

THE POLLINATION MECHANISM OF AEOLLANTHUS NJASSAE

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ABSTRACT. An explosive pollination mechanism is described for the tropical African labiate *Aeollanthus njassae* Gürke. It is of a similar type to that previously recorded in the S American *Eriope*. The question of the identity of the type species of the genus is raised.

INTRODUCTION

Examination of cultivated material of the tropical African labiate *Aeollanthus njassae* Gürke* (in Engler, Pflanz. Ost-Afr. C: 346, 1895. Baker in Fl. Trop. Afr. 5: 393, 1900) showed that it had a type of explosive pollination mechanism involving the close juxtaposition of the corolla lower lip and two of the four stamens.

Aeollanthus is an entirely subtropical and tropical African genus of some forty species. By reason of the character of declinate stamens, it is placed in the subfamily Ocimoideae and near such large and widespread tropical genera as *Plectranthus* and *Coleus*. A wide range of very different-looking species is included in *Aeollanthus* and the only character common to them all, other than the features of the subfamily, is the circumscissile fruiting calyx.

Ae. njassae Gürke (fig. 1a), apparently restricted to Malawi, is an aromatic fleshy-leaved perennial about 50 cm high. The inflorescence is conspicuous, consisting of many prominent bracteate condensed cymes borne on long horizontally spreading peduncles; the corollas are about 8 mm long and pale lilac white.

The two distinct stages of corolla and stamen position are shown in fig. 1b and c. When the flower is first open the two upper stamens project more or less straight forward and are clearly exerted whilst the lower two stamens are almost completely enclosed within the lower lip (fig. 1b). Not only are they hidden but they are also held down under tension. This is effected by the apex of the prominently hooded labellum which tightly enfolds the two thecae (fig. 1b¹). At this stage the labellum, which is cucullate and slightly compressed laterally (i.e. there is no flat landing platform) is likewise held, under strain, in a more or less horizontal position. That is, the stamens are held under tension downwards and the labellum upwards. The thecae, shown in fig. 1d, e, are unilocular—through confluence—medi-fixed, versatile and face upwards.

If a sharp tap is given to the labellum, it results simultaneously in the two stamens being abruptly released upwards and the labellum springing downwards and backwards (fig. 1c). As the thecae are triggered off, a small cloud of bright orange pollen—almost the entire contents of the thecae—is released.

One can assume that in nature a visiting insect attempting to land on the labellum will set off the mechanism with the result that its undersurfaces are sprayed with pollen.

* From a plant collected in Malawi, Mt. Mlanje, *Hilliard & Burt* 6418. A cultivated specimen, C. 9096, is in the Edinburgh herbarium; a chromosome count of $n = 17$ was made from pollen.

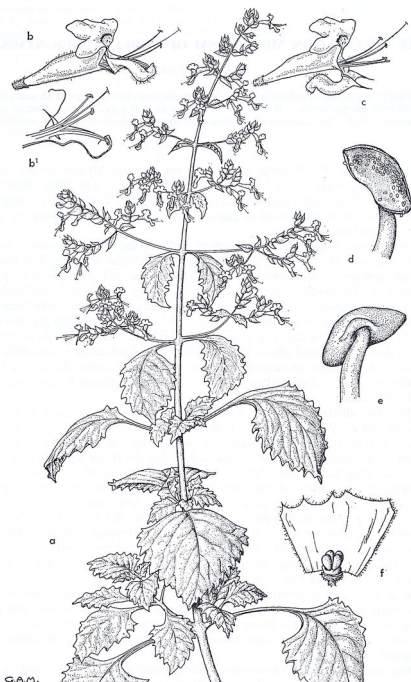


FIG. 1. *Aeollanthus njassae* Gürke: a, habit $\times \frac{2}{3}$; b, corolla unsprung $\times 3\frac{1}{4}$; b', section of labellum to show position of thecae $\times 4$; c, corolla sprung $\times 3\frac{1}{4}$; d, anterior and e, posterior views of thecae $\times 33\frac{1}{2}$; f, calyx with young nutlets and circumscription line.

DISCUSSION

The phenomenon described above is similar to that recently recorded by Harley (1971) for the Brazilian savanna species *Eriope crassipes* Benth. *Eriope* is an entirely S American genus, closely related to *Hyptis*, of about eighteen species almost all restricted to Brazil; it also belongs to the subfamily Ocimoideae. In their pollination mechanisms, there are several differences of detail between the S American and the African genus: for instance, in *Eriope* all four stamens are held within the labellum which is strongly compressed laterally and the lip margins are fimbriate and apparently interlock. But essentially the mechanisms and how they work seem to be the same in both genera.

Harley, who had the great advantage of being able to study the floral biology of *Eriope* in the field, described how pollination is effected by a small bee; he also observed that the entire process from flower opening to the fall of the corolla happens within the space of a single day. In most cases the flowers were triggered off shortly after opening.

No comparable field observations have been made on *Aeollanthus* but it seems fairly certain that in it too the activities of a bee, or some other relatively heavy insect, are responsible for triggering the mechanism. Certainly a fair amount of pressure is required to set it off and, at least in cultivation, the flowers, which like *Eriope* are short-lived, will wither and fall in the unsprung state. The flowers in *Ae. njassae* are somewhat protandrous in contrast to the marked protandry of *Eriope*.

One conspicuous feature of the *Ae. njassae* corolla is the presence of awn-like spurs on the labellum but apparently they play no part in the functioning of the mechanism. They are particularly prominent after the labellum has been triggered (fig. 1c) and although it might appear that these long processes project into the upper lip of the corolla and hold the unsprung corolla under tension, in fact this is not so as at no time are they attached or united to the hood.

How widespread the phenomenon is in the genus is a question that only field studies can answer. Certainly its presence or absence is difficult to detect from herbarium specimens. But a quick survey of tropical and southern African species suggested that it might well occur in other species. This was recently confirmed by Dr O. Hilliard, Pietermaritzburg, who observed that in Natal, the floral structure of *Ae. canescens* is essentially the same as in *Ae. njassae* although the flowers are much smaller and there are no spurs on the labellum.

Although I am unaware of any previous references to explosive mechanisms in African Labiatae, Morton (1962) noted that in the small genus *Homalochelios* flowers observed early in the morning had the corolla lip projecting forward with the stamens enclosed by it whereas by evening the lip was deflexed and the stamens exerted. This might seem to be a comparable case to that of *Aeollanthus* but from examination of herbarium specimens it appears that this is not a springing mechanism but rather a sequence in the growth stages of the corolla.

THE IDENTITY OF THE TYPE SPECIES OF THE GENUS

The type species of *Aeollanthus* Martius ex C. Sprengel (Syst. Veg. 2: 678, 750, 1825) is *Ae. suaveolens* Mart. ex C. Spreng. (l.c.) but the name never

appears to have been applied to any species in Africa, where the genus is endemic. The main reason for this is that the original wild provenance of the type specimen is not known. The type of *Ae. suaveolens* is a cultivated specimen, grown at the Munich Botanic Garden in 1825, raised from seed collected in "the gardens of the Chinese in Santa Cruz, Brazil". Apparently a plant under this name is still grown in Brazil for its pleasant fragrance. No cultivated specimens from Brazil have been seen and consequently the questions of original provenance and correlation with an African plant cannot yet be resolved. However, the full description of the species given by Martius,* its illustration and a photograph of the probable type specimen (in M) suggests that among the numerous African species, not all of which have been examined, *Ae. heliotropioides* Oliv. seems to be quite closely related to the problematic *Ae. suaveolens*. The two species agree in annual habit, sessile leaves and spike-like inflorescences but in *Ae. suaveolens* the bracts appear to be broader and larger and its leaves are somewhat broader. *Ae. heliotropioides* has a wide range in tropical Africa from Ghana in the west to Tanzania in the east but I have no reference to it as a cultivated plant in Africa. Like the plant cultivated in Brazil it too is a noticeably fragrant herb but as several *Aeollanthus* species are sweet-smelling this is not a particularly indicative point of similarity.

REFERENCES

- HARLEY, R. M. (1971). An explosive mechanism in *Eriope crassipes*, a Brazilian labiate. *Biol. Journ. Linn. Soc.* 3: 159-164.
MORTON, J. K. (1962). Cytotaxonomic studies on the West African Labiatae. *Journ. Linn. Soc. Bot.* 58: 231-283.

* As *Aeollanthus* (orth. mut.) *suavis* in Amoen. Bot. Monac. p. 4: 1829.