

生物策略表

類別	生物策略 (Strategy)
生物策略 STRATEGY	黏液抑制蒸發作用 (Slime inhibits evaporation)
生物系統 LIVING SYSTEM	肯亞半邊蓮 <i>Lobelia deckenii</i> ssp. <i>keniensis</i> (Giant lobelia)
功能類別 FUNCTIONS	#保護免受液體流失危害 #Protect from loss of liquids
作用機制標題	半邊蓮植株分泌並保留在蓮座中的液體，透過抑制蒸發的黏液成分防止水分流失 (The fluid secreted and held in the rosette of one lobelia plant avoids water loss via an evaporation-inhibiting slime component.)
生物系統/作用機制 示意圖	 <p>Source: https://en.wikipedia.org/wiki/Lobelia_deckenii</p>
作用機制摘要說明 (SUMMARY OF FUNCTIONING MECHANISMS)	
文獻引用 (REFERENCES)	
<p>在一種生長在肯亞山 (Mount Kenya) 山坡上部的半邊蓮屬植物 (<i>Lobelia</i>) 中，它的蓮座 (rosette) 狀構造形成了一個很深的不漏水杯子 (watertight cup)，含有多達 3/4 加侖的液體。每天晚上，在表面會形成一層冰。這有著像屏障的作用，防止霜雪進一步地擴散到水池的深處。底下的水分仍然保持在液態，因此在冰點以上，使浸泡在水中的芽體不會受到低溫損害而存活。這是一種最小型的防禦。如果晚上多持續幾個小時，又或者白天的溫度維持在零度以下，水池中的液體就會完全凍結成固體，底下的芽體就會死亡。然而一般情況下，太陽會在幾小時後再出現，所以一切都安好…但半邊蓮現在又受到了另一種危機。如果白天的陽光照射得太熾熱，使水池的水分蒸發掉，半邊蓮在晚間低溫時就會失去防禦效果。然而，這並不會發生。水池中的水分並不是雨水。事實上不是因為這些山坡上雨水降雨很少。而是半邊蓮以特殊的腺體分泌這些液體，且其液體中的黏液 (slime) 能抑制蒸發。因此即使是在最炎熱的中午，半邊蓮的防禦也不會消失。」 (Attenborough 1995: 263)</p> <p>「肯亞半邊蓮 (<i>Lobelia deckenii</i> ssp. <i>keniensis</i>)，是一種巨型的蓮座形植物，原生於肯亞山的高山地區，會分泌含有水分及黏稠物質的溶液。這種溶液能在緊密平貼的蓮座形</p>	

葉片基部之間形成一個多達 3 公升的水池。在這裡報導的實驗證實了當蓮座中的液體乾涸後，芽體將會面臨冰點以下的低溫。水池的存在並不影響葉片在早上回暖的速率。黏稠物質被確認為一種果膠質 (pectin)，可能減少了水池的蒸發速率，而又不會降低水分的結冰溫度。」 (Young and Van Orden Robe 1986: 267)

“In one species of lobelia that grows on the upper slopes of Mount Kenya, its rosette forms a deep watertight cup that contains up to three quarters of a gallon of liquid. Each night, a plate of ice forms across the surface. This acts as a shield, preventing the frost from penetrating more deeply into the pond. The water beneath remains liquid and therefore above freezing point and the submerged bud survives undamaged. It is a minimal defence. Were the nights to last a few hours longer or the temperature to stay below zero during the day, then the contents of the ponds might freeze solid right to the bottom and the bud would be killed. As it is, however, the sun returns after a few hours and all is well...But now the lobelia faces a different hazard. If the sun shines so hotly during the day that the water in the pond evaporates, then the lobelia would be defenceless when night fell. However, this does not happen. The fluid in the pond is not rain water. Indeed it cannot be for very little rain falls on these slopes. The plant has secreted it from special glands and it contains a slime that inhibits evaporation. So even during the hottest afternoons, its defence does not vanish.” (Attenborough 1995: 263)

“*Lobelia deckenii* ssp. *keniensis*, a giant rosette plant endemic to the alpine zone of Mount Kenya, secretes a solution of water and a mucilaginous substance. This solution forms a reservoir of up to 3 liters between the closely appressed leaf bases of the rosette. Experiments reported here show that rosettes drained of this liquid experienced bud temperatures well below freezing, whereas control rosettes never experienced bud temperatures below freezing. The presence of the reservoir did not affect the rate of leaf warming in the morning. The mucilaginous substance was identified as a pectin, which probably reduces evaporation from the reservoir without lowering the freezing temperature of the water.” (Young and Van Orden Robe 1986: 267)

參考文獻清單與連結 (REFERENCE LIST)

Attenborough, D. (1995). *The private life of plants*. Princeton University Press.

Young, T. P., S. Van Orden Robe. (1986). Microenvironmental role of a secreted aqueous solution in the afro-alpine plant *Lobelia keniensis*. *Biotropica*, 18: 267-269.

(https://www.jstor.org/stable/2388496?seq=1#metadata_info_tab_contents)

延伸閱讀

生物系統延伸資訊連結 (LEARN MORE ABOUT THE LIVING SYSTEM/S)

https://en.wikipedia.org/wiki/lobelia_deckenii
https://www.onezoom.org/life/@lobelia_deckenii
<https://eol.org/pages/11258927>

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AskNature 原文連結

<https://asknature.org/strategy/slime-inhibits-evaporation/>