Effect of temperature and storage conditions on seed germination of *Avena strigosa* and *Avena fatua*

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Aim

*Avena strigosa* and *A. fatua* are annual weeds. *Avena strigosa* is also a rare, neglected crop, nowadays considered as anthropogenic archaeophyte, which spreads only while sown with seeds of other cereals. The present research investigated: the effect of temperature and storage conditions on seed germination of *A. fatua* L.
Introduction

Field observations have shown that *A. strigosa* is resistant to rust, powdery mildew and other diseases, which can be useful in breeding programs of oats.

In order to preserve a given species *ex situ* or re-introduce it *in situ* we need to know its life cycle, mainly the germination stage.

Successful germination is the first step for a plant to complete its life cycle. As temperature and water availability control germination of seeds (Ludewig et al., 2014).

Besides that, storage of seeds is essential for the long-term conservation of plant genetic resources.
Process

- collecting seeds
- germination
- dormancy immediately after collecting
- chilling
- stratification
- temperature
- substances
Methods

- Part I – Germinability of 13 accessions of *Avena fatua* and 6 accessions of *Avena strigosa* stored at NCPGR was evaluated
  - 3 x 25 seeds for each accession was evaluated
  - Germinated seeds were counted every day for 7 days

- Part II – To compare susceptibility of *A. fatua* seeds to storage conditions the seeds were stored in two types of storage:
  - 1. Long-term, cold storage (low constant temperature and humidity, in vacuum) - treatment A
  - 2. Storage with variable temperature (from -10 to 40 °C) and variable humidity - treatment B
Number of *Avena fatua* L. and *Avena strigosa* Schreb seed samples tests conducted in years 2007-2010 at NCPGR (National Centre for Plant Genetic Resources)
Germinability and mean germination time (MGT) of *Avena fatua* L. and *Avena strigosa* Schreb. seed samples collected in different years.
Germinability of *Avena fatua* L. and *Avena strigosa* Schreb. seed samples stored at 0°C for different period
Mean germination time (MGT) of *Avena fatua* L. and *Avena strigosa* Schreb. seed samples stored at 0°C for different period
Results – Part I

- Analysis of data from the seed tests at the NCPGR shows that big variation in seed germinability was observed due to acquisition year.
- The germination and mean germination time (MGT) were connected to the period of storage.
Germination of *A. fatua* seeds under long-term storage and variable storage conditions.

Significance: storage conditions (SC) $P < 0.000$; year (Y) $P < 0.000$; SC × Y $P < 0.000$
Percentage of dead seeds under long-term storage and variable storage conditions

Significance: storage conditions (SC) $P < 0.000$; year (Y) $P < 0.000$; SC $\times$ Y $P < 0.000$
Percentage of fresh non-germinating seeds of *A. fatua* under long-term storage and variable storage conditions

Significance: storage conditions (SC) *P* < 0.000; year (Y) *P* < 0.000; SC × Y *P* < 0.000
Results – part II

- Germination of *A. fatua* was high when stored at a low constant temperature. There was no significant variation in germination capability between years during seed storage in low temperature (treatment A).

- Under the variable conditions (treatment B), the germination capability of seeds increased in 2010. A significant decrease in seed germination was observed throughout the storage time starting after two years of storage. In the fifth year, it reached zero.
Conclusions

- Seeds of *Avena strigosa* accessions stored in long-term conditions for period up to 24 years had higher germinability than seeds of *Avena fatua*

- Seeds of *Avena fatua* are more susceptible to unfavourable storage conditions than seeds of *Avena strigosa*
Denise, jeśli nie umieszczalaś wyników, moim zadaniem nie powinnaś też umieszczać tego w celu i wnioskach. Reszta OK

Mariusz, 14/10/2016
Others rare weed species

Bupleurum rotundifolium L.
Caucalido-Scandicetum association

- **Thymelaea passerina**
- **Ranunculus arvensis**
- **Euphorbia falcata**
- **Adonis aestivalis**
- **Bupleurum rotundifolium**
- **Caucalis daucoides**
Importance:

Seed dormancy is an important stage in the life cycle of many wild plants, and is characterized by the temporary failure of a viable seed to germinate under conditions that normally favor the process. Dormancy promotes survival by distributing germination in both time and space. As a consequence, dormancy is one of the major factors contributing to the persistence of weeds in agricultural systems.

Li B., Foley M. E, 1997. Genetic and molecular control of seed dormancy
General conclusions

Knowledge of biology of weeds seed germination (which could also be crop wild relatives) is essential for the development of strategy of its long-term conservation. Still we do not know the real value of particular species for crop improvement and for agroecosystems functioning in the future.

An implementation of a protection action plan is necessary to preserve both in situ and ex situ rare weed species.
Thank you!
Dziękuję bardzo za uwagę!

fragmentation of land
landraces, rare weeds

conservation by local, national authorities