

PHOTOPERIODISM

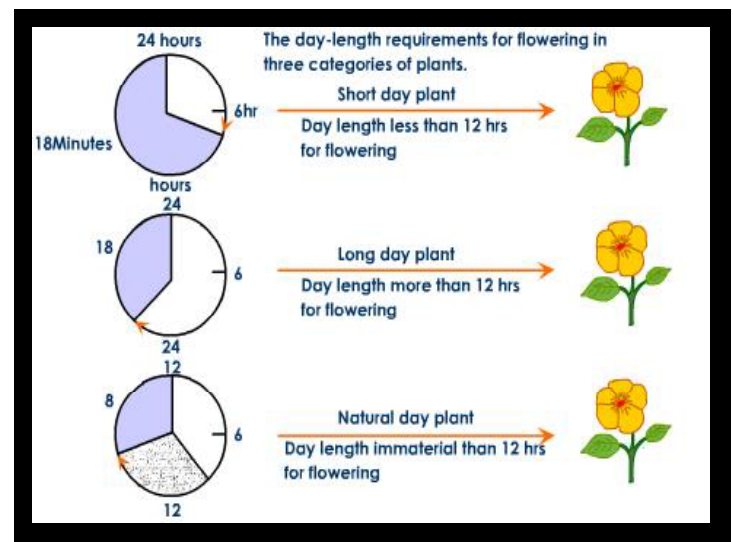
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Photoperiodism

- **Angiosperms** flower at about the same time every year
- **Growing at different times**
- Flowering - **response to the changing length of day and night** - season progresses
- Experiment - **with artificial lighting in winter and artificial darkening in summer**
- Maryland Mammoth - affected by photoperiod
 - flower only when exposed to short periods of light - **short-day plant**
 - chrysanthemums (bloom in the fall)
 - rice (*Oryza sativa*)
 - poinsettias
 - morning glory (*Pharbitis nil*)
 - the cocklebur (*Xanthium*)

Long Day Plants

- **flower only after exposure to long days**
 - spinach
 - **Arabidopsis**
 - sugar beet and the
 - Radish
- **Day Neutral – Tomato - flowering - not regulated by photoperiod.**



- **Arabidopsis** - **CONSTANS (CO)**, a gene -encodes a **zinc-finger transcription factor** - mRNA rise and fall with a circadian rhythm
- Translation of **CONSTANS mRNA** produces the **transcription factor** - turns on a **number of genes - FLOWERING LOCUST (FT)** - **apical buds** into flower buds
- **CONSTANS messenger RNA (mRNA)**- abundant early in the **morning**,
 - declines during the middle part of the day
 - rises to another peak late in the afternoon
 - **CONSTANS protein** - quickly degraded (in **proteasomes**) during the morning and middle part of the day and also during the night

- The degradation triggered by morning light (rich in 660 nm rays) - mediated by **phytochrome B**
- By late in the afternoon
 - transcription of the **CO gene increases** producing a rise in **CO mRNA**
 - translation of the **CO mRNA produces more CO protein** - no longer degraded.
- Effects - mediated by the **absorption of red** (enriched in far-red) **light by phytochrome A (PhyA)** and **blue light by cryptochrome**.
- **CONSTANS protein accumulating** - turn on the **gene transcription (e.g., FT)** needed for the induction of the flowering
- In short days, **with darkness falling before the rise in CONSTANS mRNA -not enough CONSTANS protein synthesized to induce flowering**

