

# Ecology of Sahara Mustard, *Brassica tournefortii*

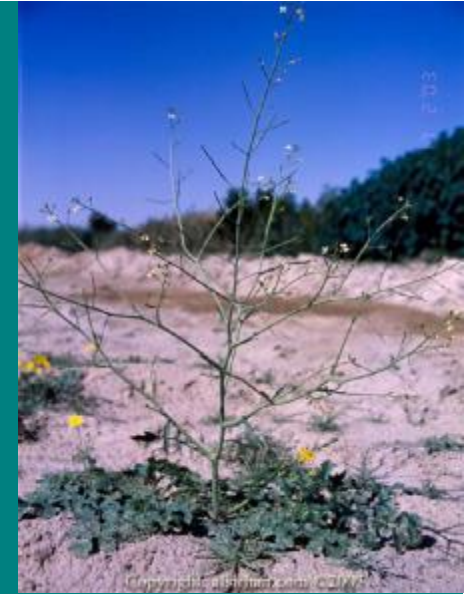


Jodie S. Holt and Robin G. Marushia  
University of California, Riverside

*Cooperators:*

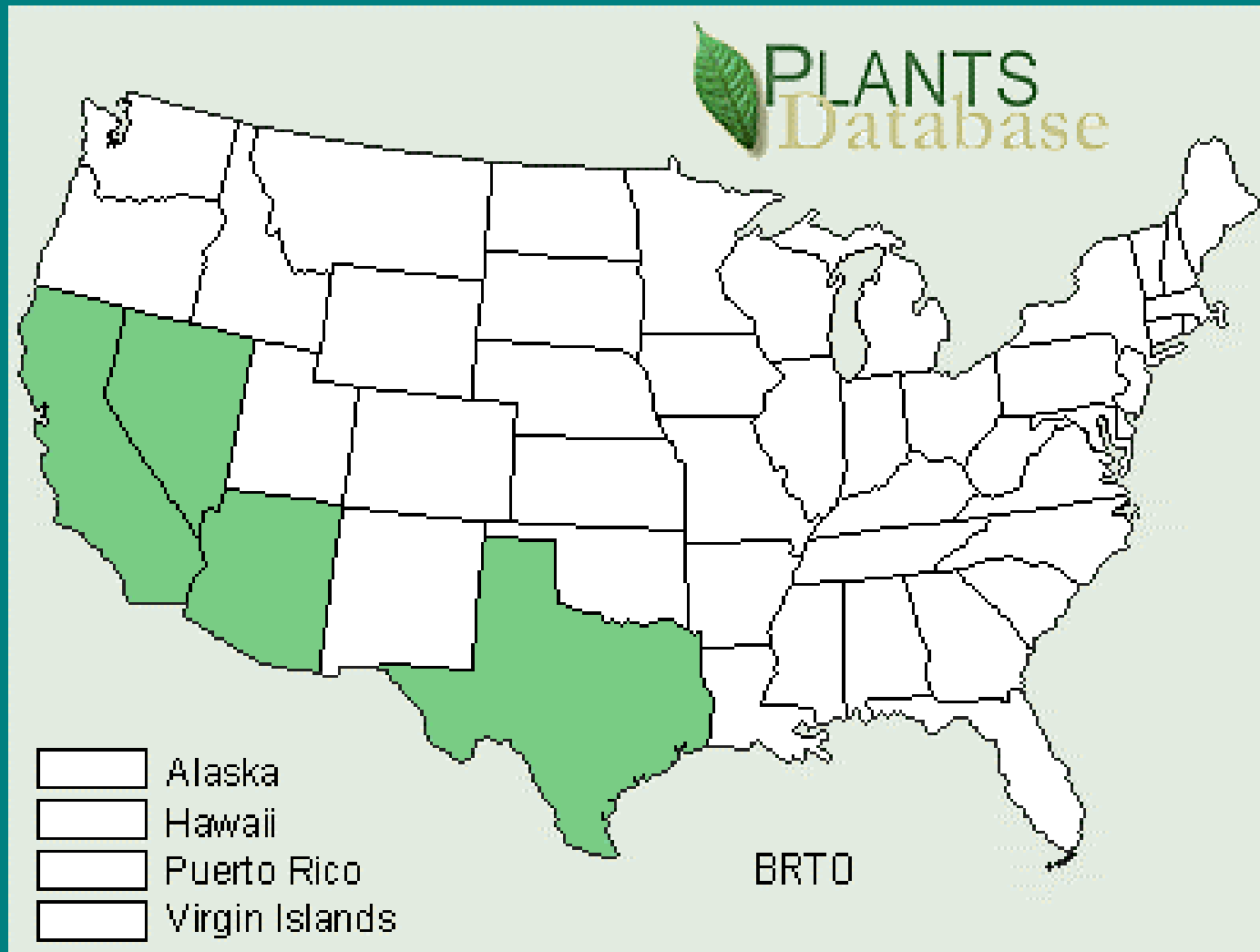
Matt Brooks and Melissa Trader  
U.S. Geological Survey

# Origin and Habitat of *B. tournefortii*



- Mediterranean region
- Grows on sand dunes and alluvial sand
- Adapted to drier habitats of Middle East, central and western Asia
- Grown as oilseed crop in marginal dry lands in India
- Considered for breeding for drought and aphid resistance
- No hybridization with other *Brassica* species

# *Brassica tournefortii* in the U.S.

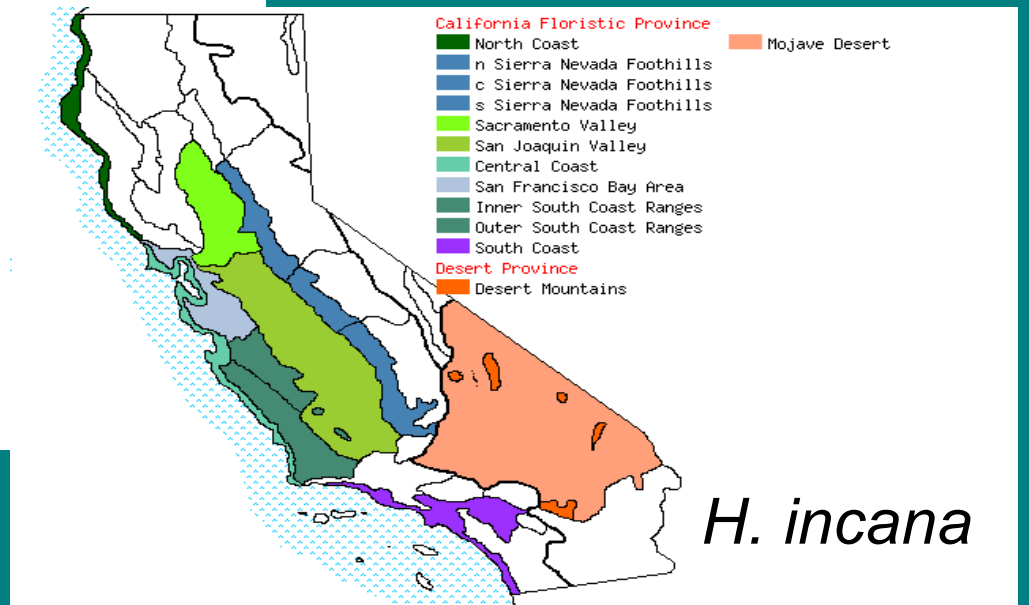
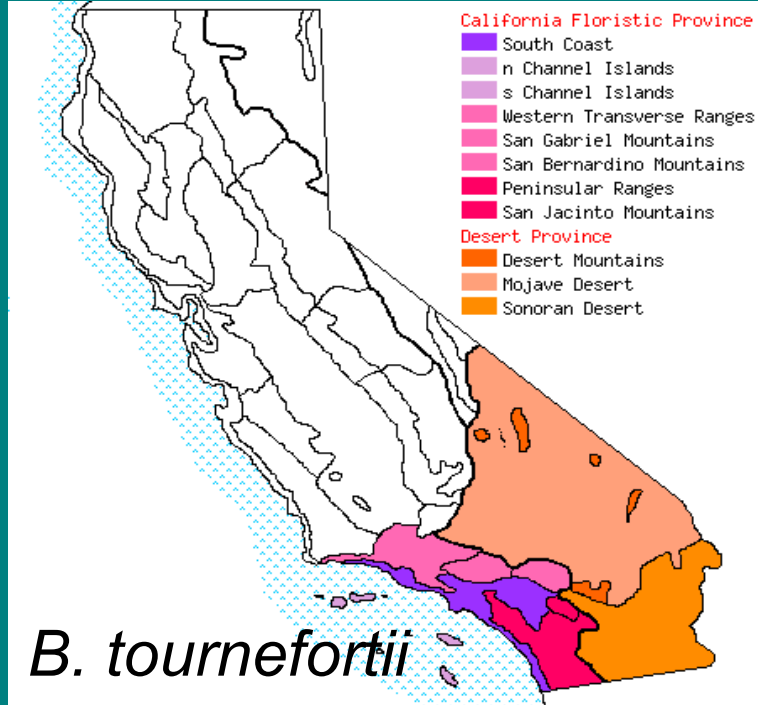
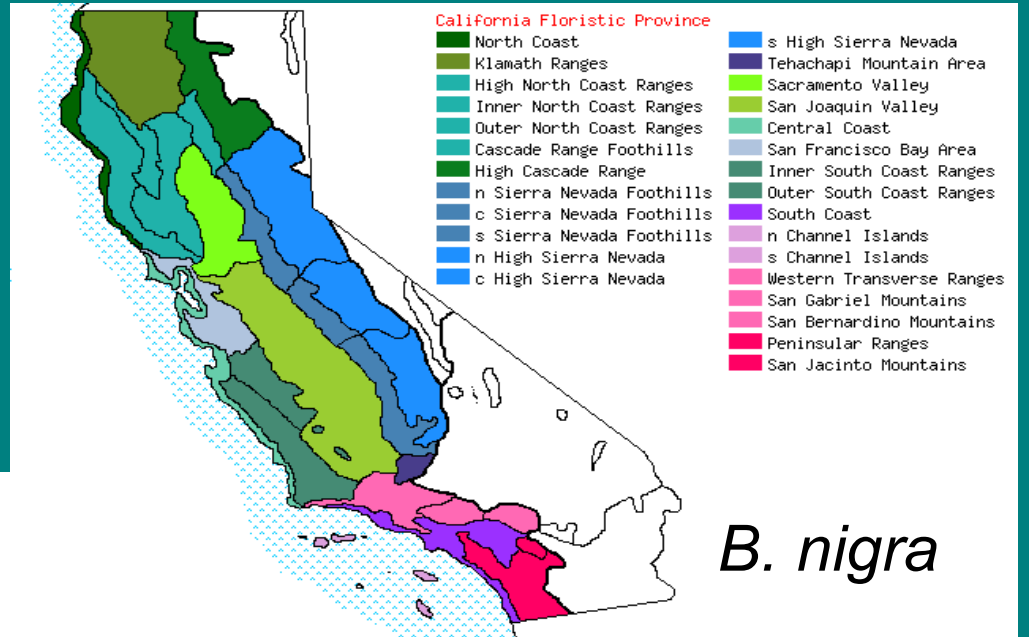


# Brassicas in California

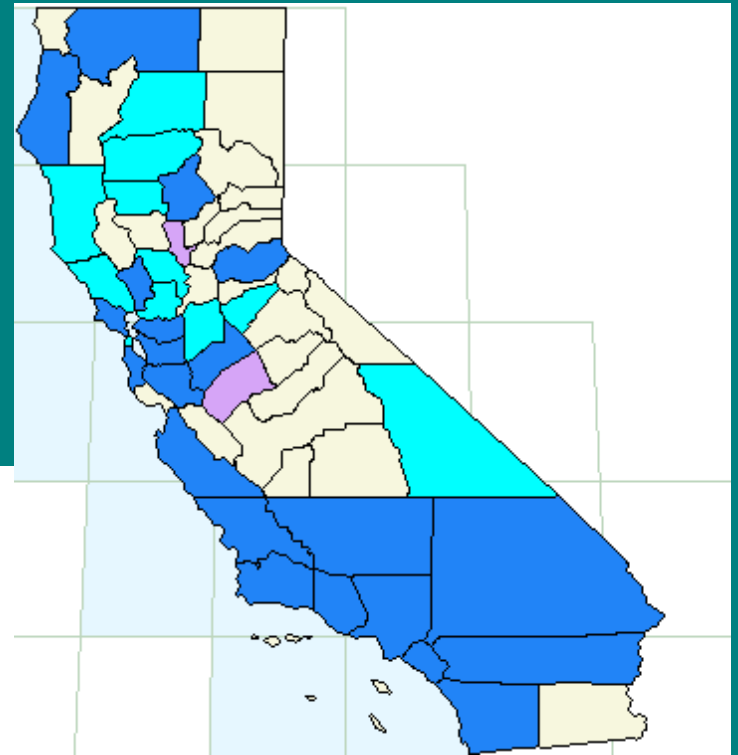
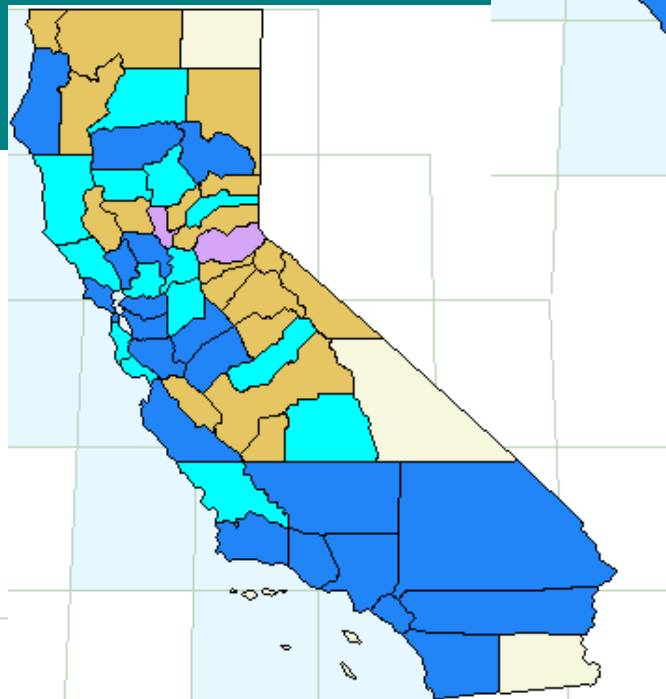
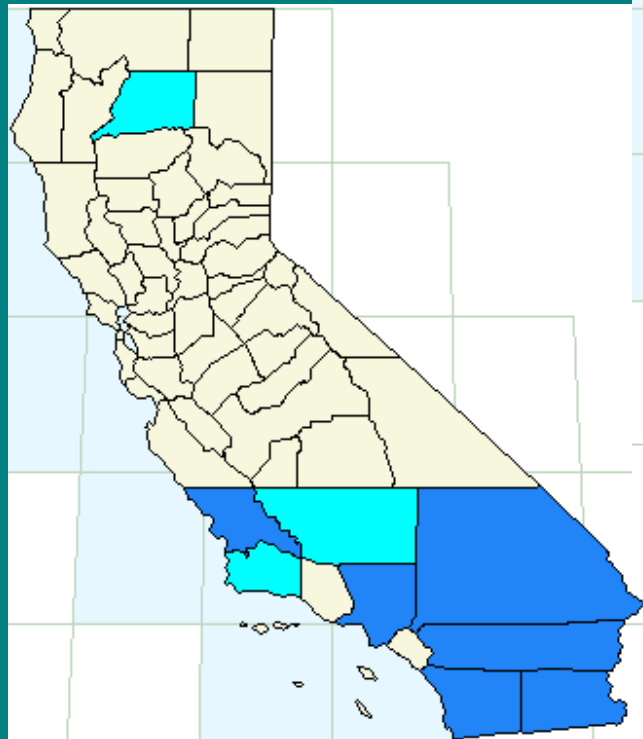
- 5 related species in California—
  - *Brassica juncea*, *napus*, *nigra*, *rapa* (= *campestris*), *geniculata* (= *Hirschfeldia incana*)
- *Brassica nigra*
  - disturbed sites across North America
- *Hirschfeldia incana*
  - disturbed sites in California, Oregon, Nevada
- Only *Brassica tournefortii* is expanding into the desert (?)



# Distribution of *Brassicac* (Jepson)



# Distribution of *Brassicas* (Cal Flora)



*B. tournefortii*

*H. incana*

*B. nigra*

# Biology of *Brassica tournefortii*

- Winter annual
- Basal rosette growth form until flowering
- Seed dispersal by tumbling plant or dehiscent fruit (siliques)
- Unknown—
  - Phenology
  - Germination physiology
  - Regulation of seed production
  - Seed longevity in seedbank
  - Effects on soil chemistry, toxicity



# *B. tournefortii* Germination

- Wide temperature range
  - 16-32 °C
- Tolerates high salt concentration
  - Up to 1.58 dS/m
- Light or darkness
- After 10 wk under water



*(Bangle and Powell 2004 Mojave Desert Science Symposium)*

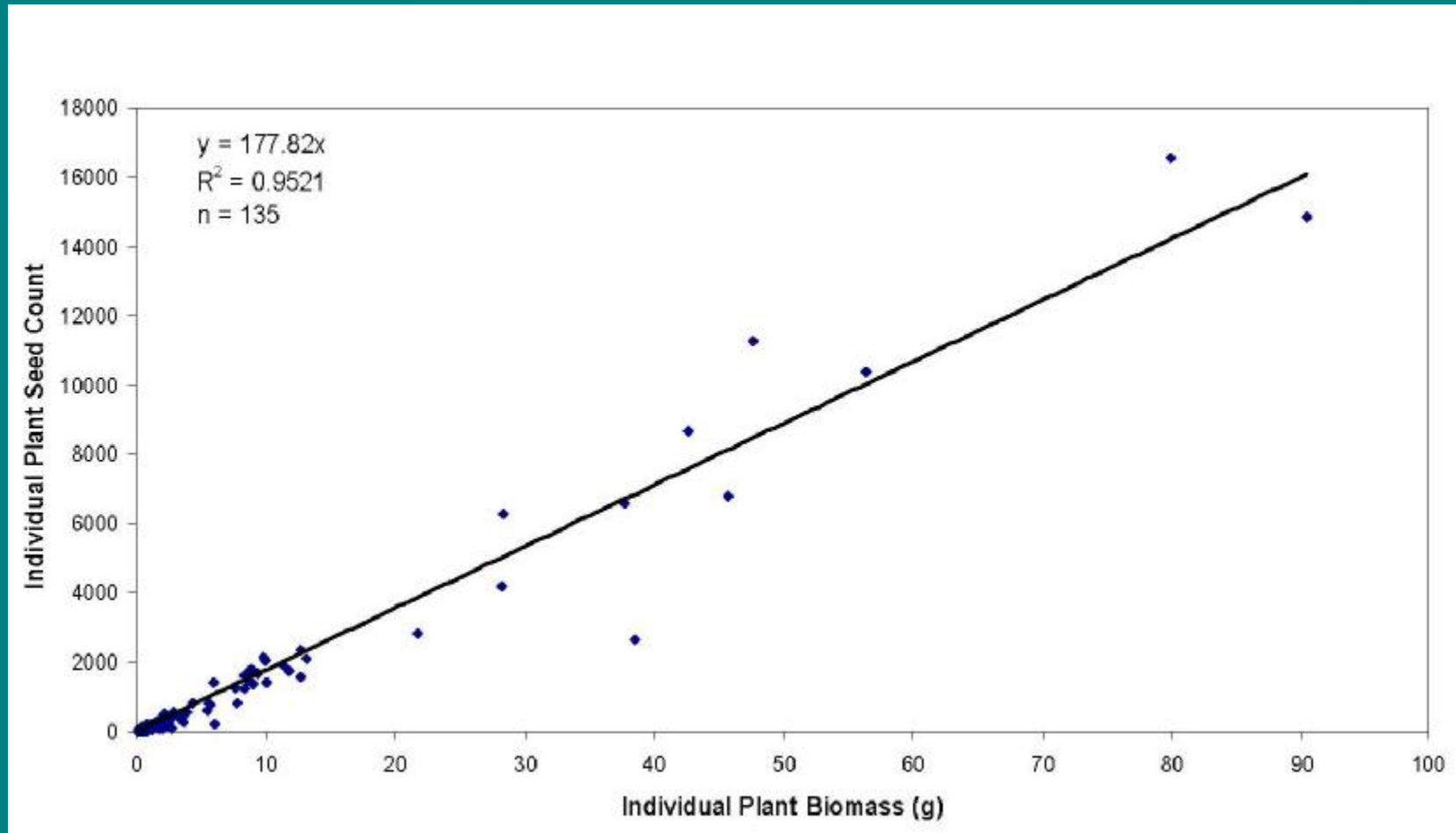


# *Brassica* spp. Germination



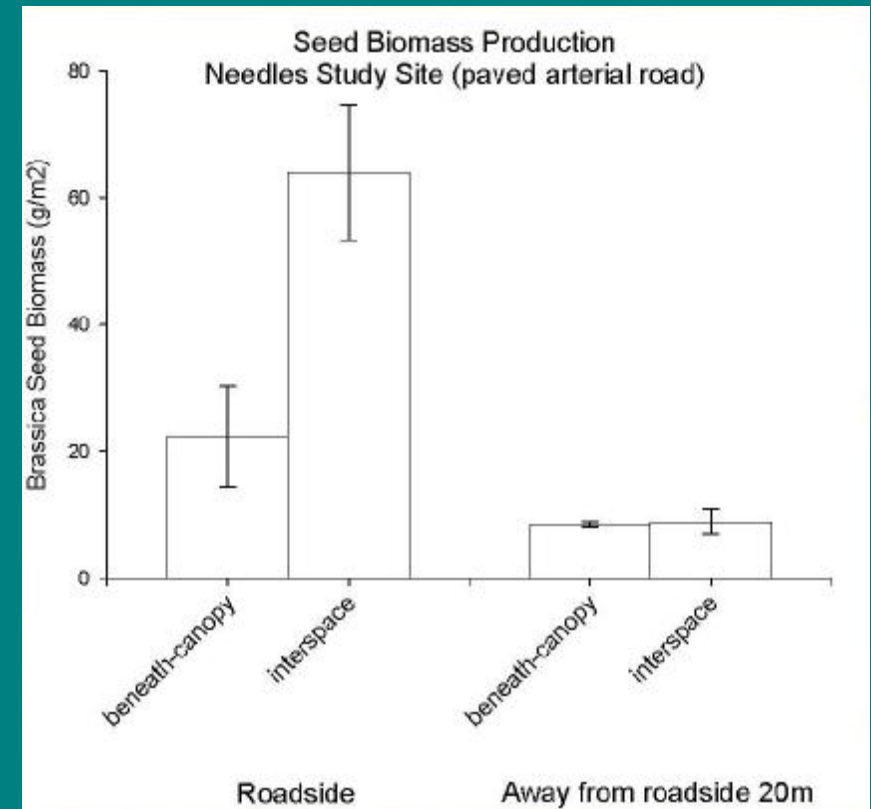
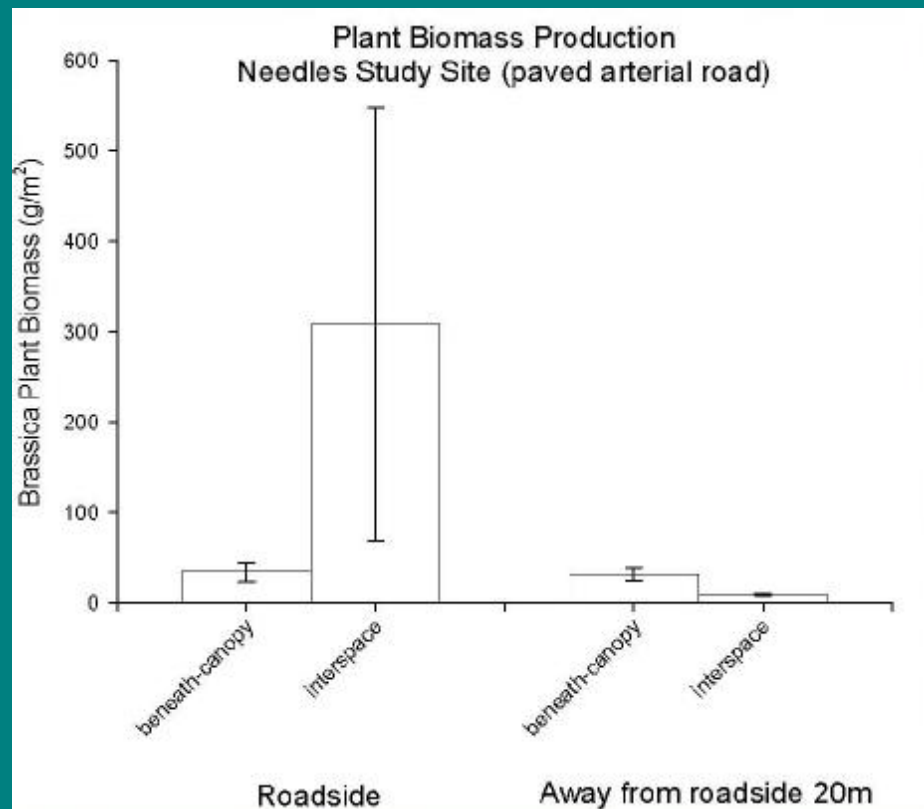
- Light or darkness
- Species differences
  - *B. tournefortii* - 100% germination
  - No differences between Riverside and Coachella *B. tournefortii*
  - *B. nigra* and *H. incana* - 44 to 76% germination
- Temperature responses (day/night °C)
  - Germ at 19/7 > germ at 23/9 > germ at 27/10
- Moisture responses
  - Germ at 0 bars > -1 bar > -5 bar

# *B. tournefortii* Seed Production



(Trader and Brooks 2004 Mojave Desert Science Symposium)

# Road Effects on Biomass and Seed Production



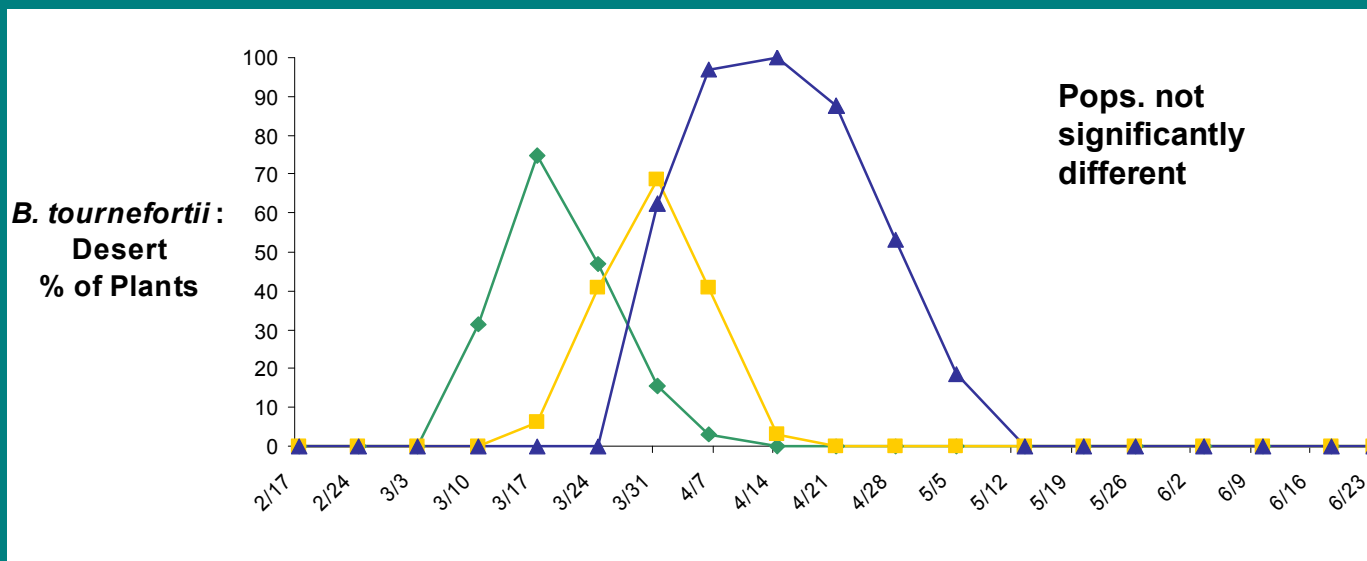
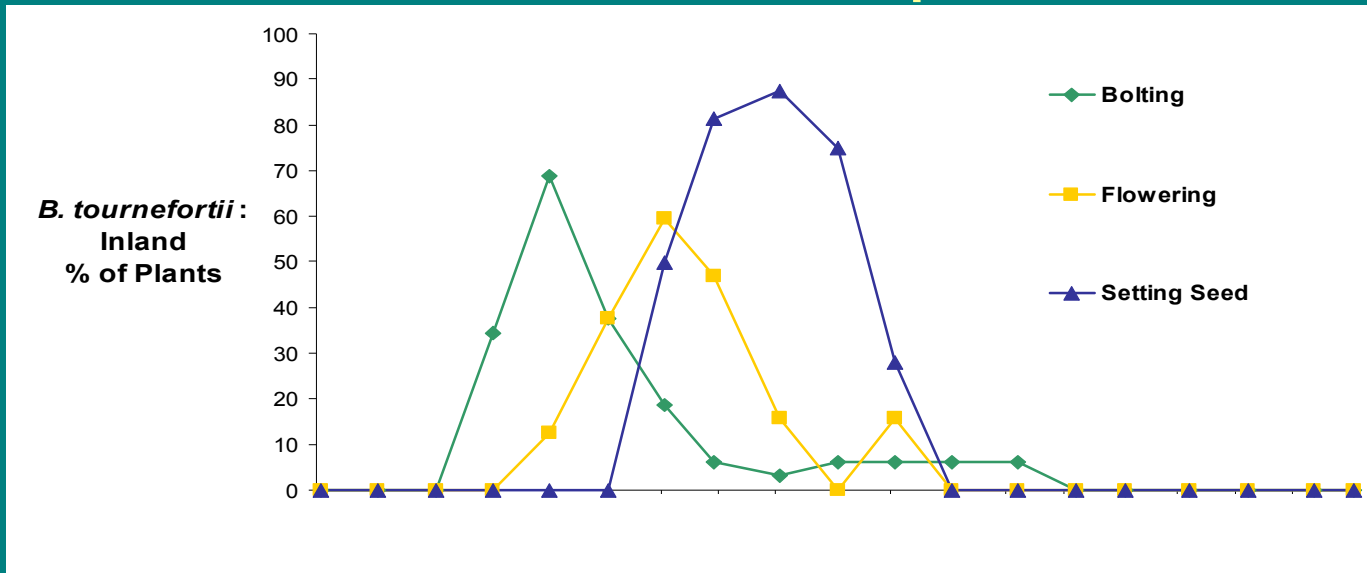
*(Trader and Brooks 2004 Mojave Desert Science Symposium)*

# Comparative Phenology

- Pot experiments
  - Riverside, CA and Las Vegas, NV
  - *B. tournefortii* (inland and desert), *B. nigra*, *H. incana*
  - Quantify development, growth, life span, fecundity
- Field experiment
  - Mojave Desert site
  - *B. tournefortii* and native annuals
  - Quantify development, growth survival, diversity

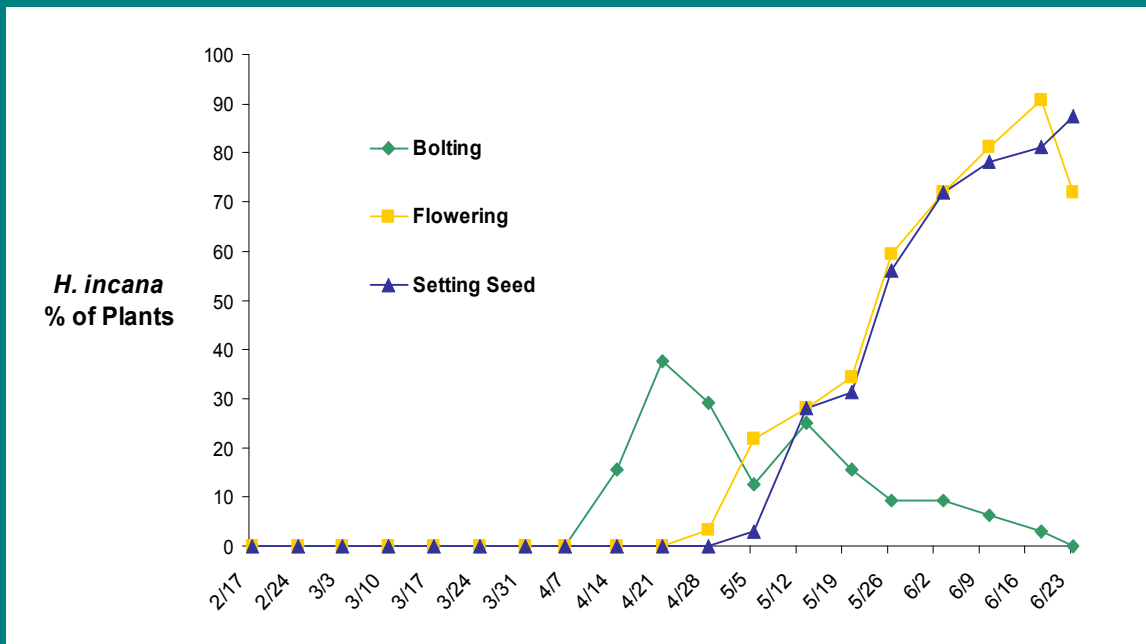
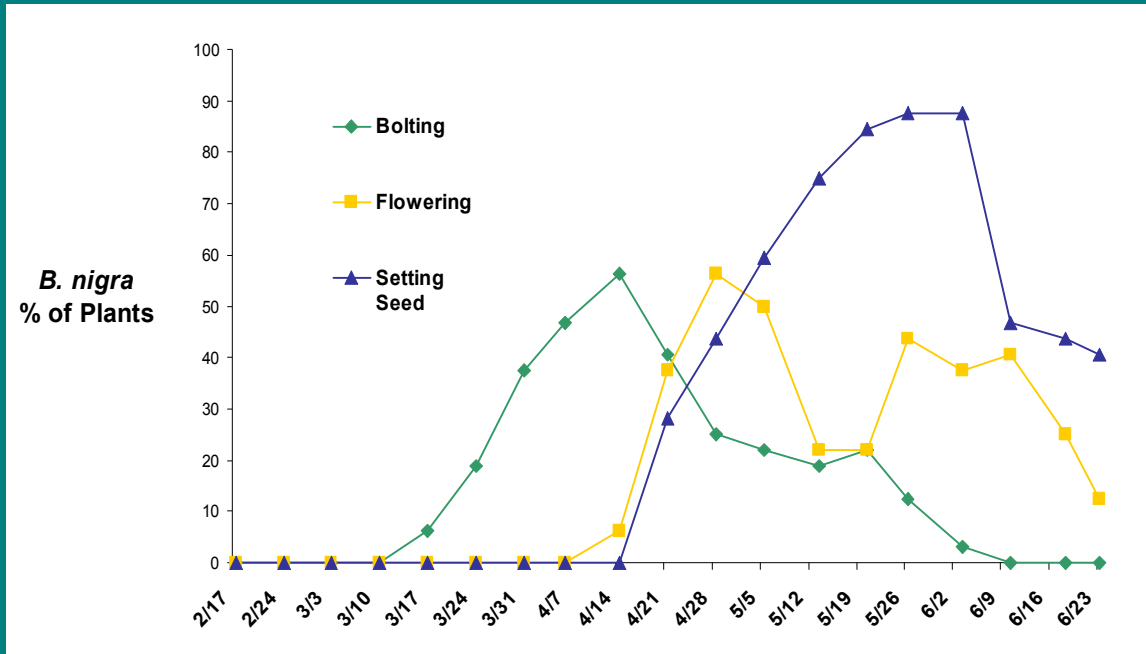


# *B. tournefortii* Phenology in Pots: Inland vs. Desert Populations



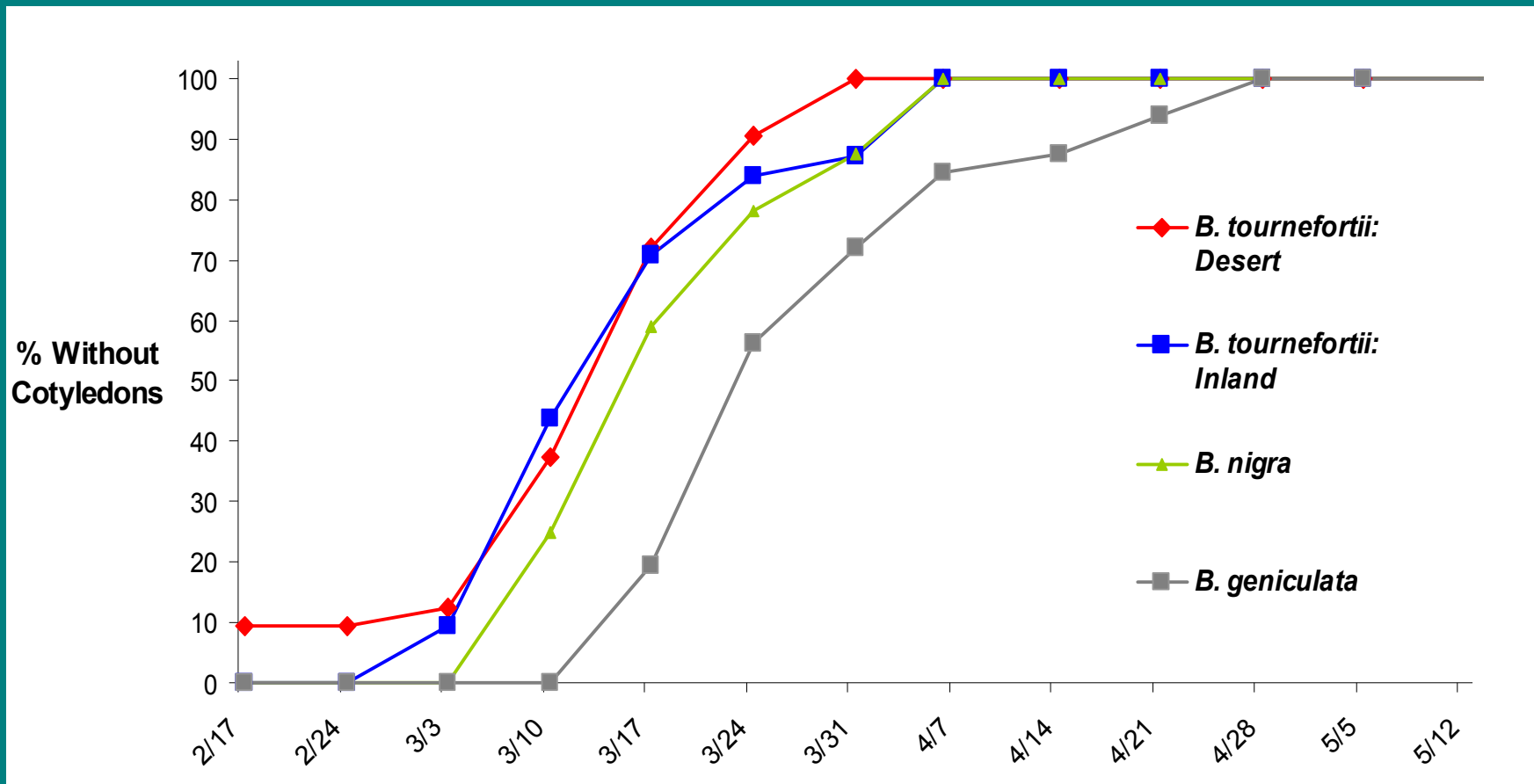
# Brassica Phenology in Pots:

*B. nigra* vs.  
*H. incana*



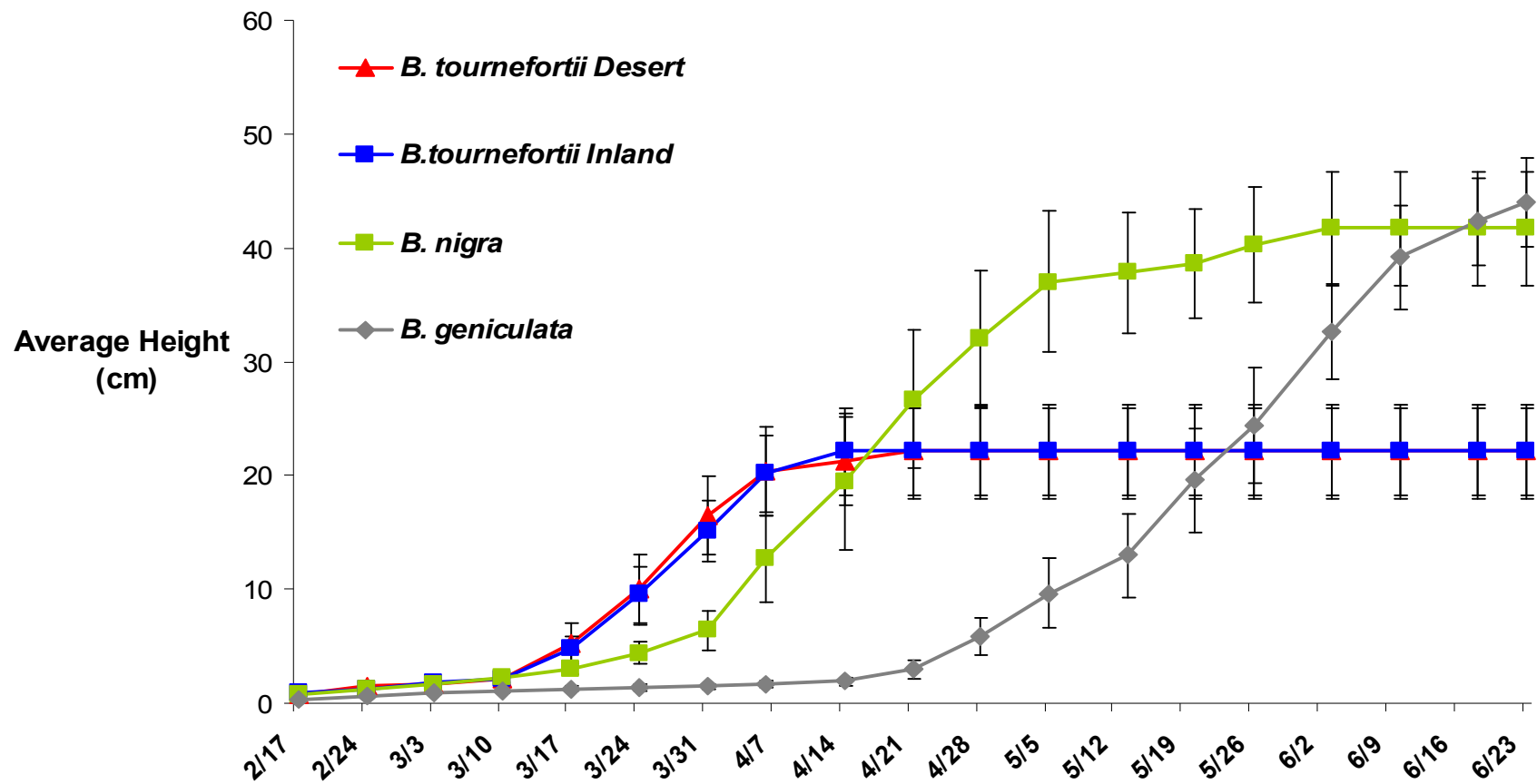
# *Brassica* Phenology in Pots:

## Rate of Cotyledon Loss in *Brassica* Species



# Brassica Phenology in Pots:

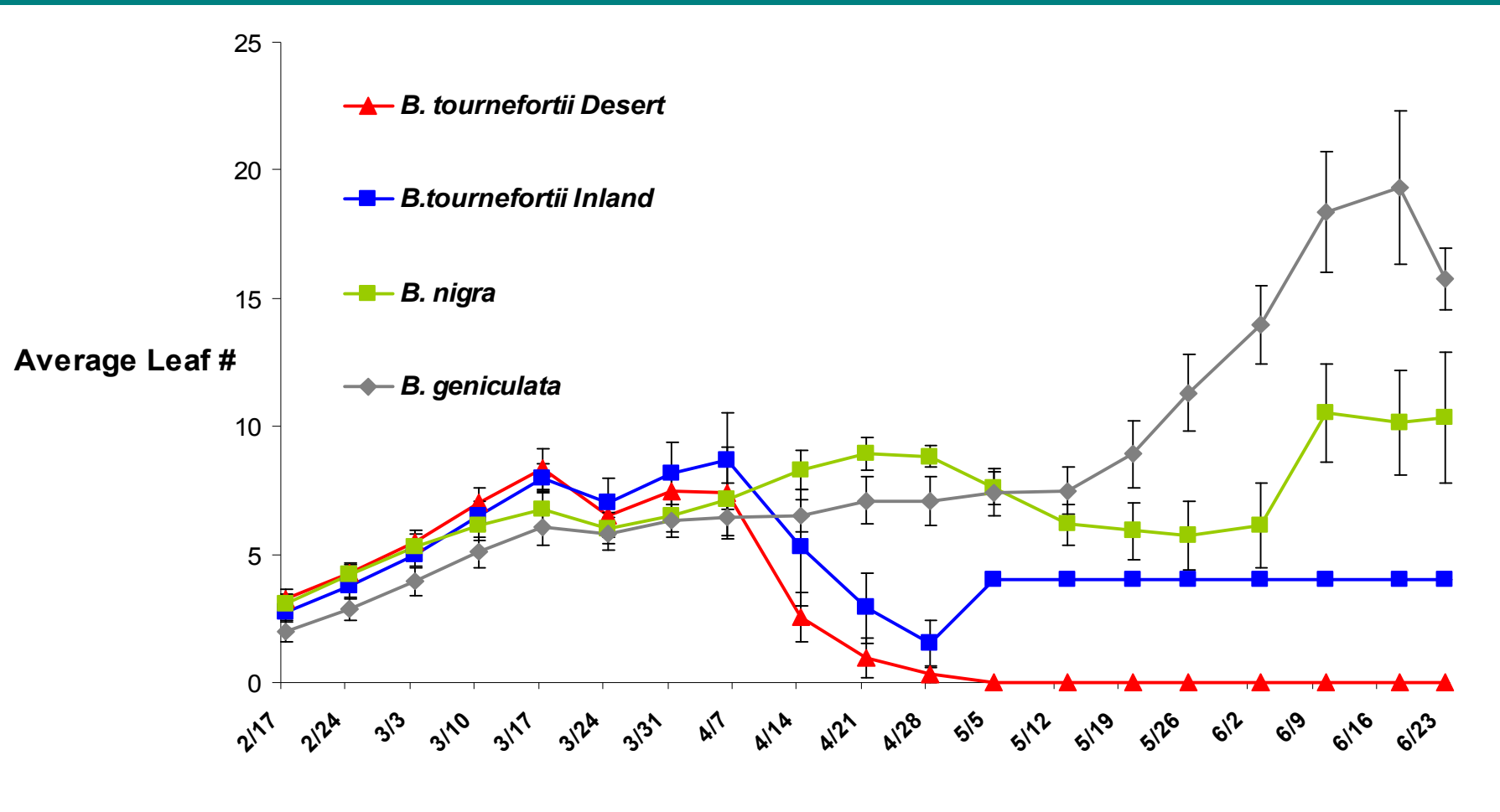
## Rate of Height Growth in *Brassica* Species





# Brassica Phenology in Pots:

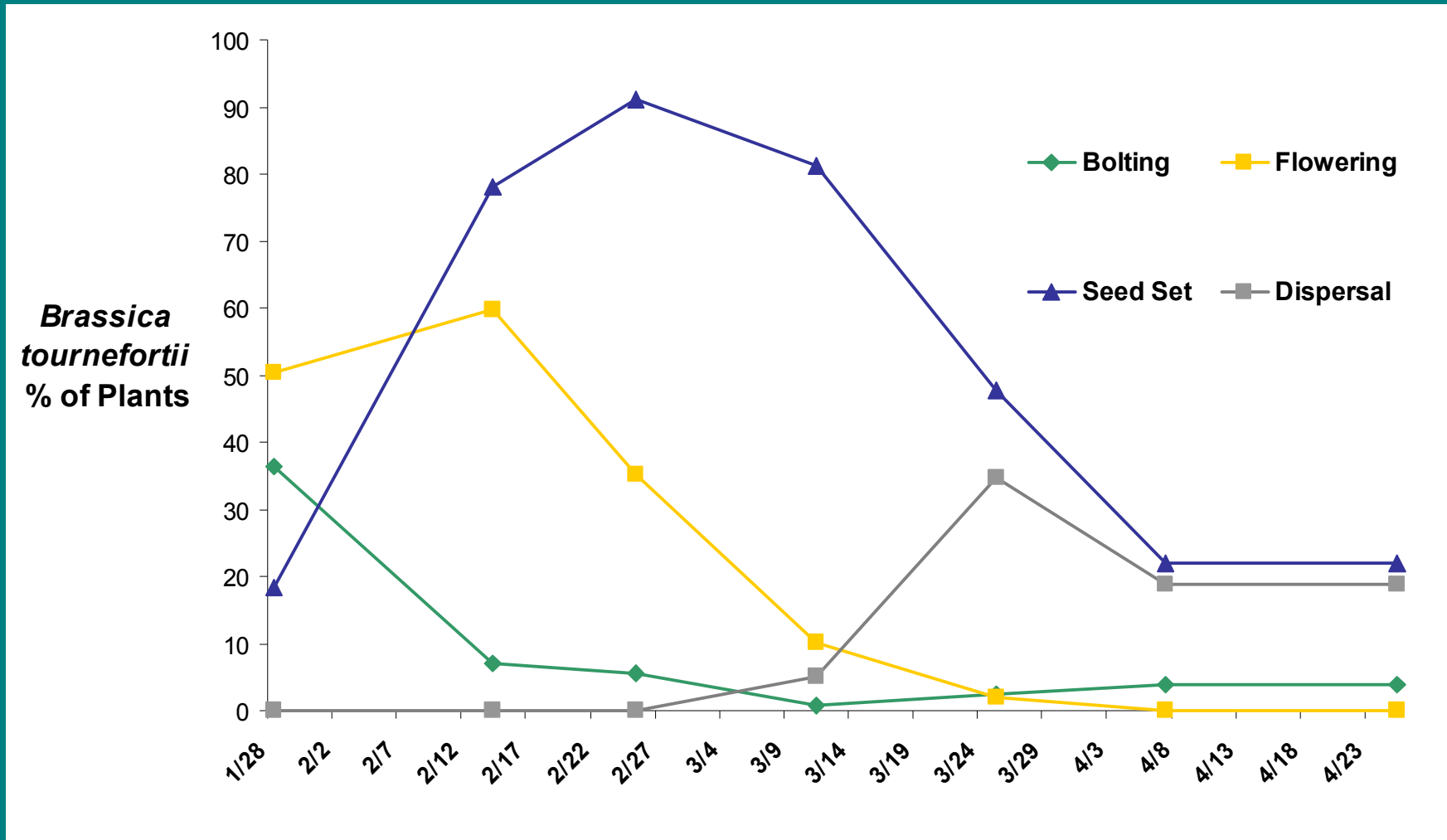
## Rate of Leaf Production in *Brassica* Species



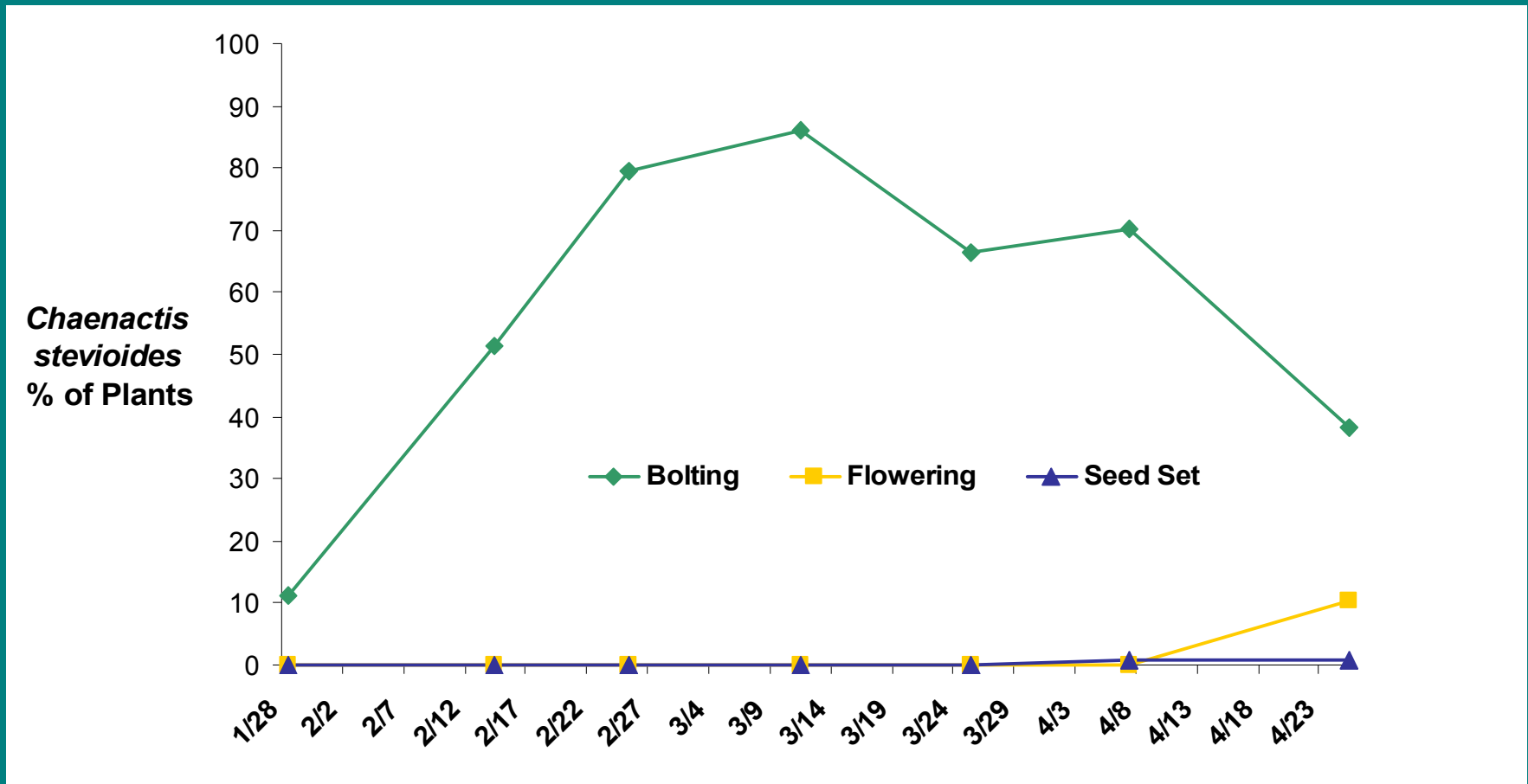
# Field Phenology Experiment



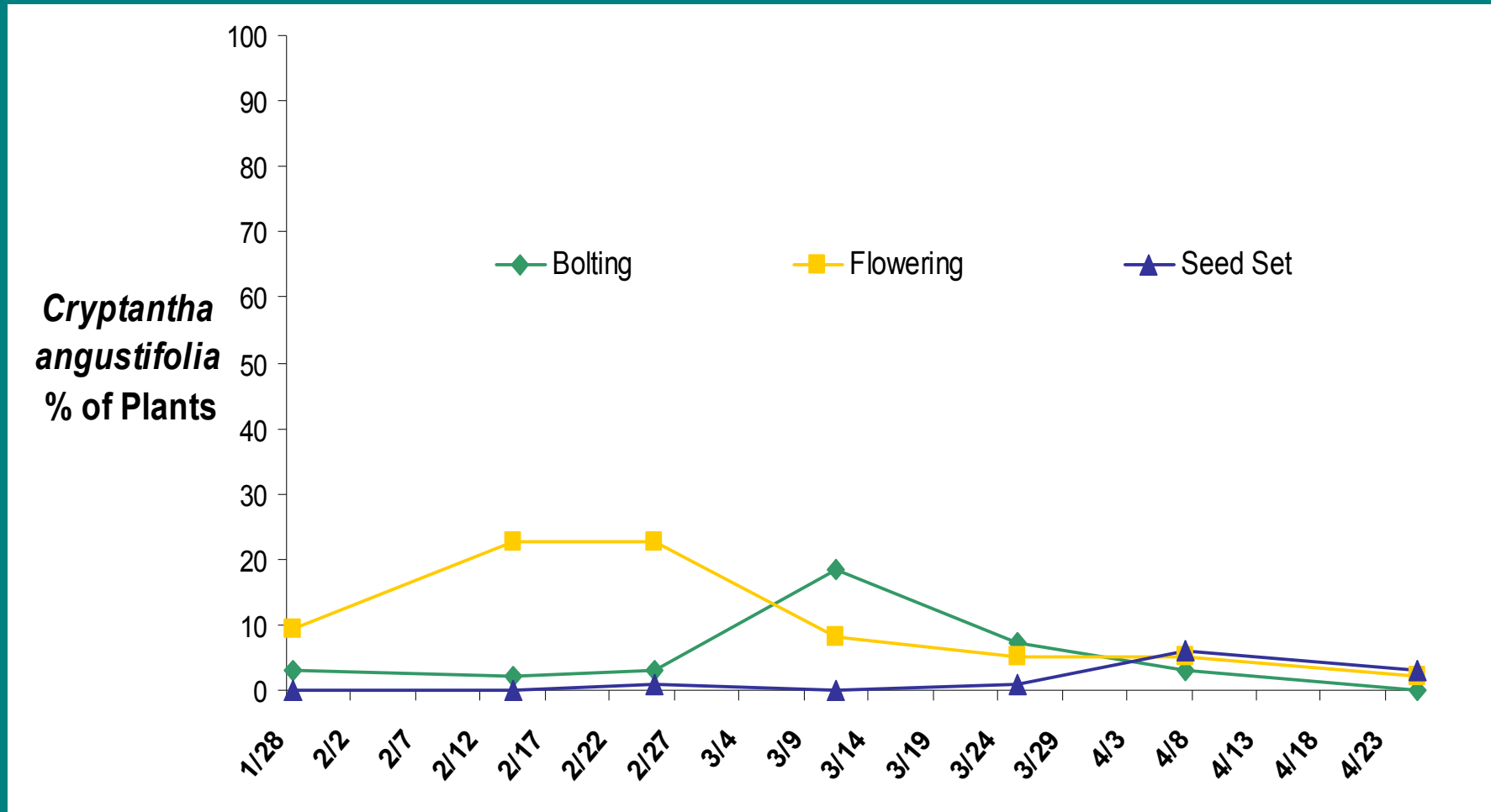
# Phenology of *B. tournefortii* and Native Species: *B. tournefortii*



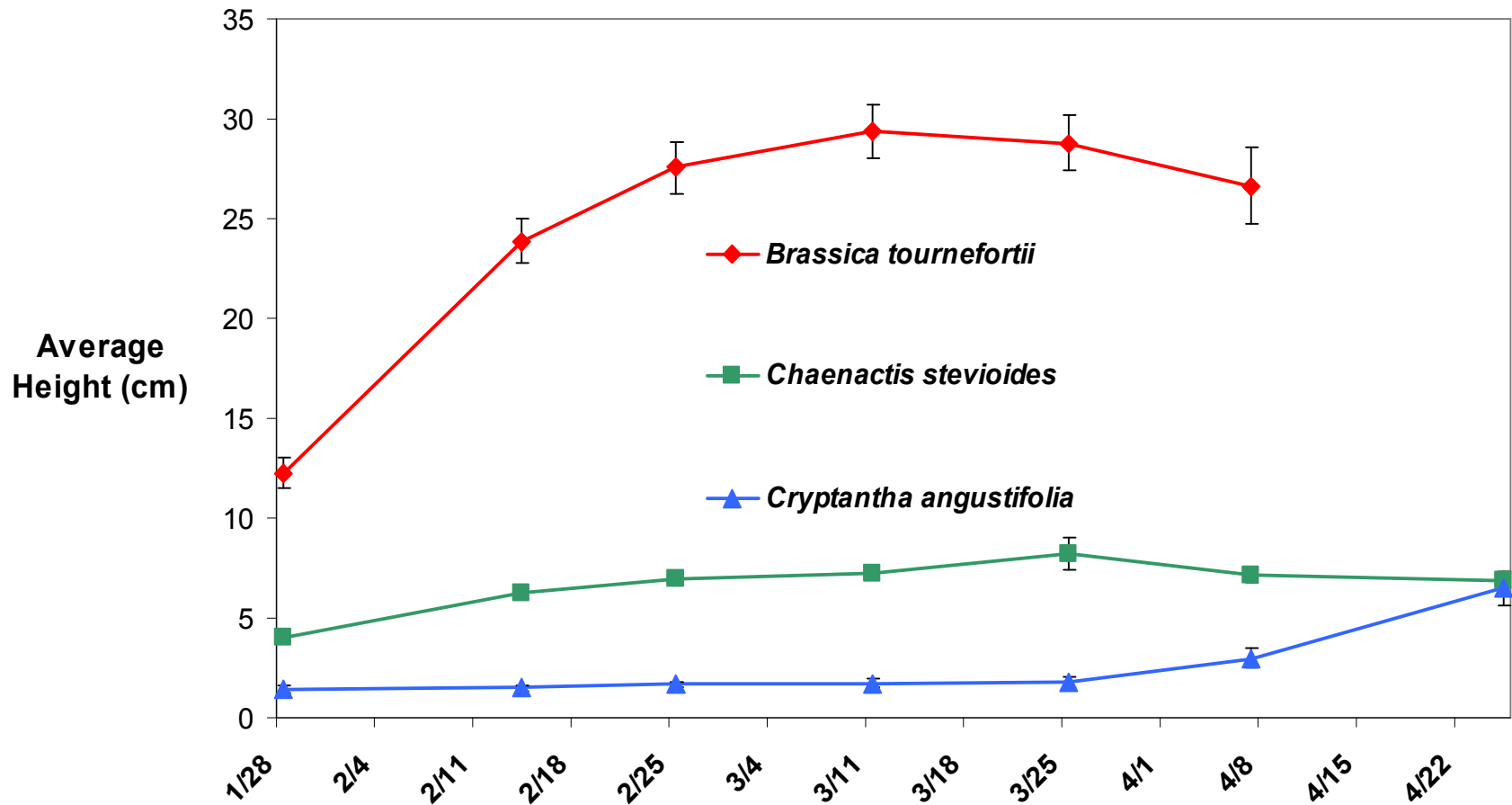
# Phenology of *B. tournefortii* and Native Species: *Chaenactis stevioides*



# Phenology of *B. tournefortii* and Native Species: *Cryptantha angustifolia*



# Rate of Height Growth in *B. tournefortii* and Native Species





# Conclusions



*Photo—Mark Dimmitt, Arizona-Sonora Desert Museum)*