

## CARBON FIXATION

- Photosynthetic reactions are different in plants due to varying environmental conditions
- during hot, dry days plants close their stomata to conserve water but this blocks carbon dioxide from entering the leaves and oxygen built up inside the leaves are also unable to escape
- **photorespiration** occurs as a result; oxygen binds to RuBP (oxidation) producing one phosphoglycolate
- plants that form 3-C PGA as their first intermediate are called  $C_3$  Plants (Kentucky bluegrass)

### $C_4$ Plants

- plants that form oxaloacetate (4 C) as the first intermediate (corn, crabgrass, and sugarcane)
- $C_4$  plants fix carbon dioxide twice:
  1. in the mesophyll (cytoplasm), oxaloacetate is produced by the carboxylation of PEP (phosphoenolpyruvate); then it is converted to malate
  2. malate is then transferred to the bundle sheath (around the veins) where decarboxylation occurs creating 3-C pyruvate and carbon dioxide is fixed again in the  $C_3$  Calvin Cycle
- one ATP molecule is used
- $C_4$  plants have smaller stomata and loses less water than  $C_3$  plants
- in  $C_3$  plants 18 molecules of ATP are used to make one glucose molecule whereas in  $C_4$  plants use 30 ATP

### CAM (Crassulacean Acid Metabolism) Plants

- succulent plants (water storing plants) like cacti open their stomata at night as to not lose any water, and their cells store the intermediate ( $C_4$  organic acids) in their vacuoles, using it the next day for photosynthesis.

### Seatwork

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