DINTERIA NR. 19 — WINDHOEK S.W.A. — MAI 1987

Hydnora johannis in Southern Africa

by
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INTRODUCTION

The Hydnoraceae, with only the genera *Hydnora* and *Prosopanche,* includes some of the strangest plants in the world. *Prosopanche* is found in Central and South America. *Hydnora,* on the other hand, is essentially African in distribution with perhaps two species in the southern portion of the Arabian peninsula (Musselman, unpublished). Harms (1935) notes that the genus contains about 12 species in Africa but fewer species may be recognized with further research. Very little information on *Hydnora* is available due to its furtive nature and often seasonal appearance.

The most recent monograph of *Hydnora* is that of Harms (1935) which is based largely on the work of the Italian botanist Vaccaneo (1934). Vaccaneo worked in East Africa and described numerous species. According to Schreiber (1968), two species are present in South West Africa: *Hydnora africana* Thunb. and *H. solmsiana* Dinter. Visser (1981) discusses the biology of *Hydnora africana*, a very distinct species which parasitizes the roots of fleshy *Euphorbia* species.

During recent field studies on parasitic angiosperms in southern Africa, we collected *Hydnora* species in central and northern South West Africa. As a result, we suggest that *Hydnora solmsiana* Dinter is the same plant known in East Africa as *Hydnora johannis* Beccari, as depicted in Plate 1 and 2.

TAXONOMY

The name *Hydnora solmsiana* was published by Dinter in 1909 (Dinter, 1909). In his treatment, the description follows that of *Hydnora africana* and is given below:

Hydnora solmsiana Dtr. ist viel schöner und größer. Sie wächst auf den Wurzeln der *Acacia horrida* am Rivier in Klein-Windhoek in Menge, sowie unter einzelnen Bäumen in Pokkjesdraai, Brakwater, Okakango bei Okahandja und am Rivier ca. eine Stunde östlich von Keetmanshoop. Im Gartenhause des Herrn Ludwig in Klein-Windhoek hatten die Hydnoren die Dielen über 1 Fuß hoch gehoben, es wurden viele Schubkarren der Pflanze darunter hervorgeholt. Die Blüte ist ca. 12 cm lang, röhrig, 4-zipflig, außen abgeplattet, mit Warzen bedeckt, die, wie mir scheint, unentwickelte Blüten darstellen. Früchte so groß wie ein großer Apfel, braunrindig, innen rosa, von

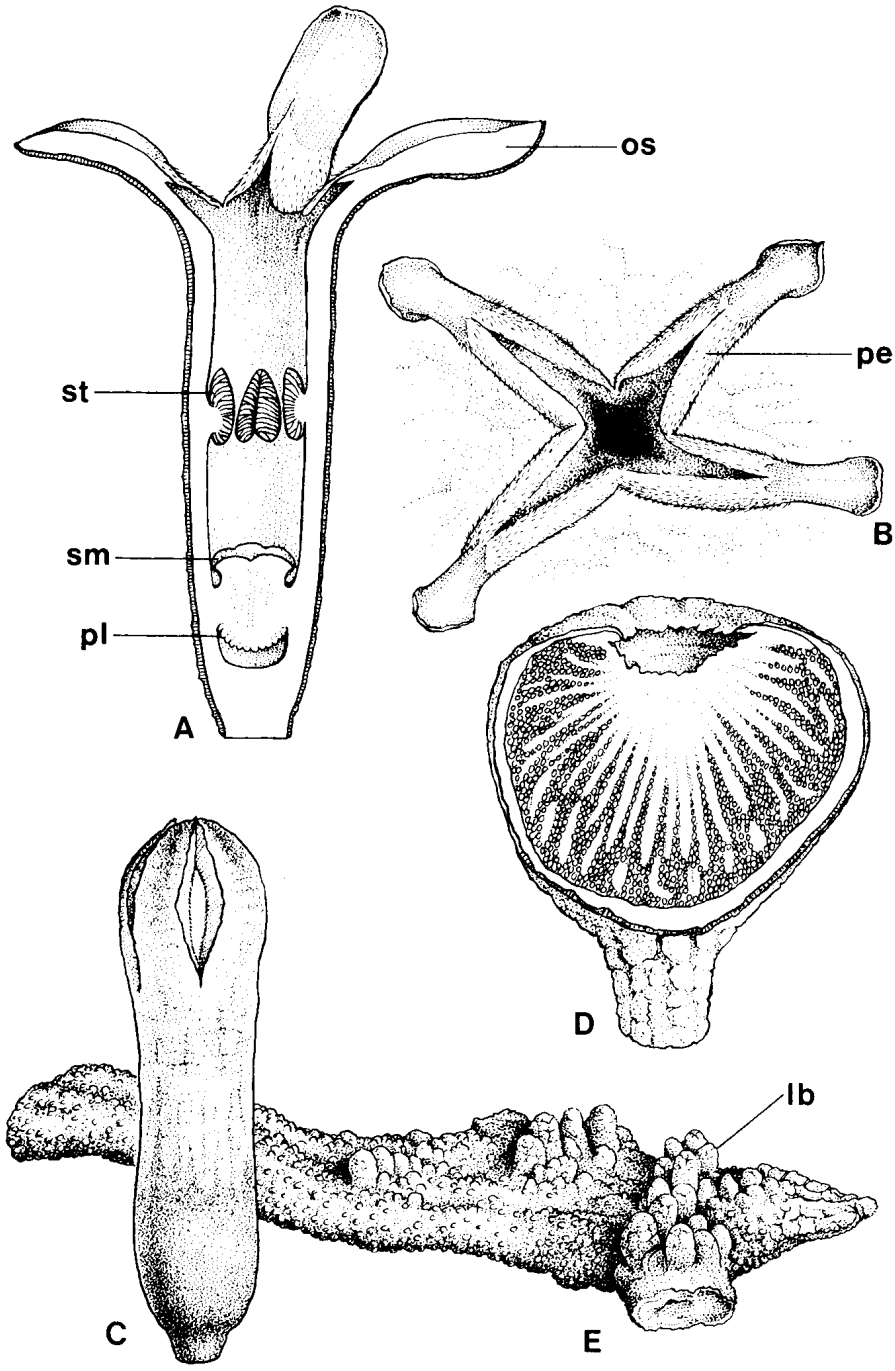

Figure 1. *Hydnora johannis* A, half-flower (os, osmophoric region; pl, placenta; sm, stigma; st, stamen); B, open flower on soil-surface showing spreading perianth lobes (pe, perianth-lobe); C, a flower showing only slight separation of perianth lobes at anthesis because of lack of moisture; D, half-fruit; E, portion of root (lb, latent bud). A & B x approx. 2/3; C, D, E x approx. 1/2. (Used with permission of Royal Botanic Garden, Edinburgh).

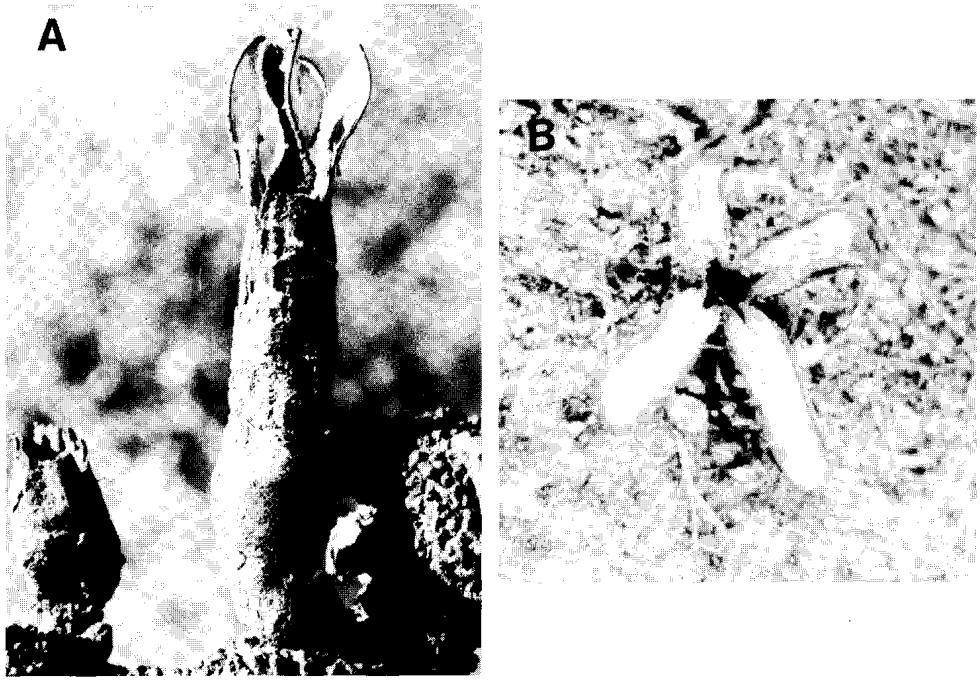

Fig. 2. *Hydnora johannis.* (a) Under relatively dry conditions the perianth lobes do not open fully. (b) Under wet conditions the lobes are fully reflexed exposing the entrance to the subterranean part of the flower.

vielen Tausenden hirsekorngroßen Samen erfüllt, oft zu 4-6 nestartig auf dem Rhizom zusammensitzend.

Later, Dinter (1922) discussed the relationship of *Hydnora solmsiana* to other *Hydnora* species:

Diese stets tetramere Art unterscheidet sich von den übrigen Arten dieser Gruppe, und zwar von *H. hanningtoni* und *H. abyssinica* durch die sehr starken (handgelenkdicken) Rhizome und von *H. bogosensis,* die nach Beccari „rosy-yellow inside" ist, durch ihre cremeweiße Farbe. Mit der trimeren *H. longicollis* hat sie gar nichts gemein.

We have not been able to locate the type of *Hydnora solmsiana,* it appears that the type was destroyed in the Berlin herbarium during the Second World War (Butzin, personal communication). Likewise, we have not been able to locate the type of *Hydnora johannis* so further work is needed in the typification of this and other species in the genus. In fact, in view of the often very large populations, there is a remarkable paucity of *Hydnora* in any of the world's larger herbaria; fewer than 100 specimens have been available in several years of taxonomic research in the genus. The point needs emphasis that more specimens are necessary for a critical revision of the genus. The cause of so little material is no doubt due to the difficulty of preparing the usual type of herbarium specimens (see Musselman, 1984).

Schreiber (1968), in her treatment of the genus for the Prodromus states regarding *Hydnora solmsiana* „Die Abgrenzung dieser Art gegenüber der ostafrikanischen *H. johannis* Becc. ist ungeklärt . . ." The possible relationship between these two species had been noted earlier by Harms (1935).

Hydnora johannis was described by Beccari in 1871. His original description follows:

1. *Hydnora johannis*, sp. n., hermaphrodita; perigonio *quadrifido* laciniis primum erectis, dein horizontali-patentibus vel saepe etiam reflexis, elongatis ovato-lanceolatis, carnosis, *roseo-carolloideis* interne coloratis, externe una cum tubo terreo-ochraceis, apicem versus albido-discoloribus pergamenaceis, *uncinatus,* marginibus *muricato-barbatis*, reflexis. Anterhis 4 contigusi, annulum competum efformantibus, leteis. Stolonibus carnosis, teretibus, tuberculosis.

A comparison of the description of Dinter (1909) and the above by Beccari shows some of the similarity between the plants. For example, both refer to the "tubercles" on the outer surface of the roots (which Dinter terms a rhizome), and its terete shape.

Earlier work by one of us in East Africa (Musselman) indicated that there was little, if any difference between the plant known as *Hydnora johannis* and *Hydnora solmsiana.* Accordingly, we have collected material in South West Africa, Botswana, and Zimbabwe for comparison. We now conclude that the two names are synonymous and that the plant known as *Hydnora solmsiana* is correctly known as *Hydnora johannis.*

Specimens Examined

SOUTH WEST AFRICA: W. Bauer, Grootfontein (WIND); Freyer in Giess 7649 & 7650, Otavi/Grootfontein (WIND); KAT. E 807, Tsumkwe (WIND); Gaerdes in Giess 7651, Okahandja (WIND); Kotze in Giess 10892, Bethanie (on *Acacia karroo*) (WIND); Giess & Robinson 13256, Maltahöhe (on *Acacia karroo*) (WIND); Musselman & Visser sn, Namutoni (on *Acacia tortilis*) (ODU); Musselman & Visser, Halali (on *Acacia luederitzii*) (ODU); Hälbich in Giess 7652, Karibib (M); Merxmüller & Giess 28200a, Maltahöhe (on *Acacia karroo*) (M);

ZIMBABWE: Musselman & Obilana sn, Bulawayo (on *Acacia tortilis*) (ODU, M).

BOTSWANA: P. Smith, Okavango (ODU).

To our knowledge, the reports from Botswana and Zimbabwe are the first collections from these areas. However, *Hydnora johannis* is known from several collections in Tanzania (Musselman, unpublished) and there is a recent report of this species from Zaire (Malaisse, 1982). Thus, it appears that *Hydnora johannis* may be a widespread species throughout much of Africa. Further work is necessary in Zimbabwe, Zambia, Angola, and Mozambique as well as central Africa to determine the distribution of *Hydnora* species.

Synonymy

Hydnora johannis Beccari in Nuov. Giorn. Bot. Ital. 3:5 (1871). Synonyms: *Hydnora abyssinica* A. Braun in Schweinfurth Beitrag zur Flora Aethiopiens 217 (1867); *Hydnora solmsiana* Dinter in Deutsch-Südwest Afrika Flora, Forst- und landwirtschaft-

liche Frag. 57 (1909). Other names which should be investigated are *Hydnora cornii* Vacc., *H. ruspolii* Chiov., *H. bogosenis* Becc., *H. hanningtonii* Rendle.

Description

Because there is no detailed description of *Hydnora johannis* for the region, we present the following based on South West African material (adapted from Musselman (1984). We are here using the term root for the underground portion of the plant in the sense of Visser (1981) rather than Musselman (1984).

Holoparasitic herbs with often massive root system spreading laterally from the *Acacia* host. Roots up to 1 dm wide, terete or sometimes flattend. Periderm well developed, brick-red except at the tip of the root. Fresh roots flesh-red with sticky exudate, extremely bitter and astringent. Entire root (except for the tip) covered with warty out-growths. Neighbouring roots of other species occasionally growing into the root. Latent and active buds scattered along the roots, usually in clusters of 2-4. Flowers emerging from the soil after the rains. Buds tubular with valvate lobes. Flowers usually 4-merous but occasionally 3- or 5-merous. If adequate moisture present, perianth-lobes patent and resting on the soil; if moisture is lacking, lobes not reflexed but flower opening by a slight separation of the lobes. Flowers variable in size from 5-25 cm, the length depending on the depth of the root, pedicel 4-9 cm. Perianth tube terete to 4-sided, 3-4 cm in diameter. Ovary inferior, with numerous infolded, pendant placentae; unilocular. Stigmas 4 (3-5), sessile with distinct grooves on surface. Stamens 4 (3-5), basifixed with 2 large anthers 2.5-3 x 2-2.5 cm. Pollen very sticky, adhering to the anthers. Perianth lobes 6-8 cm, 3-sided, differentiated at the tip into a glabrous, light pink osmophoric cucullus with a strongly fetid odor; perianth-lobe below cucullus densely pilose, light pink, and not osmophoric. Fruit a fleshy berry, globose, 10-15 cm wide, many-seeded and entirely subterranean. Fruiting pedicel very short and easily separated from the root. Outer layer of fruit a scaly periderm; inner pericarp mealy, white, very sweet. Fruiting placentae similar to inner layer of pericarp in taste and texture. Seeds brown, very hard, irregularly shaped, oblong to globose, 1-1.7 mm.

Chromosome Number

Chromosome number ca. N=8 (Coffin and Musselman, unpublished) based on Sudan material. This is the first count for this genus.

Floral Visitors

The fetid flowers are visited by beetles in Sudan (Musselman, 1984) and Zimbabwe (N. Hughes, personal communication).

Hosts

We know of no instances where *Hydnora johannis* grows on any host other than species of *Acacia.* The observations of Dinter reflect the usual observation that the *Hydnora* is often expected on a certain species but will occasionally be found on a different host. "An der Etoshapfanne Südseite fand ich Früchte einer *Hydnora* auf *Acacia heteracantha,* leider nicht in Blüte, so daß nicht festgestellt werden konnte, ob es sich um *H. solmsiana* oder um eine andere Art handelt (Dinter, 1909)." Later, (Dinter,

1922) he noted "Sie wächst (abgesehen von einem Falle, wo ich auf *Acacia uncinata* eine *Hydnora* an der Etoshapfanne fand, die aber aus Blütenmangel nicht sicher zu bestimmen war) ausschließlich auf *Ac. horrida* und in Windhoek außerdem auf der austr. *Ac. cyanophylla*". What is not clear is if there is a preference for certain groups of *Acacia* species, i.e., species in a certain section of the genus. Like other parasitic angiosperms, it is no doubt unwise to attribute a very narrow host range to *Hydnora johannis*. The recorded hosts for South West Africa are noted in the list of cited specimens.

Uses

The uses of various species of *Hydnora* is recorded in Vaccaneo (1934). In South West Africa, the fruits are eagerly sought by Bushmen (Paxton, personal communication). In Etosha Pan, we observed a large population of *Hydnora johannis* which had been excavated by foraging elephants. Rhinoceros are reported to do the same in Uganda (in Musselman, 1984). In Sudan and other parts of East Africa, the dried roots of *Hydrona* are used as an antidiarrhoeal medicine; we are not aware of a similar use in southern Africa. During World War I, a large German shipment of *Hydnora johannis* was intercepted by the British (in Musselman, 1984) but its intended use was never determined. Was this used for tanning hides? The following quote from Dinter (1909) suggests this: "Die ganze Pflanze enthält außerordentlich viel Gerbsäure, weshalb sie Stern & Henker fuderweise in Klein-Windhoek sammeln liessen und zur Gerberei verwendeten. Vor dem Kriege wurde auch in Okakango zum großen Teil mit diesem Material gegerbt". It would be interesting to know if the shipment from Khartoum had a similar use.

Acknowledgments

We thank Mr Mark Paxton and Ms Norma Hughes for their assistance. Financial assistence by the Foundation for Research Development of the CSIR is gratefully acknowledged.

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