Comparative longevity of Bryophyte spores: influence of storage conditions, spore maturity stage, and plant ecology

Aleksandra Ruzic, Carlos Eced, Ricardo Garilleti, Belen Albertos, Daniel Ballesteros

VNIVERSITAT DE VALÈNCIA

4th Mediterranean Plant Conservation Week

VALÈNCIA | 23-27 OCTOBER | 2023

VNIVERSITAT DE VALÈNCIA
Jardí Botànic

Introduction

❑ HOW LONG DO BRYOPHYTE SPORES REMAIN VIABLE?

Not much information regarding their longevity → Important for efficient conservation in gene/spore banks

❑ HOW DO WE DETERMINE SPORE LONGEVITY?

P_{50} is the time it takes for viability to fall to 50% → Can be used to **compare the relative longevity** of bryophyte spores with that of seeds and fern spores **aged at comparable conditions**

Objectives

- **TO DETERMINE THE RELATIVE LONGEVITY OF BRYOPHYTE SPORES AGED AT DIFFERENT STORAGE CONDITIONS**

- **TO UNDERSTAND THE INFLUENCE OF THE MATURITY STAGE IN THE SPORE LONGEVITY POTENTIAL**

- **TO INVESTIGATE IF THE LONGEVITY POTENTIAL IS DETERMINED BY THE SPECIES ECOLOGY**

Materials and Methods

© Michael Lüth

- Epiphyte

***Lewinskya acuminata* (H. Philib.) F. Lara, Garilleti & Goffinet**

© Stefan Gey

- Epiphyte

***Ulota crispula* Bruch**

© Michael Lüth

- Epiphyte

***Lewinskya iberica* (F.Lara & Mazimpaka) F.Lara, Garilleti & Goffinet**

© Hugues Tinguy

- Terricolous
- Different maturity of spores

***Funaria hygrometrica* Hedw.**

Materials and Methods

Accelerated Ageing Conditions

60% RH + 45ºC

Dry storage

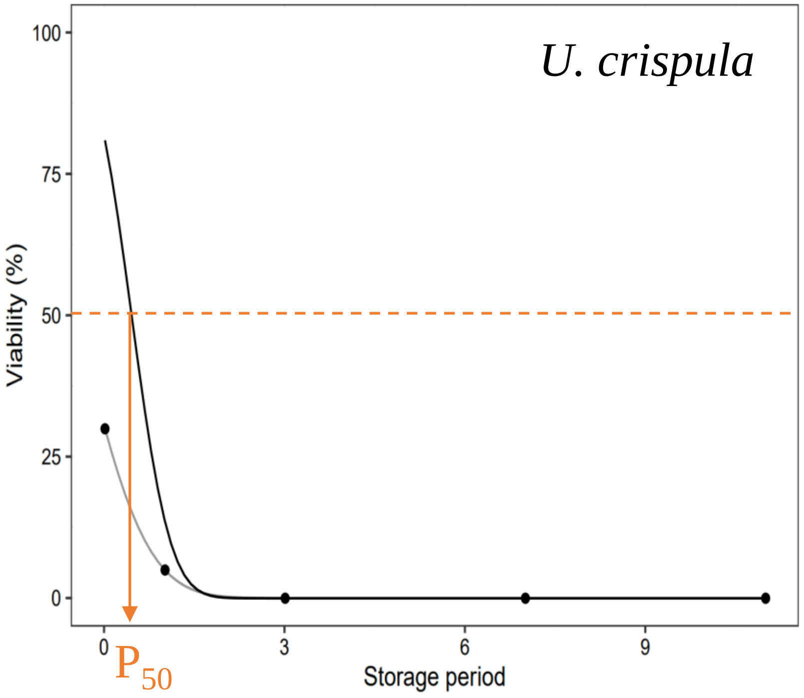
15% RH + 20ºC

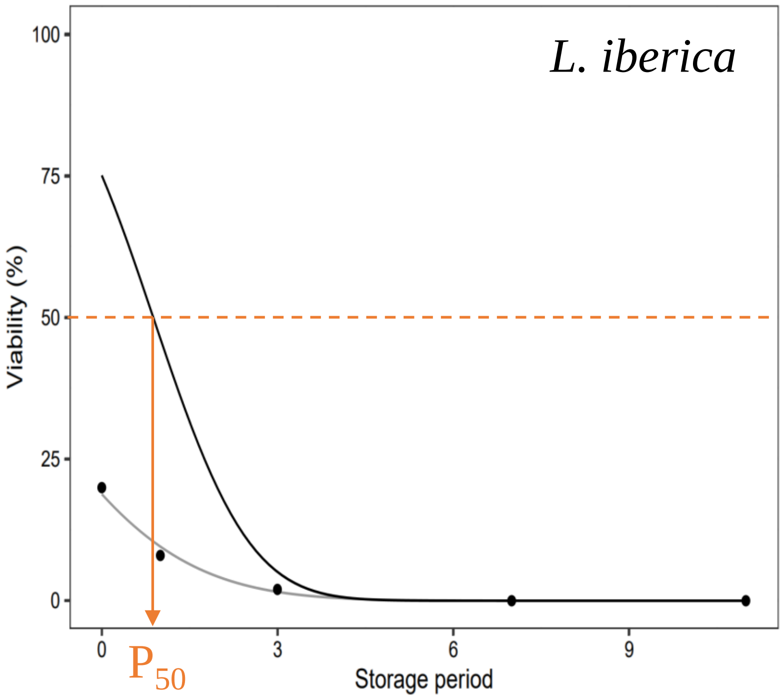
Knop medium

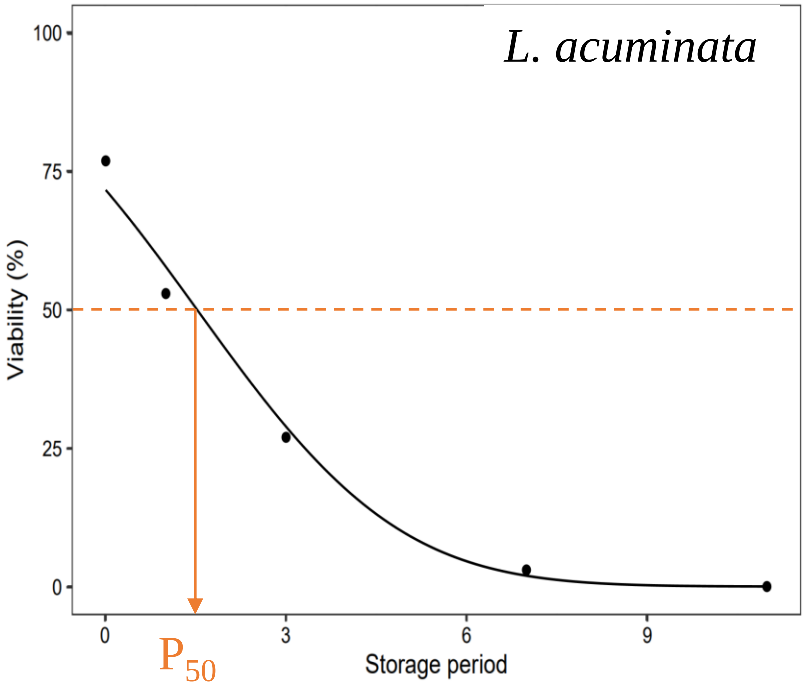
Germination at 20ºC
and 12h photoperiod

$$Viability = \frac{Germinated\ spores}{Total\ number\ of\ sown\ spores}$$

Results and Discussion



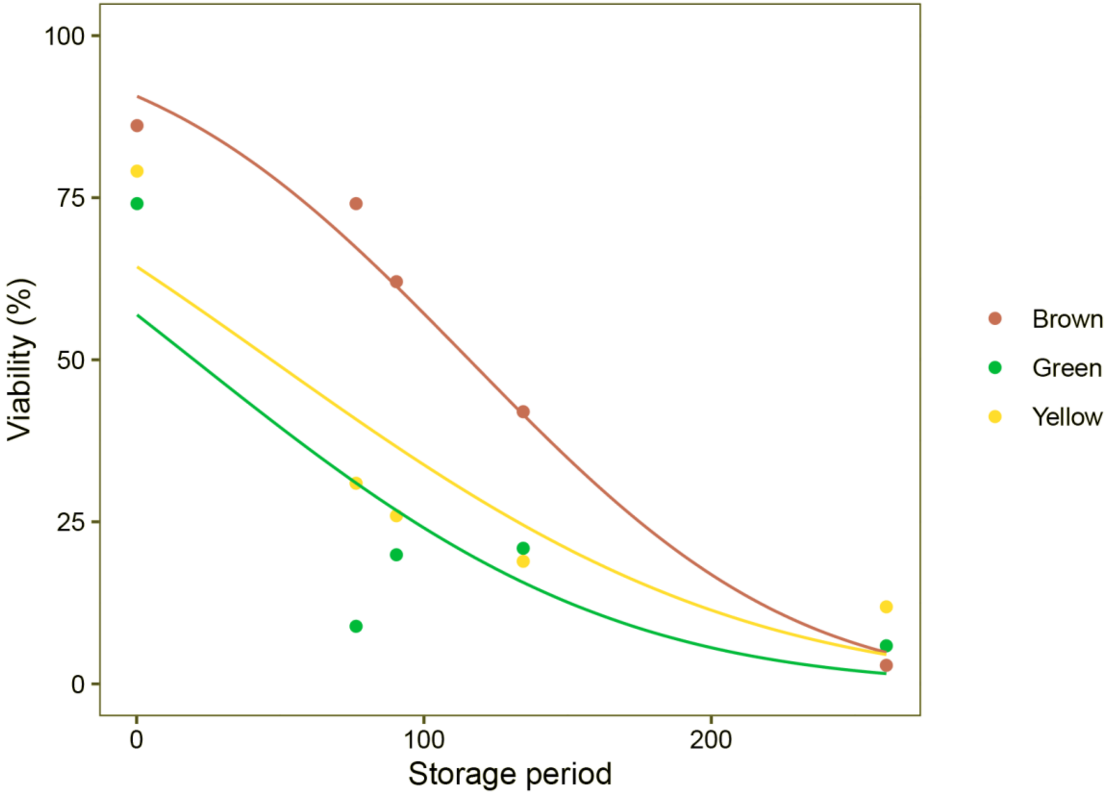




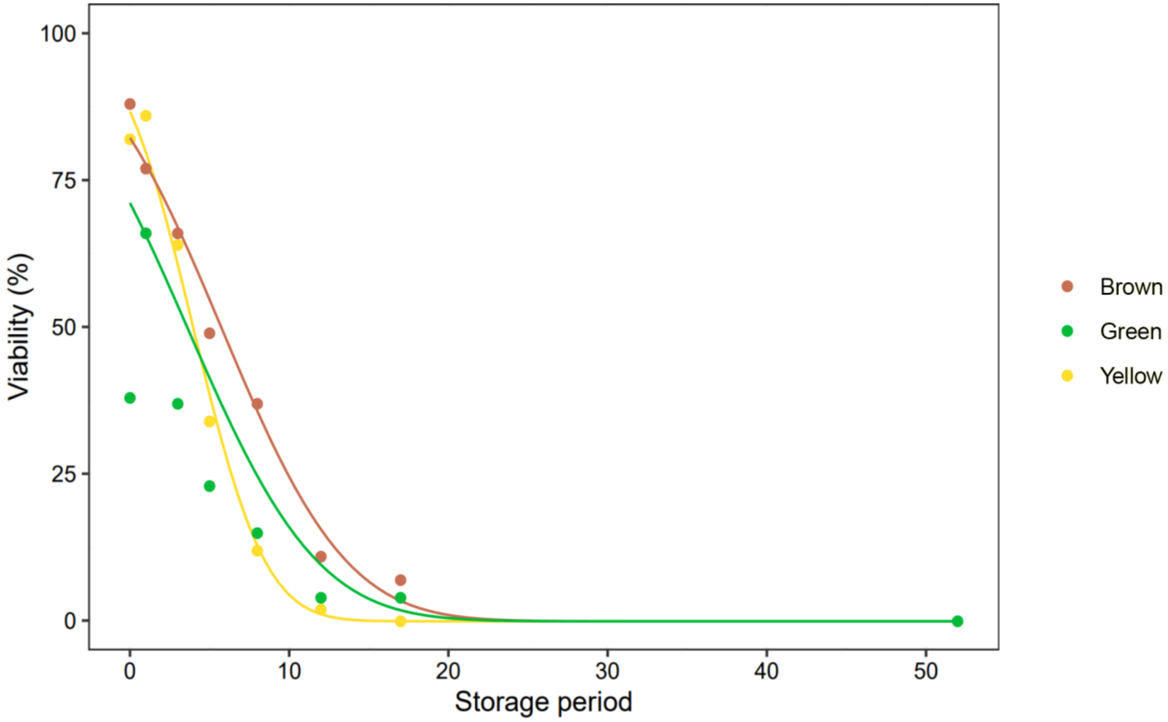
Mead and Gray's (1994) correction was used for U. crispula and L. iberica to compensate for the low initial viability of the spores.

Results and Discussion

- ❑ **SPORE LONGEVITY INCREASED WHEN STORED IN DRY CONDITIONS**



Dry conditions



Accelerated ageing conditions

Results and Discussion

- ❑ **BRYOPHYTE SPORES LOOSE VIABILITY RELATIVELY FAST COMPARED TO CATEGORIES DETERMINED FOR SEEDS**

Species	Ki	σ	P_{50} (Ki x σ) days
*U. crispula**	0.88	0.5	**0.44 d**
L. acuminata	0.57	2.65	**1.51 d**
*L. iberica**	0.68	1.3	**0.884 d**
F. hygrometrica	0.92	6.2	**5.704 d**

**Mead and Gray's (1994) correction was used for U. crispula and L. iberica to compensate for the low initial viability of the spores.*

Following the interpretation of P_{50} by Mondoni et al. (2011):

- Values of ≤ 2 days → transient or very short-lived
- Values of > 2 and ≤ 10 days → short-lived
- Values of > 10 days and ≤ 100 → medium longevity

Results and Discussion

- **BROWN (MATURE) SPORES REMAINED VIABLE THE LONGEST, WHILST GREEN (IMMATURE) SPORES THE SHORTEST**

Maturity	Ki	σ	P_{50} (Ki x σ) days	
Green*	0.56	6.44	3.606 d	Accelerated ageing
Yellow*	1.12	3.56	3.987 d	
Brown	0.92	6.2	5.704 d	
Green*	0.62	93.79	58.150 d	Dry storage
Yellow	0.72	107.08	80.31 d	
Brown	0.95	158.5	150.575 d	

**P_{50} values calculated with Mead and Grey (1994) correction*

Results and Discussion

- ☐ **BRYOPHYTE SPORE LONGEVITY IS RELATIVELY SHORT AT ALL AGEING CONDITIONS USED WHEN COMPARED TO SEEDS AND FERN SPORES**

Species	**P_{50}**
Ficus exasperate Vahl[a]	76.6 d
F. salicifolia Vahl[a]	33.8 d
Calothamnus graniticus Hawkeswood[a]	256.3 d
Caiophora latenitia Benth[a]	4.3 d
Silene gallica L.[a]	114.7 d
Streptocarpus cyaneus S. Moore[a]	0.9 d
Pteris vittata (non-chlorophyllous spores)[b]	4781 d
Christella dentata (non-chlorophyllous spores)[b]	310 d
Matteuccia struthiopteris (chlorophyllous spores)[b]	119 d
Todea barbara (chlorophyllous spores)[b]	15 d

[a] Species of vascular plants subjected to accelerated ageing, extracted from Probert et al., 2009.

[b] Species of pteridophytes that were stored in comparable dry conditions, extracted from Ballesteros et al., 2018, 2019.

Conclusions

- ❑ **THE PRESENCE OF CHLOROPHYLL IN BRYOPHYTE SPORES MAY DETERMINE THEIR RELATIVE SHORT LONGEVITY**

- ❑ **SHORTER LONGEVTY MAY BE AN EVOLUTIONARY TRADE OFF IN THE EPIPHYTIC SPECIES TESTED**
  - Epiphytes have hygrochastic spore dispersal → Facilitates safe-emplacement strategy
  - Terricolous bryophytes have xerochastic dispersal → Long-distance dispersal

- ❑ **THE DREGREE OF SPORE LONGEVITY IS DETERMINED BY THE MATURITY STAGE**

Thank you!