



## Why the early bird won't see the daisies

ABOVE: A field of gousblom *Ursinia cakilifolia*.  
Photo: Hester Steyn.

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World renowned for its showy displays of spring flowering annuals, Namaqualand is home to approximately 330 species of annuals in eighty-five genera and twenty-four families. Plants with short life-cycles that may be completed many times in one growing season (called 'ephemerals') make up a large percentage of the plant species in Namaqualand. In spring members of the daisy family (Asteraceae) transform the barren landscape into a miracle of colour that is unrivalled in any part of the world.

In Namaqualand the flowers generally open at midmorning and close in the afternoon. One can seldom expect to see a really colourful stretch of flowers before ten o'clock or half past ten, or after four o'clock in the afternoon. During field trips to Namaqualand between 1991 and 1995, we observed the different times when flowers of different species were open. The opening and closing of flower heads depend on the petal movement of the ligulate (the tongue-shaped outer) florets and they do not fully open on cloudy, windy or relatively cool days. Flowers close to protect their pollen from rain and nocturnal dew, while the closed flowers also provide a sanctuary for beetles and other pollinators. Some Asteraceae species, however, do not close their flower heads, but rather roll back the ligulate florets, the pollen thus remaining exposed.

The opening and closing of flowers has been attributed to temperature, wind, relative humidity, a combination of temperature and exposure to light, and an endogenous rhythm. However, the environmental factors that control opening and closing of flowers of Namaqualand 'ephemerals' have not yet been investigated.

In an attempt to determine the trigger of these movements, five ephemeral species were studied during their peak flowering period. Plants from four species of the daisy family; bittergousblom *Arctotis fastuosa*, Namaqualand daisy *Dimorphotheca sinuata*, dassiegousblom *Tripteris hyoseroides* and gousblom

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*Ursinia cakilefolia* and the sporrie *Heliophila seselifolia* var. *seselifolia* from the Brassicaceae or cabbage family, were grown in 0.5 m<sup>3</sup> pots (up to 50 plants per pot) out of doors at the University of Pretoria. During their peak flowering period in August and September, the daily opening and closing of the flowers were noted and irradiance (photosynthetic photon flux density) and temperature were recorded.

While some species started to open their flowers as early as nine o'clock in the morning, others kept theirs shut until around ten\*. The flower heads of dassiegousblom and gousblom started to open first in the morning. Dassiegousblom's flower heads started to open as early as nine o'clock but began to roll back their ligulate florets at two o'clock in the afternoon. Those of gousblom opened relatively slowly and opened fully only at around noon. Sima Elovson noted that the flower heads of dassiegousblom would open even on dull mornings, but rolled up firmly after midday and remained fully closed for the afternoon.

According to a study conducted at

the University of Pretoria, dassiegousblom produced no seeds in the absence of insects; and no insects except thrips and on occasion a visiting bee were noticed on these flower heads. The earlier opening of these flower heads could possibly prevent competition for pollinators with other flowers of similar colour and shape or could be due to a specialized relationship between this species and an early rising insect.

Flower heads of Namaqualand daisy were the last to open fully but they remained partially open until four o'clock, when the flowers of most of the other species had already closed for the night. Of the five species tested, sporrie had the shortest open-flower period and these dainty, white flowers could be appreciated only between noon and half past two in the afternoon.

From the results it seemed that bittergousblom needed relatively high temperatures (above 18 °C) for opening and the flower heads were fully open at light intensities of 600–1140  $\mu\text{mol m}^{-2} \text{s}^{-1}$ . The flower heads of the Namaqualand daisy also needed an irradiance higher than 600  $\mu\text{mol m}^{-2} \text{s}^{-1}$  and temperatures above 18 °C to open

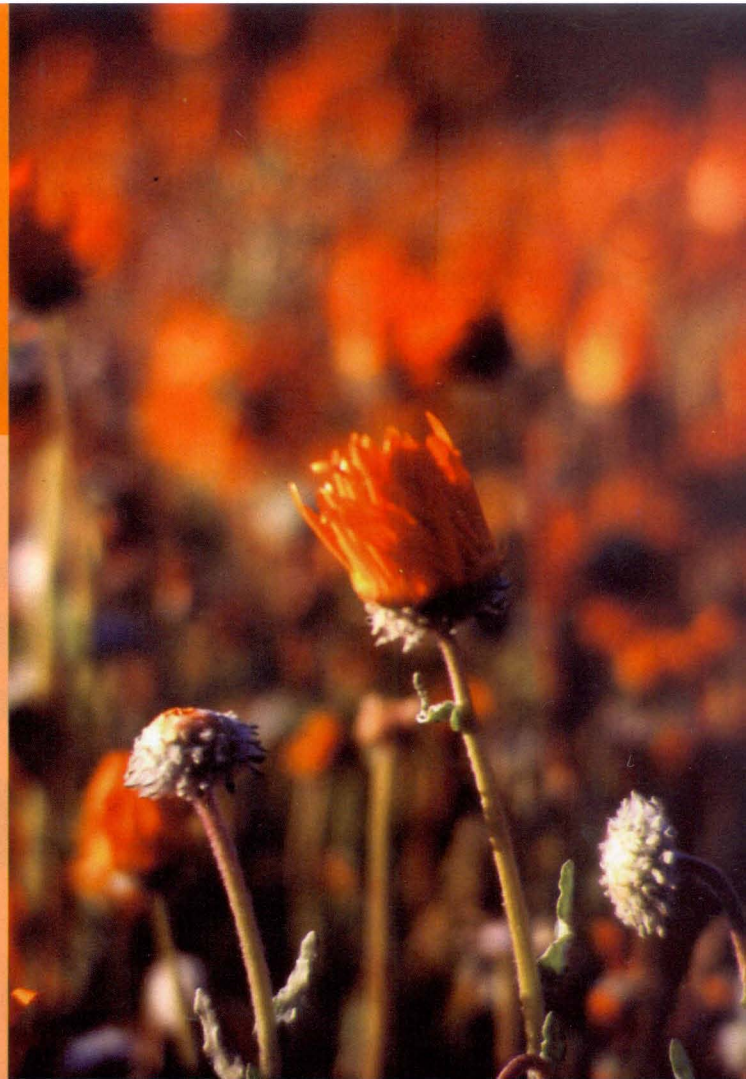
fully, while sporrie flowers seemed to open fully only at temperatures above 20 °C. There seemed to be no correlation between temperature and the opening phases of dassiegousblom as the flower heads were fully open at temperatures ranging from around 11 °C up to 22 °C and the flowers started to close during the warmest part of the day.

The opening of gousblom was also temperature-dependent and although the flower heads started to open at temperatures as low as 11 °C, they opened fully only at 18 °C and over.

In Namaqualand, pollinators are active for a few hours between mid-morning and early afternoon, even on sunny warm windless days. For the species tested, most flowers were fully open between ten and two o'clock, coinciding with the active period of most pollinators. However, some daisies like sambreeltjies (*Felicia*) and succulents like varkiesknol *Conicosia elongata* open fully only at midday and remain open until later in the afternoon, while some species with white flowers, like wilde-anys *Pharnaceum* and donkiebos *Aridaria noctiflora* open

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RIGHT: Early morning bittergousblom *Arctotis fastuosa*.  
Photo: Hester Steyn.





ABOVE: Flowering displays during the hottest part of the day. Photo: Hester Steyn.

late in the afternoon or after dark and are possibly moth-pollinated.

From this preliminary study it seems that temperature, rather than sunshine or light intensity, is the cue for the opening of flowers in four of the five species tested and therefore that temperature is the better predictor of flower opening. Flowers tend to be open on a windy overcast warm day, but will remain closed on a windless sunny but cold day.

If you plan to visit Namaqualand during the flowering season, don't get up early and do take a book to read on those chilly days when most of the daisies will be closed!

\*If you would like a graph showing the opening phases of each of the five species observed, please contact the author at [voget@kingsley.co.za](mailto:voget@kingsley.co.za).

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#### Further Reading

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RIGHT: Namaqualand daisy  
*Dimorphotheca sinuata*.  
Photo: Hester Steyn.

