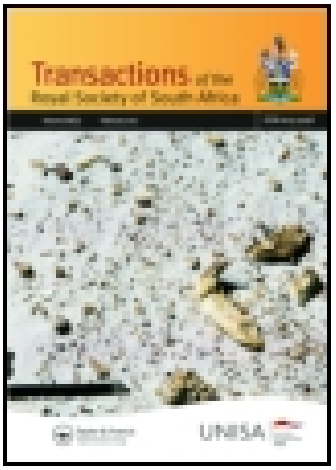

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A DIPLOSTIGMATIC PLANT, *SEBÆA EXACOIDES* (L.) SCHINZ (*BELMONTIA CORDATA* L.).

By R. Marloth, Ph.D., M.A., F.R.S.S.Afr.

(Read September 16, 1908.)

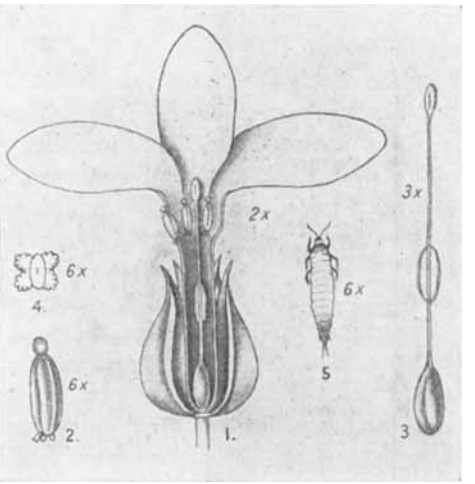
The genus *Belmontia* was separated from *Sebæa* by Ernst Meyer in 1835 on account of the included stamens. While in the genus *Sebæa* proper the stamens are inserted at the mouth of the corolla tube and are consequently exserted, they are, owing to their lower insertion, hidden in the tube of the corolla on the species included in *Belmontia*. Recently, however, both genera have been re-united by Schinz,* owing to the existence of intermediate forms; hence the pretty little plant generally known as *Belmontia cordata* would have to be called *Sebæa cordata*, if it had not been shown at the same time by Schinz that there exists an older Linnæan name for it, viz., *Gentiana exacoides*. Consequently, according to the international rules of nomenclature, this older specific name must have the preference, and the plant is *Sebæa exacoides* (L.) Schinz.

The flowers of most species of *Sebæa* possess two curious organs, viz., the Brown's bodies—a term introduced by Schinz—and the papillose ridges of the style. The Brown's bodies are little appendages of the anthers, existing either at the apex of the anther only—in which case there is only the one apical body—or also at the base of the anther, in which case there are three such bodies, one apical and two basal ones. Until recently these bodies were called glands, but Schinz has shown, that they contain sugar and that they are often removed from the flower. This he ascribes to the action of insects, which rob the flowers of these bodies, and he looks upon the Brown's bodies as a bait for the attraction of insects, complaining at the same time of the indifference of Cape botanists, who have not paid any attention to the visitors of these flowers. Professor Schinz would, however, have been less severe in his judgment, if he possessed my experience in this matter. For twenty-five years I have seen hundreds or thousands of plants of *Belmontia cordata* every year without ever observing a single insect on its flowers, and yet this is, for some special reason, a

* Schinz, H., Versuchveiner monograph. Uebersicht der Gattung *Sebæa* R. Br.; Mitt. der Geogr. Ges. in Lübeck, Heft 17, 1903.

favourite spring flower of mine, and the relationships of plants and animals are one of my favourite studies.

The other peculiarity of structure of the flowers of *Sebæa* is the swollen portion of the style, designated by various names, *e.g.*, as a hairy ring,* or a tubercular thickening,† but described more correctly by Schinz ‡ as *Papillenwulst* (papillose swelling). It is not a ring, but consists of two flat longitudinal swellings, separated by a narrow portion of the smooth style. Schinz says: "The Brown's bodies and the papillose swelling must have something to do with the pollination of the flowers by means of insects; the function of the former is comprehensible, but that of the latter not—at least, not at present." My observations on *Sebæa exacoides* do, I think, now supply this information.



SEBÆA EXACOIDES (*L.*), *Schinz.*

1. Flower, $\frac{2}{3}$ of corolla removed. 2. Stamen. 3. Pistil.
4. Section through secondary stigma. 5. Thrips (larva.)

When, years ago, I examined the swollen part of the style for the first time under the microscope, I could not help noticing, that it possessed exactly the same structure as the receptive surface of the knob-shaped stigma, and that numerous pollen grains were adhering to the papillose surface. Gradually I came to the conclusion, that this might be a stigmatic organ, but as nothing of a similar kind was known from other plants I hesitated to express this opinion without further investigations.

* Gilg in Engl. Pflanz. Fam. IV., 2, p. 64. † Baker in Flora Trop. Afr. IV., p. 546.
‡ Schinz, *loc. cit.*, pp. 6 and 7.

Recently, however, I had, in connection with some other work, to study these plants again, and found in the course of this research that some pollen grains had germinated on this papillose surface. By staining the style with magenta, &c., one can find numerous pollen-tubes in the tissue of the style, below the swollen part as well as above it; hence their presence in the lower portion of the style would not necessarily prove, that they came from the swollen portion, as they may just as well have descended from the terminal stigma. Owing to lack of time I have not been able to actually trace the tubes from the grains down through the style into the ovary, but I have seen some enter the style at the swollen portion, hence the function of this latter organ is fairly clear. It is a secondary stigma, which means that *Sebæa exacoides*, and probably most other species of *Sebæa*, possess two stigmatic organs; they are, as I propose to call this structure, diplostigmatic.

If one examines flowers of *Sebæa* of different age, one finds that in flowers which have just opened the terminal stigma is still within the tube of the corolla, just blocking the entrance to it, whilst the secondary stigma appears still fairly smooth, with short papillæ only and without adhering pollen. At a later stage—perhaps a week later (the flowers last fairly long)—the terminal stigma protrudes from the tube about 1 to 2 mm., but it is brown and shrivelled, whilst the secondary stigma is quite fresh, having now longer papillæ and being generally covered with adhering pollen grains. The function of the secondary stigma is therefore evidently to secure self-pollination when cross-pollination should not have been effected, for when the style gradually lengthens its papillose swelling touches the base of the anthers.

During all these investigations, however, I found no clue with regard to the insects which, I felt sure, must visit these flowers. Their colour is a bright yellow, and there are even orange-coloured spots at the entrance to the corolla tube; the flowers possess a pleasant although weak clove-like scent, especially in the evening, and the anthers are provided with saccharine appendages, the Brown's bodies. In all probability, I thought, it must be some nocturnal insect, and often I watched the flowers during my rambles on moonlight evenings or in the dawn of the early morning, but in vain. This season, however, I have succeeded in finding the visitor and with him the explanation of previous failures. The insect is not a moth nor a fly, but an almost microscopically small creature belonging to the Thripsidæ (Physopoda), a family of the Orthoptera. Their length is only 1 or 1½ mm., but when they are crawling up the style and attempt to force their way through the mass of pollen which completely fills the narrow space between the style and the anthers, they force a considerable quantity of the pollen down upon the secondary stigma. At the same time they cover themselves with numerous pollen grains, as can be seen on

the mounted specimens, although these had been kept in alcohol and subsequently in glycerin before they were mounted.

When the winged forms finally make good their escape they carry the pollen to other flowers, to which they are attracted by the Brown's bodies, for they live on the juices of plants and would consequently eagerly suck the sweet contents of these bodies. Thus they would effect cross-pollination.

Recapitulation: The flowers of *Sebæa exacoides*, and probably of all species of *Sebæa*, are diplostigmatic, the swollen portion of the style being a secondary stigma.

The function of the secondary stigma appears to be in the first instance the securing of self-pollination when cross-pollination should not have been effected, but it will also increase the probability of cross-pollination.

The flowers are visited by one or more species of thrips, which obtain the saccharine contents of the Brown's bodies by piercing them with their mouth parts. On leaving the flower they carry its pollen to others, thereby effecting cross-pollination.