Wintry jewel of the Highveld

The parasitic plant, *Harveya pumila*, flowers briefly in late winter before the first spring rains – a fairly common strategy amongst many wildflowers of the Highveld grasslands.

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WINTERNAG
by Eugène N. Marais (1871–1936)

O koud is die windjie
en skraal.
En blink in die dof-lig
en kaal,
so wyd as die Heer se genade,
lê die velde in sterlig en skade.
En hoog in die rande,
versprei in die brande,
is die grassaad aan roere
soos winkende hande.

O treurig die wysie
op die ooswind se maat,
soos die lied van 'n meisie
in haar liefde verlaat.
In elk' grashalm se vou
blink 'n druppel van dou,
en vinnig verbleek dit
tot ryp in die kou!

WINTER'S NIGHT
Translated by At de Lange

O cold is the windlet
and spare.
And bright in the dim-light
and bare,
as vast as God's mercy has bade,
lie the plains in starlight and shade.
And high in the ridges,
spreaded in burnt ditches,
are the grass plumes stirring
like beckoning hands.

O tune with grief laden
on the east wind's drone,
like the song of a maiden
in her love made alone.
In each grass blade's fold
a drop of dew gleams bold,
and it pales quickly
to frost in the cold!

A common misconception is that winter on the Highveld can be equated to the classic poem 'Winternag' by Eugène N. Marais. True enough, this poetic account describes our clear, icy, Highveld winter nights very accurately, but the haunting, forlorn feeling one is left with at the end quickly disappears once the sun comes out. Frost slowly starts to melt, revealing a glistening wonderland full of botanical jewels for anybody to find.

One such jewel is *Harveya pumila*, a plant spotted so infrequently that it lacks a vernacular name. Sometimes members of the *Harveya* genus as a group are called 'inkblom' in Afrikaans (literally 'ink flower'), a name alluding to the black colour that flowers of some of the species assume during ageing. Formerly these blackened flowers were used to make ink. In members of the witchweed family (Orobanchaceae) the leaves and flowers characteristically turn blackish on drying. (See box on page 193 for the chemical explanation.)

Some genera in this family were previously classified in the snapdragon family (Scrophulariaceae) but were recently transferred to the witchweed family, a step based amongst others on their parasitic way of life. Members of the witchweed family are either partial or complete parasites. Partial parasites have green leaves and are capable of producing their own food from sunlight and carbon dioxide

Coral pink flower buds of *Harveya pumila* emerge in recently burnt grassland. Photo: B. van Wyk.

ABOVE: *Harveya pumila* is a complete root parasite with no green foliage. It is totally dependent on its host for nutrition. Photo: B. van Wyk.

through photosynthesis, but their roots are attached to the roots (or stems in the case of parasites from certain other families, e.g. the mistletoes) of host plants from which they derive water and mineral nutrients. Complete parasites, on the other hand, do not contain significant green tissues and are completely dependant on the host plant for sustenance.

Harveya pumila, in particular, has been found to parasitize the roots of *Anthospermum hispidulum*, an insignificant little shrublet of the coffee family (Rubiaceae). In winter the host plant is dormant and dies back above ground, only to re-sprout from its perennial underground rootstock by the time the flowers of *H. pumila* have shrivelled up and died. It is also thought that *H. pumila* parasitizes grassroots.

These pretty pink flowers are complete root parasites and, having no leaves of their own, rely on their host for water as well as both organic and inorganic nutrition. Scale-like appendages, just below the tube-shaped flowers, are all that evolution has left of the original foliage leaves. Another species of *Harveya* that it could at first be mistaken for is *H. pulchra*, but this species is a Drakensberg endemic and is only known from a few places along the Great Escarpment.

The considerable importance of fire as an essential ecological factor in the grassland of the Highveld cannot be over emphasised. The lifestyle of *H. pumila* suggests that this interaction between climate (of which fire is an integral part) and plant is even more profound than previously thought.

Harveya pumila flowers briefly and at a very odd time of the year—for a duration of two weeks only at the end of winter. The species has only been noticed to flower profusely in patches of grassland burned during late winter. Flowers are sparsely produced in unburnt grassland, perhaps indicating that the cover of old rank grass from the previous season would not allow them to advertise effectively for insect pollinators. Likewise, *H. pumila* ensures competition by grasses is limited by flowering before active grass growth resumes, which, unlike many of the wildflowers, is dependant on good spring rains. Perhaps this behaviour is the main reason for their apparent scarcity, since the South African National Herbarium has less than ten records of the plant.

On the Highveld very few people, even professional botanists, venture outdoors during the first two weeks of August. This is not at all surprising, because from a distance the grassland still appears drab and dormant, even black and devastated in the wake of grassland fires.

The public at large have been led to believe that grassland functions along similar lines as some of the arid parts of southern Africa (e.g. Namaqualand) where wild flowers mainly abound following good seasonal rains.

The dynamics of the high-rainfall temperate grasslands of South Africa are, however, completely different and highly specialized. These grasslands are dominated by perennial plants that die down above ground in winter, only to re-sprout in spring and summer. During the main growing sea-

son (summer) many non-grassy herbs, the so-called wildflowers, accumulate water and food in underground storage organs. Flowering is at the end of the dry season during late winter and early spring, often before a drop of rain has fallen.

Outdoor enthusiasts who wait for the grasses to start sprouting following the first good rains of the season, which can be as late as November or December, before going to look for wildflowers are often disappointed by finding relatively few flowers, many of which are then in the fruiting stage already. This unusual and rather unexpected flowering behaviour has led to the coining of the term 'pre-rain flowers' to describe *Harveya pumila* and hundreds of other Highveld grassland flowers.

This beautiful yellow-throated, pink flower of *H. pumila* teaches us that all is not always as it seems. By hiding away from the cold outside, or avoiding the seemingly devastated fire-scorched areas of grassland, we miss out on some spectacular natural bouquets and dashes of colour in the otherwise monochromatic veld.

ABOVE: Flowers of *Harveya pumila* are bright pink, fading to white with age. Damaged edges and bruised parts of petals turn black, a common feature in many members of the witchweed family. The host plant *Anthospermum hispidulum* can be seen in the background. Photo: G. Krige.

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Explaining the chemistry

Why do the flowers and leaves of members of the Orobanchaceae often turn black? The chemical orobanchin (an orobanchoside), an ester# of a sugar with caffeic acid, appears to be responsible mostly for the blackening. Generally, phenolic compounds such as the orobanchoside, and the enzymes that catalyze their oxidation, are kept in separate compartments within plant cells. (Another plant phenolic is lignin, and tannins are also derived from phenolics.) When certain enzymes and the phenolic compound come into contact, for example, when the plant is damaged or dying, oxidation takes place, changing the phenolics into quinones. Reactions like these usually involve a rapid and drastic colour change and light-coloured phenolics are often changed into much darker quinones. Apparently this blackening can be avoided by steeping plants in a solution of sodium sulphate before pressing them.

Thanks to Fanie de Meillon for this explanation.

#Ester A compound formed by replacing the hydrogen of an acid by a hydrocarbon radical of the ethyl type.