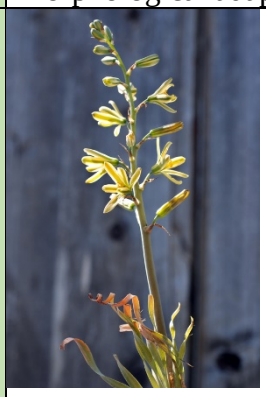
生物策略表

類別	生物策略 (Strategy)
生物策略 STRATEGY	聚集水分的葉片 (Leaves gather water)
生物系統 LIVING SYSTEM	哨兵花屬（天門冬科） *Albuca*
功能類別 FUNCTIONS	#獲得、吸收、或過濾液體 #貯存液體 #Capture, absorb, or filter liquids #Store liquids
作用機制標題	地下芽植物的葉片透過地上部的形態適應，從霧氣及露水中收集和保留水分 (Leaves of geophytes collect and retain water from fog and dew by morphological adaptation of their aerial parts.)
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)

「在南非納馬誇蘭 (Namaqualand) 及鄰近地區的半沙漠地帶 (semidesert)，有一群來自單子葉八個科和一部分酢漿草屬 (*Oxalis*) 的地下芽植物 (geophyte)（球根植物），它們的地上部 (aerial part) 展現出獨特的形態適應性，能夠從這地區主要濕氣來源的露水及霧氣中收集和吸收水分…這些形態 (morphome) 罕見於其它地區的單子葉植物，它們透過表面積及邊緣的增大以促進露水及霧氣凝聚的增加，同時維持著有限葉片的整體大小。它們透過以下三個方法增進這些植物的水分預算：(1) 水分殘留在地上部以減緩日間的蒸散壓力；(2) 雖然看來並沒有直接吸收水分的特殊器官，但野外及實驗室測試皆顯示它們吸收相當多的水量，然而其量並沒有超過多數非沙漠植物的吸收量；(3) 由葉片所收集的水滴落到泥土上並到達根部區域，再被貯存在塊莖、鱗莖、球莖及地下莖中，此為主要貢獻的方式。使用人為定向造霧及金屬模型模仿自然相貌 (natural profile) 的實驗證實了各種表面類型者比相同大小無雕塑（平面）鋒面 (frontal surface) 的標準模型會多收集到額外的水，其效率從 0.1-66%不等。」(Vogel S; Müller-Doblies U. 2011: 3)

「它們展現的獨特葉片構造，再加上特殊種類的纖毛 (ciliation)，這是在此地區以外植物界中難以找到的構造，很顯然地比起扁平的葉子更能誘發使露水與霧氣中的水更豐富地凝聚下來。」(Vogel S; Müller-Doblies U. 2011: 29)

「雖然納馬誇蘭 (Namaqualand) 的地下芽型單子葉植物中有相當數量的物種長著「常見 (conventional)」的葉片，但不少的物種展現顯眼的特殊性：它們的葉片，少數為軸 (axis) 和葉附屬物，都有著奇異的變化，有著多種不同方式的扭轉、皺紋、卷曲、褶板或波狀的 (pleated or undulate) 與 (或) 不尋常外觀的細披毛 (pilosity)。當地的植物學家注意到這種特異性，因此稱該地區為「卷曲旋轉國 (curly-whirly-country)」。此 8 個科的成員如下：石蒜科 （Amaryllidaceae，55 種）、吊蘭科（Anthericaceae，[註]現已併入天門冬科，1 種）、阿福花科（Asphodelaceae，13 種）、秋水仙科 (Colchicaceae)、洋莎草科（Eriospermaceae，[註]已併入天門冬科，20 種）、風信子科（Hyacinthaceae，[註]已併入天門冬科，100 種）、仙茅科（Hypoxidaceae，6 種）、鳶尾科（Iridaceae，80 種），以及蘭科（Orchidaceae，4 種），總共 294 個物種普遍有這個性狀 (表 1, 圖 3-41)。在雙子葉植物中，似乎只有部分酢漿草屬 (*Oxalis*) 的物種也參與…水分逆境仍然是這種性狀的潛在推動力。」 (Vogel S; Müller-Doblies U. 2011: 18, 21)

"In the semidesert of Namaqualand and adjacent regions of the former Cape Province, South Africa, there occurs an assemblage of geophytes belonging to eight monocot families and some Oxalis species that exhibit special morphological adaptations of their aerial parts to harvest and absorb water from dew and fog, the main source of moisture in this region...These morphomes, rare elsewhere among monocotyledons, promote an increased deposit of dew and fog by enlargement of surfaces and edges, keeping at the same time the overall size of the leaves restricted. They improve the water budget of these plants in three ways: (1) remnant water on the aerial parts retards the transpiration stress at day-time; (2) although special organs for direct absorption seem to be absent, field and laboratory tests show, that considerable uptake of water occurs but in quantities not exceeding that capacity found in many non-desert plants; (3) the water harvest of the leaves dripping to the soil and reaching the root zone, where it is stored in tubers, bulbs, corms and rhizomes, appears to be the main contribution. Experiments using artificial, directional fog and metal models imitating the natural profiles demonstrate that a surplus of water in efficiency rates of 0.1–66% is collected by the various surface types compared to a standard model with a non-sculptured (plain) frontal surface of the same size." (Vogel S; Müller-Doblies U. 2011: 3)

"The peculiar leaf structures they exhibit [described in next quote], plus a special kind of ciliation, – structures rarely found in the plant kingdom outside our region – apparently induce dew and fog water to settle more copiously than on plain leaves." (Vogel S; Müller-Doblies U. 2011: 29)

"Although among the geophytic Namaqualand monocot species a fair number bearing 'conventional' foliage occur, a great deal exhibit a striking peculiarity: The leaves, rarely axes and leaf appendages, are curiously modified, being twisted, crisped, curled, pleated or undulate in many different ways, and/or their pilosity has an uncommon appearance. Resident botanists

aware of this oddity, therefore call the area the “curly-whirly-country”. Members of 8 families: Amaryllidaceae (55 sp.), Anthericaceae (1 sp.), Asphodelaceae (13), Colchicaceae, Eriospermaceae (20), Hyacinthaceae (100), Hypoxidaceae (6), Iridaceae (80), and Orchidaceae (4) have this trait in common, amounting to 294 species (Table 1, Figs. 3–41). Among dicotyledons, only some species of Oxalis seem to join...the water stress remains as potential motivation.” (Vogel S; Müller-Doblies U. 2011: 18, 21)

參考文獻清單與連結 (REFERENCE LIST)

Vogel, S. and U. Müller-Doblies. (2011). Desert geophytes under dew and fog: The “curly-whirlies” of Namaqualand (South Africa). *Fuel and Energy Abstracts* 206: 3-31. (https://doi.org/10.1016/j.flora.2010.01.006)

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/albuca
https://www.onezoom.org/life/@albuca
https://eol.org/pages/1084060

撰寫/翻譯/編修者與日期

譚國鎏翻譯 (2021/03/22)；許秋容編修 (2021/04/30)

AskNature 原文連結

https://asknature.org/strategy/leaves-gather-water/