Germination and growth traits of *Dittrichia graveolens* (stinkwort): A foundation for developing management strategies

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Outline

• Why study *Dittrichia graveolens*?
• Research approach
• Experiments
• Results
• Conclusions
• Ongoing studies
• Management recommendations
Why study *Ditrichia graveolens*?

- Rapid rate of spread in California
California county distribution
Why study *Dittrichia graveolens*?

- Rapid rate of spread in California
- Unstudied (biology, ecology)
- Unique life history
- Invasive elsewhere

Goal

- Understand biology and life history traits of *Dittrichia graveolens* to provide a foundation for developing management strategies
**Research approach**

- **Dittrichia graveolens**

- **Seed dormancy**
- **Seed viability**

- **Environmental conditions supporting germination (light, temperature, photoperiod)**

- **Modes of dispersal**
- **Dispersal distance**

- **Root growth, depth**
- **Resource capture**
- **Phenology and climate**

**Life Cycle**

- **Seed**
  - Winter

- **Germination**

- **Reproduction**
  - Fall

- **Rosette**
  - Spring

- **Mature plant**
  - Summer

- **Flowering**
  - Environmental signals
  - Pollination effectiveness
  - Self-fertilization
# Experiments 2010-2011

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Light

Germination

Growth
Season

Germination

Growth
Results
Germination and Temperature

- Viability of mature, filled seeds collected in November 2010 is 96%.
- Seeds germinate quickly and total germination is high at a wide range of temperatures (12-34°C).
- No innate seed dormancy.
Germination and Light

- No significant differences in cumulative germination between light treatment (ANOVA, α=0.05)
Germination-Season

Cumulative Field Germination November 2010- July 2011

Cumulative precipitation at Davis, California

2010-2011
Growth - Light

- Above and below ground growth are significantly reduced by shading (ANOVA $\alpha=0.05$)
Growth- Season

Canopy growth over time (May-September 15, 2011)
Flowering!

- Begins during the first two weeks of September = photoperiod
- Seed production: late September through November/December

Field

Greenhouse, 9% light
Conclusions

• Seed germination requires sufficient surface soil moisture
• Growth but not germination is greatly reduced by shade
• Seed longevity is likely low (no innate dormancy and small seeds)
• Plant growth is determined by seasonal factors not germination date
• Determinate, predictable flowering phase
• Effective miner of surface soil moisture?
2011-2012 *Dittrichia graveolens* studies

**Location**

**GERMINATION**

- Temperature
- Temperature table
- Season
- Field

**GROWTH AND PHENOLOGY**

- Season
- Field
- Root growth
- Field (Minirhizotron)

Image: www.rootimage.msu.com
Management recommendations

• Pre-emergence chemical treatments should be applied early (November, December).
• Late season mowing may be effective, but should correspond with maximum above-ground growth (mid-late August) prior to flowering.
• Preventing seed production for 1-2 years will likely deplete the seed bank and greatly reduce the population.
• Recontamination is highly probable. Continued monitoring to detect new populations is recommended.
Thank you!