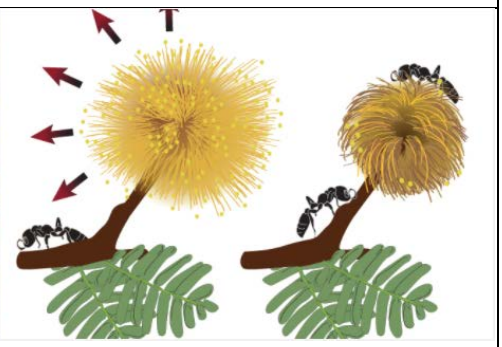
生物策略表

類別	生物策略 (Strategy)
生物策略 STRATEGY	花朵選擇性驅散昆蟲 (Flowers selectively deter insects)
生物系統 LIVING SYSTEM	金合歡/相思樹 (Texas huisache)
功能類別 FUNCTIONS	#授粉 #保護免受動物危害 #傳遞化學訊號（氣味、味道等） #Pollinate #Protect from animals #Send chemical signals (odor, taste, etc.)
作用機制標題	某些金合歡在吸引傳粉者的同時，透過使用揮發性有機化合物來驅除保護性共生螞蟻 (Flowers of some acacia plants attract pollinators while deterring protective symbiotic ants through the use of volatile organic compounds.)
生物系統/作用機制示意圖	 

作用機制摘要說明 (SUMMARY OF FUNCTIONING MECHANISMS)

文獻引用 (REFERENCES)

「1. 螞蟻與植物呈現複雜的互動，包括兼性 (facultative) 和互利 (mutualistic) 的，從取食而散播種子，到擔當牧人守衛植物的草食性動物等各種角色。但是螞蟻很少能擔任傳粉者 (pollinators)，牠們拜訪花朵反而不利於植物的生殖適應。」

「2. 植物於是以不同的策略來控制螞蟻的分布，並限制牠們在葉片而不是到花朵。這些『過濾器』可能涉及在花朵或附近的物理性障礙，或是在葉片上的「誘餌」（通常是花外蜜腺, extrafloral nectaries, EFNs）。或者是把揮發性有機化合物 (volatile organic compounds, VOCs) 用作訊號來控制螞蟻的行為，吸引螞蟻到葉片及/或制止牠們到具功能的花朵上。以往部分關於花朵以 VOCs 驅散螞蟻的證據並不明確，而我們將會敘述部分實驗方法的不足之處，這些牽涉到在人工環境下的行為測試。」

「3. 我們審視了我們之前對與螞蟻共生之相思樹 (myrmecophytic acacias) 在原生地的實驗 (in situ experiments) 結果，發現花藥開裂 (dehiscence) 釋出花粉後，來自花粉的揮發物能專一且暫時地驅散螞蟻，這種效果在受到螞蟻牧養守衛的物種中更為強烈，對非洲及新熱帶居住在相思樹的螞蟻物種更是明顯。在這些植物中，驅散作用涉及到一些揮發性化合物如已知的螞蟻警戒費洛蒙 (alarm pheromones)，但對帶來益處的蜜蜂訪客則無驅

散效果。」

「4. 我們亦提出了新的證據關於溫帶花朵的 VOCs 對螞蟻的驅散效果，這些 VOCs 通常來自花粉，對驅散一般歐洲螞蟻有效。我們的數據顯示有一定數量的植物，因為使用防禦性花朵揮發物以及替代性 EFNs 誘餌，又或者是物理性障礙等這些過濾策略來防止螞蟻訪花，使得其生長需付出明顯的代價 (trade-off)。」 (Willmer et al. 2009: 888)

"1. Ants show complex interactions with plants, both facultative and mutualistic, ranging from grazers through seed predators and dispersers to herders of some herbivores and guards against others. But ants are rarely pollinators, and their visits to flowers may be detrimental to plant fitness."

"2. Plants therefore have various strategies to control ant distributions, and restrict them to foliage rather than flowers. These 'filters' may involve physical barriers on or around flowers, or 'decoys and bribes' sited on the foliage (usually extrafloral nectaries - EFNs). Alternatively, volatile organic compounds (VOCs) are used as signals to control ant behaviour, attracting ants to leaves and/or deterring them from functional flowers. Some of the past evidence that flowers repel ants by VOCs has been equivocal and we describe the shortcomings of some experimental approaches, which involve behavioural tests in artificial conditions."

"3. We review our previous study of myrmecophytic acacias, which used in situ experiments to show that volatiles derived from pollen can specifically and transiently deter ants during dehiscence, the effects being stronger in ant-guarded species and more effective on resident ants, both in African and Neotropical species. In these plants, repellence involves at least some volatiles that are known components of ant alarm pheromones, but are not repellent to beneficial bee visitors."

"4. We also present new evidence of ant repellence by VOCs in temperate flowers, which is usually pollen-based and active on common European ants. We use these data to indicate that across a wide range of plants there is an apparent trade-off in ant-controlling filter strategies between the use of defensive floral volatiles and the alternatives of decoying EFNs or physical barriers." (Willmer et al. 2009: 888)

參考文獻清單與連結 (REFERENCE LIST)

Willmer, P. G., C. V. Nuttman, N. E. Raine, G. N. Stone, J. G. Pattrick, K. Henson, P. Stillman, L. McIlroy, S. G. Potts, and J. T. Knudsen. (2009). Floral volatiles controlling ant behavior. *Functional Ecology* 23: 888-900. (https://doi.org/10.1111/j.1365-2435.2009.01632.x)

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/vachellia https://www.onezoom.org/life/@vachellia https://eol.org/pages/684149
撰寫/翻譯/編修者與日期
譚國鎏翻譯 (2021/03/22)；王俊能編修 (2021/04/19)
AskNature 原文連結
https://asknature.org/strategy/flowers-selectively-deter-insects/