Exploring the germination ecology of *Iris pseudacorus* populations invading California wetlands

Morgane B. Gillard\(^1\), Jesús M. Castillo\(^2\), Mohsen Mesgaran\(^3\), Caryn J. Futrell\(^4\), Brenda J. Grewell\(^5\)

\(^1\) USDA-ARS Invasive Species and Pollinator Health Research Unit, Department of Plant Sciences, University of California, Davis
\(^2\) Department of Plant Biology and Ecology, University of Seville, Seville, 41080, Spain
\(^3\) Department of Plant Sciences, University of California, Davis

**Context**

- **Seed germination:**
  - Important life stage which plays critical role in seedling establishment, environmental adaptation
  - largely influenced by environmental factors
  - Sexual propagules contribute to plant distribution, invasiveness and spread of a species

- **Knowing germination ecology is important to improve management strategies**
  - *Iris pseudacorus* (yellow flag iris), native to Europe:
    - Invases and spreads in California wetlands
    - Reproduces mostly from seed\(^2\) (unusual for aquatic plants)
    - Little is known about its germination requirements

**Aim** — Unravelling some of the germination requirements of invasive populations of *I. pseudacorus*, by testing seed response to stratification, light, seed coat presence and temperature in controlled conditions.

**Materials & Methods**

- **Protocol points common to all experiments**
  - One replicate = a lot of 25 seeds
  - 4 to 8 replicates per population and per treatment, depending on experiment
  - Seeds were soaked in DI water for 7 days, and then put on moist filter paper in Petri dishes
  - Germination was monitored daily until the peak of germination was reached; then every other day and every three days as germination was slowing down. Experiments were stopped when no germination was recorded for 10 days.

**Temperature requirement**

- **Constant temperatures**
  - 5 populations tested (CS, AN, BI, BC)
  - 8 replicates per pop. per treatment
  - Seeds exposed to eight constant temperatures: 12°C, 16°C, 20°C, 24°C, 28°C, 32°C, 36°C, 40°C.

- **Alternating temperatures**
  - 1 populations tested (AN)
  - 8 replicates per pop. per treatment
  - Seeds exposed to 25/15°C and to 35/25°C

**Stratification requirement**

- 3 populations tested (CS, AN, BC) • 6 replicates per pop. per treatment
- Two stratification treatments: seeds soaked at 4°C or at 25/15°C for 7 days, then placed at 20/12°C

**Seed coat presence/absence**

- 1 population tested (MS) • 4 replicates per treatment
- Seeds with or without coat were exposed to greenhouse conditions

**Conclusions**

- The seed germination of *I. pseudacorus*:
  - Does not require a cold or warm stratification treatment
  - Is not impacted by the presence or the absence of the seed coat
  - Can happen in the dark, but is enhanced by light
  - Is greatly enhanced by alternating temperatures
  - Can happen at high temperature

These results are important for risk assessments of *I. pseudacorus*, and raise concerns about the ability of this species to germinate under climate warming. Germination under a wide range of conditions indicates the need for long-term management approaches.

**References**