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A note on the flowers of *Halleria lucida*

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ABSTRACT

Studies of sunbirds (*Cinnyris* spp.) feeding on the nectar of flowers of *Halleria lucida* L. suggest that partial protandry may be operative in the breeding system of this cauliflorous tree. Attention is drawn to certain anomalies depicted in published botanical drawings. These anomalies are discussed in relation to the sequential development of the androecium and gynoecium in live flowers. *Colius colius*, the speckled coly, is reported to eat the fruits of *Halleria lucida*. This bird also feeds on nectar after piercing the base of the corolla tube.

RESUME

*NOTE SUR LES FLEURS D'*HALLERIA LUCIDA

Des observations sur la consommation de nectar par des souïmangas du genre Cinnyris *exploitant les fleurs d'*Halleria lucida *L. suggèrent qu'une protandrie partielle peut intervenir dans le système reproducteur de cet arbre cauliflore. On attire l'attention sur certaines anomalies figurant dans des dessins botaniques qui ont été publiés et on discute ces anomalies par rapport au développement séquentiel de l'androcée et du gynécée dans des fleurs vivantes.* Colius colius, *la veuve tachetée, est signalé comme mangeant les fruits d'*Halleria lucida. *Cet oiseau se nourrit également de nectar après avoir percé la base du tube de la corolle.*

Halleria lucida L. is one of the few cauliflorous trees in South Africa (Marloth, 1932). The massed red tubular flowers are visited regularly by various species of sunbirds (*Cinnyris*) and sugarbirds (*Anthobaphes*) and this has led to the belief that pollination is ornithophilous (Marloth, 1932. Vogel, 1954). This note has arisen from observations of *Cinnyris* spp. feeding on the flowers of a solitary tree of *H. lucida* growing in the National Botanical Gardens, Pretoria.

A close inspection of massed flower clusters revealed that each cluster was composed of flowers at different stages of development. Sequential dissections from bud stages to fully mature flowers suggested that partial protandry might operate as an outbreeding mechanism. It was found that the didynamous stamens expanded at different rates and that the stigma was always below the lowest pair of these stamens until their anthers had dehisced. This sequential development is shown in Fig. 1. Prior to the opening of the corolla lobes all four anthers were held at the same level, even though the filaments of the two pairs were adnate to the corolla tube at different levels. Steps 1–5 in Fig. 1 show the emergence of the anthers from the corolla mouth. The outer pair of anthers (deepest inserted) developed faster than the inner pair of anthers, so that by the time the inner pair had dehisced the outer pair had completely shed their pollen. The style expanded rapidly once dehiscence of the inner pair of anthers had begun and eventually either overtopped or attained the level of the outer pair of anthers. It was difficult to establish accurately the time of receptivity of the stigma, but it appears to have occurred once the stigma had reached the level of the inner pair of dehisced anthers.

Any interpretations of the phenomenon discussed above must be made cautiously for a number of reasons. Firstly, different authors have commented on different flower types in *Halleria lucida* and secondly, different patterns of development have been reported for the androecium and gynoecium. Sims (1815), who commented on a rudimentary fifth filament, compared this species to the genus *Lonicera* (Caprifoliaceae) in which Burman (Rar. Afric. 244, t. 89, fig. 2) had placed it. Verdoorn (1946) drew attention to anomalous flowers and commented as follows: "While the majority of flowers on this shrub are funnel-shaped with an oblique, somewhat 2-lipped mouth, several were found to be trumpet-shaped with the lobes equally spreading and 4 or 5 in number. In these examples the stamens were also equally disposed and not unilateral." Flowers observed in Pretoria approximated those in t. 961, fig. 4 (Flow. Pl. Afr., 1946) of Verdoorn's article. No abnormal flowers were found. Vogel (1954), however, has commented that the stamens and stigma hardly exsert from the corolla mouth and his Fig. 132: 4 closely approximates t. 961, fig. 8 described as an abnormal flower by Verdoorn. It is difficult to assess from these drawings, as well as from the t. 1744 (Bot. Mag. 41, 1815) described by Sims, whether the relative position of anthers and stigma can be ascribed to the artist having drawn flowers at different stages of development. If the flowers drawn were indeed mature, it must still be decided whether such flower types are abnormalities or whether they are normal and may possibly play an important rôle in the pollination strategy of the plant. This will require further field studies.

My assessment of partial protandry is derived from the observations outlined above. If this is correct, it would mean that a bird flying from flower to flower could conceivably transfer pollen from a flower with only one pair of anthers dehisced to a flower in which the stigma was completely exerted. This would constitute a measure of outbreeding if more than one plant was involved. On the other hand, the late emergence of the second pair of anthers, with their dehiscence occurring as it does with the elongation of the stigma, could guarantee inbreeding. Limited emasculation and bagging studies of flower clusters on the Pretoria plant indicated that autogamy was operative.

An important feature of this cauliflorous tree is that the flower clusters, consisting as they do of flowers at all levels of development, ensure a constant visitation over a long period by potential pollinators. As Vogel (1954) has indicated, the flowers are rich in nectar, but non-odoriferous. The fruits of this plant are relished by the speckled coly, *Colius colius*, which also pierces the base of the corolla tube to feed on the nectar.

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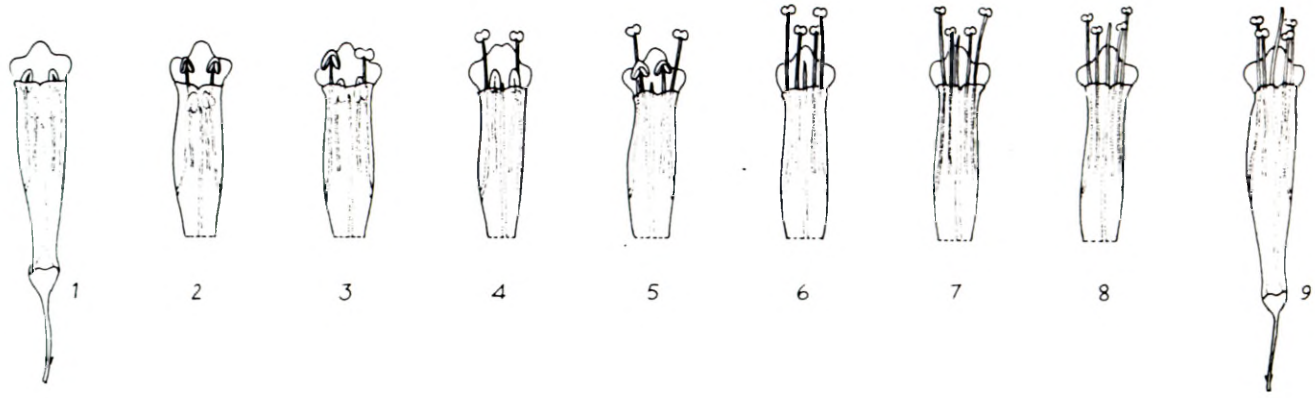

FIG. 1.—Sequential developmental stages of the flower of *Halleria lucida* once the corolla mouth has opened. 1, outer pair of stamens beginning to emerge from mouth, note stigma well below inner pair of stamens; 2, outer pair of stamens emerged from corolla mouth; 3, right hand anther of outer pair has begun dehiscence, while the inner pair has begun to emerge; 4, and 5, the outer pair has dehisced, the inner pair has emerged, as has the stigma; 6, inner pair has dehisced; 7-9, the stigma gradually elongates until it reaches the upper pair of anthers or overtops them.

An interesting feature of the dehisced anthers is that they are completely flattened, with the pollen-shedding surface facing downwards (i.e. towards the viewers of Fig. 1). This provides a maximum surface area to brush against any bird's bill or tongue inserted into the flower.

Detailed studies on a tree growing in the Kirstenbosch Botanical Gardens in Cape Town gave the same results as the studies carried out in Pretoria.

UITTREKSEL

Waarnemings op suikerbekkies (Cinnyris *spp.*) *wat op die nektar van blomme van* Halleria lucida *L. voed, skep die indruk dat gedeeltelike protrandrie werksaam mag wees in die voortplantingstelsel van hierdie boom, waar die blomme op die stam gedra word. Aandag word gevestig op sekere afwykings wat aangedui is in gepubliseerde plantkundige tekeninge. Hierdie afwykings word bespreek in verhouding tot die opeenvolgende ontwikkeling van die androecium en gynoecium in lewende blomme. Dit word berig dat* Colius colius, *die gespikkelde muisvoël, die vrugte van* Halleria lucida *eet. Hierdie voël voed ook op nektar nadat dit die basis van die kroonbuis deurboor het.*

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