

ABSCISIC ACID - STOMATAL CLOSURE

- ABA = stress hormone \therefore secreted $\downarrow \psi$ (dry, $\uparrow t^\circ$) & released in \downarrow light intensities
- rapid response \uparrow salty

Guard cells - inner wall $>$ thick

turgid = open (bend)
flaccid = closed

Stomatal Closure process

- ABA attach receptor p-memb guard cells
- $\hookrightarrow \uparrow [Ca^{2+}]_{cyt}$ (stim mov Ca^{2+} cell cyt)
- $\hookrightarrow K^+$ ch open - as Ca^{2+} 2nd mess
- \hookrightarrow inhibit proton pumps
- $\therefore \uparrow$ +ve charge build up IN cells
- Ca^{2+} act 2nd mess $\therefore \Delta$ perm guard c-memb via activ. memb chprot
- K^+ diff OUT cell $\therefore \uparrow \psi$
- $\downarrow \psi$ out $\therefore H_2O \xrightarrow{osm} OUT$, \downarrow vol g.c
- lose turgor \leadsto flaccid \therefore stomatal pore closes

\uparrow ABA - inhibit prot. pumps

\downarrow
+ve build up

\downarrow
 K^+ diff out

\downarrow
 H_2O out osm \leadsto flaccid
 \therefore close

Q: Describe role ABA in closure of stoma (8)

1. stress horm
2. plant secretes ABA: $\uparrow t^\circ$, dry cond
3. ABA binds recept. - p-memb guard cells
4. inhibit proton pump
5. \uparrow +ve charge IN cell
6. K^+ diff OUT cell
7. $\uparrow \psi$ cell
8. $H_2O \xrightarrow{osm} OUT$
9. \downarrow vol guard cells \leadsto flaccid
10. v-fast response

g.cells

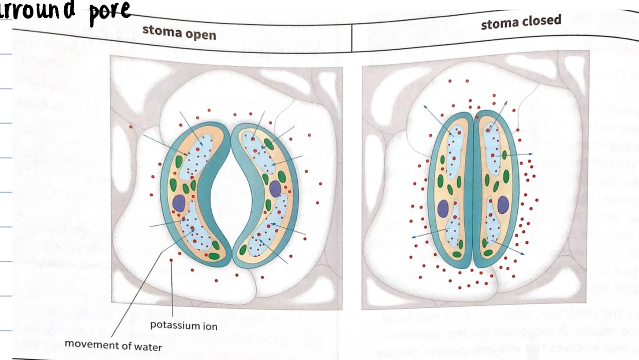
- sausage shaped
- joined only @ ends
- unevenly thickened walls
- vacuole

STOMATA

- each stoma = 2 curved guard cells surround pore
- Δ curvature g.c Δ size pore
- open + close via turgor g.c

4 factors \leadsto close stomata:

- darkness
- \downarrow humidity \therefore dry
- $\uparrow t^\circ$
- water stress & \uparrow rate transpⁿ



- proton pumps actively transport H^+ ions out of guard cells
- this causes potassium channels to open and K^+ ions enter the guard cells
- the increase in the concentration of potassium ions in the guard cells lowers the water potential
- water enters the guard cells, by osmosis, increasing the turgor of the guard cells
- because of differences in the cell wall thickness, the guard cells become curved, opening the stomatal pore

When stomata close, these changes are essentially in the opposite direction; loss of water by the guard cells causes them to lose turgor.