Roberts (1980) introduced the viability equation for prediction of seed longevity:

$$V = Ki - {}^{P}\!/_{10^{K_E - C_w \log m - C_H t - C_Q t^2}}$$

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Received:May, 2014
Accepted: July, 2014