HAUSTORIUM AND IPPC

HAUSTORIUM issues 9 through 14 were word processed, printed, and distributed by IPPC, the International Plant Protection Center at Oregon State University (USA), with support derived in part from a contract with AID, the U.S. Agency for International Development. That contract ended May 31, 1985 and with it the Center’s ability to absorb printing and mailing costs.

Issues #15 was printed and mailed by the INTSOMIL program headquartered at the University of Nebraska (USA). On behalf of the International Parasitic Seed Plant Research Group, we express appreciation to IPPC for its interest and assistance, to AID for support, and now to INTSOMIL for willingness to keep Haustorium alive.

The Editors

STRIQA BAUMANII ENGL.
AN UNUSUAL BIOLOGY
FOR A PARASITIC PLANT
Aline Raynal-Rouques

12, fig. 0-5), little has been added to our knowledge of this unusual plant. It is a perennial herb with stiff glabrous stems, scale leaves and tiny flowers. The broad basal leaves have never been described, nor has its peculiar way of life which appears to be unusual among parasitic flowering plants. Striga baumanii occurs in Sudanian savannas extending from Kenya and Zaire in East Africa to Sierra-Leone and Mali westwards. It is restricted to plateau and montane-grasslands, at 50 to 200 m elevation. This means that it grows in comparatively wet savannas north of the equator where, despite an 8-9 months dry season, wild fires sweep the savannas.

Shortly after the beginning of the rainy season, the soil becomes wet or even water-logged. At this time a short stem arises from the rootstock and bears a single pair of green, thin, delicate, nearly circular leaves which spread on the soil surface. Each leaf is about 1 cm in diameter; the perfoliate leaf-base fonn a tiny cup around the abortive stem apex. With functioning leaves and water supply, the tuberous roots begin to thicken.

These two small leaves do not last long; as soon as the weather becomes dry they fade, turn pale yellow and shrink. At this stage they are easily broken off and estimated to 1.8 - 0.7 m. In the dry season, wild fires sweep the savannas.

As the season becomes even drier, the vegetation becomes sparser on the dried soil. The early wild fires burn the savanna, destroying grasses and leaves. After the fires the flower stems of Striga baumanii appear. From the rootstock arises one flowering stem (sometimes two or three). The stem bears opposite-decussate leaves. The upper stem (one half or two thirds of its total height) is densely covered by flowers. When the flowering stems dries, seeds disperse by exploding capsules in the hot savanna. As the dry season progresses other fires come across, burning Striga stems when the first rains finally come, the unburnt flowering stems rot quickly, and nothing remains of the plant above ground level. Soon after the tuberous rootstock will produce two new rounded leaves. The functioning leaves will mark the beginning of a new cycle.

...
An unusual biology for a parasitic plant.

During the year, *Striga baumannii* has two distinct vegetative and flowering phases. It looks like two different plants with different stems and leaves. This alternation is related to food production in the vegetative phase, and food utilization in the flowering phase. As a whole, *Striga baumannii*‘s biology must be considered as a geophytic one. Such a way of life is shared by a number of savanna plants belonging to various families (Compositae, Papilionaceae, Asclepiadaceae, Convolvulaceae, etc.). They flower in the dry season after the burning of savanna grasses; all of them have tuberous or woody, turmip-like or bulbous root stocks; produce leafless flowering scapes; leaves appear later on, and develop after fruiting during the next rainy season. Flowers and leaves are not commonly seen at the same time except when small early flowers appear soon after flowering. These geophytic plants are called "pyrophytes", though they do not really need fire to bloom but probably only a bare overheated soil. *Striga baumannii* is a geo-pyrophytic species. The parasitic habit of *S. baumannii* is evident, its hosts are unknown but root-connections are frequent. As far as known, it is the only flowering plant being both a parasite and geopyrophyte.

Brief description of *Striga baumannii*:

Leafy stem:
* a single stem in the rainy season;
* short (2-4 mm high), just enough to raise the leaves up to ground level;
* bears no more than one pair of developed leaves; its base, on the root stock, is clasped by two minute scales;
* never grows into a flowering nor a leafy stem later.

Vegetative leaves:
* one pair per stem borne in the rainy season;
* blade round, somewhat broader than long (c. 1 an long, 1, 3 an broad), narrowed at base, sessile;
* leaf-bases connate.

Flowering stem:
* up to four at the same time produced in the dry season;
* thin and stiff, 20-50 cm high; mostly unbranched;
* glabrous, pale grey-green; 4-angled nearly terete, sometimes longitudinal furrowed;
* bears opposite, deussate, scale leaves on the upper ones containing auxiliary flowers; leaf length: 4-9 mm;
* internodes: up to 4 cm long in basal part of stem; abruptly shorter (10-15 mm) in flowering upper one.

Flowers:
* tiny, sessile, erect, stiff; clasped the scaly bract;
* two acicular bracteoles;
* calyx narrowly tubular, 10-12 mm long about 13-15 ribbed;
* four unequal erect teeth; anterior lobes shorter (c. 3 mm long) lateroposterior ones longer (c. 4 mm long); tube deeply cleft on the back;
* corolla narrow, as long as the calyx, long-tubular, dark reddish, turning brownish;
* five subequal narrow lobes, somewhat carnose-thicken, papillose incide, c. 5 mm long, spreading-excurving;
* corolla tube 10 mm long, 0.5-0.9 mm wide;
* stamens 4; filaments very short (0.2 mm); anthers 1-1.5 mm high;
* inserted by pairs on two different levels in the corolla tube: the anterior pair higher than the lateroposterior one;
* pistil 3.5-4 mm high; ovary 1.5 mm long; stigma club-shaped, beneath the anthers.

Fruits and seeds:
* Capsule included in calyx and capped by marcescent corolla;
* narrowly linear, 6.5-7.5 mm high, 1-1.3 mm wide; apex truncate;
* dehiscence by 2 loculicidal slits;
* seeds numerous, angular, dark reddish brown, 0.5-0.7 mm long.

Tuberous rootstock:
* Roots clustered, fusiform, tuberous in upper part; fleshy part c. 15 mm long and 2.8 mm thick, tapering downwards;
* whitish, smooth when fresh; blackish, wrinkled when dry;
* roots are thinning when drying; they do not appear obviously tuberous in herbarium specimens;
* root-connections with host roots (host unidentified, probably grasses);
top of stock: a few millimeters under ground level;
*previous year of stems leave scars on the stock: the small number of scars observed suggest that a single plant lives only a few years.

The Weed Research Division (previously Weed Research Organization, now part of the Long Ashton Research Station of Bristol University), is continuing to work on parasitic weeds under funding from the U.K. Overseas Development Administration (ODA). After many years of work on the Striga problem in cereals it is concentrating on cowpea (Vigna unguiculata), studying its resistance to Striga gesnerioides and Alectra vogelii and the possibilities of selective control by herbicides. The project is collaborative with Birkbeck College, London, where the genetic variability of S. gesnerioides is being studied. Birkbeck College also has a separate ODA-funded Striga project, looking in depth at Striga resistance mechanisms in the cereals.

At the Royal Tropical Institute an EEC-funded project is in progress on the resistance of Vicia faba beans to Orobanche crenata.

---

Striga baumannii -1. Whole plant in rainy season (vegetative phase); scale: 1 mm; fs, base of an old, burnt flowering stem (from last dry season); hr, host root.
---

2. Basal part of plant in dry season (flowering phase); scale: 1 mm; the rounded vegetative leaves are dry; fs, flowering stems, 2 are already developed and blooming, the third one is younger; s, scar left by stem (of previous year). -3. Habit of whole plant in dry season; scale: 1 mm; vegetative leaves and stem have been destroyed.
---

4. Flower, front view, clasped in its bract; scale: 1 mm. -5. The same, back view, showing the deep sinus on posterior face of calyx.

---

NEW PROJECTS

---

The Weed Research Division (previously Weed Research Organization, now part of the Long Ashton Research Station of Bristol University), is continuing to work on parasitic weeds under funding from the U.K. Overseas Development Administration (ODA). After many years of work on the Striga problem in cereals it is concentrating on cowpea (Vigna unguiculata), studying its resistance to Striga gesnerioides and Alectra vogelii and the possibilities of selective control by herbicides. The project is collaborative with Birkbeck College, London, where the genetic variability of S. gesnerioides is being studied. Birkbeck College also has a separate ODA-funded Striga project, looking in depth at Striga resistance mechanisms in the cereals.

At the Royal Tropical Institute an EEC-funded project is in progress on the resistance of Vicia faba beans to Orobanche crenata.

---

LITERATURE

Renaudin, S., P. Thalouarn, L. Rey, J. Vidal, F. Larher. 1984. Phosphoenolpyruvate carboxylase in parasitic plants: Further characterization in various species and localization at the level of cells and tissues in Lathraea clandestina L. Journal of Plant Physiology 116: 455-465. (This is part of a continuing effort from this laboratory to study the role of this enzyme in parasitic plants. It is suggested that PEPc might perform some kind of internal carbon dioxide cycling and also might play a role in the buffering of pH between host and parasite.)


145:461-464. (This Mexican species of dwarf mistletoe is the largest known. Its phloem appears to be typical dicot phloem; this is the first report of normal phloem in a dwarf mistletoe.)

[Enhinger, J.R., E.D. Schulze, H. Ziegler, O.L. Lange, G.D. Farquhar, I.R. Cowan. 1985. Xylem-tapping mistletoes: Water or nutrient parasites? (By measuring the nitrogen levels in the transpiration stream of the host and parasite, it was found that the water use efficiencies of the parasites were correlated with that of the host. Mistletoes parasitic for water also obtain food from their hosts.)


[Nagarajan, K., T.S.N. Reddy, R. Lal, G.V.G. Krishnamurty, N.S. Murty. Salient research findings on tobacco diseases (1953-1983). 1984. Division of Plant Pathology, Central Tobacco Research Institute, Rajahmundry, India. (Among sane of the interesting findings regarding Orobanche cernua on tobacco was that flooding reduced seed germination by 90% after 4 weeks. Seeds remained viable in the field for only 7 years. A variety of trap crops showed efficacy in reducing the level of seeds in the soil.)


[Mauseth, J.D., G. Montenegro, A.M. Walckowiak. 1985. Host infection and flower formation by the parasite...
Trixtexis aphyllus (Loranthaceae) Canadian Journal of Botany 63 (3) 488-491. (A detailed and fascinating account of the biology of this unusual parasite which, once established, is totally endophytic until...

Ghara, S.; R. Khera. 1985. Lipids of Cuscuta reflexa and changes in lipids of its host plants after infection. Physiology Plants


Striga spp.


Las, P.C. broomrape (Orobanche crenata) in tobacco. 1984 Co sta '84 Bulletin d'Information. C reation Centre for Scientific Research (CORESTA). (Abstract of a paper presented at the 8th International Tobacco Science Congress, Vienna in October 1984, reporting good control of O. crenata and improved tobacco growth from application of maleic hydrazide 0.7 + 0.7 kg/ha or glyphosate at 0.2 + 0.3 kg/ha at 40 + 60 days after transplanting.)

Gupta, A., M. Singh. 1985. Mechanism of parasitism by Cuscuta reflexa, distribution of cytokinins in different regions of the parasite vine. Physiologia Plantarum 63 (1), 76-78. (Cytokinin is shown to be particularly high in the concave portion of the haustorial region.)

Obilana, T.A. 1984. Inheritance of resistance to Striga (Striga hermonica Benth) in sorghum. Protection Ecology 7 (4), 305-311. (Inheritance of the resistance in line 187 is shown to be polygenic, based on 2 to 5 genes. Susceptibility is dominant over resistance.)

Fisterse, A.H., C.J. Pesch. 1983. The witchweeds (Striga spp) - a review. Abstracts on Tropical Agriculture 9 (8), 9-37. (A concise but comprehensive review of 521 references under headings of Systematics, General Botany, Distribution, Habitat and Major Host Crops, Germination, Effect on Host Plants, Chemical Control, Biological Control, Manual and Cultural Control, Resistant Crop Varieties and Chemical Composition and Practical Use.)

Mesa-Garcia, J. L. Garcia-Torres. 1984. A competition index for Orobanche cereata Forsk effects on broad bean (Vicia faba L.) Weed Research 24 (6), 379-382. (An equation is developed: \( \frac{x}{\text{crop loss}} = 100 \times \frac{0.124}{\text{Ocn}} \) where Ocn is the average final number of emerged O. cereata per crop plant.)


Forstreuter, von W., H.C. Weber. 1984. Zum parasitismus von Cuscuta auf Euphorbia-Wirten, Beiträge zur Biologie der Pflanzen 59 (1), 31-54. (The abnormal growth of C. reflexa and C. odorata on Euphorbia spp was studied, and the further abnormalities resulting from application of growth regulator such as chloromequat.)

HAUSTORIUM is edited by C. Parker, Weed Research Organization, Begbroke Hill, Yarnton, Oxford OX5 1PF, UK and L.J. Musselman, Dept. of Biological Sciences, Old Dominion University, Norfolk, VA 23508 USA, and typed by Susan Larson, IPFC, OSU, Corvallis, OR, USA. Material should be sent to either editor as should requests for copies.

Copies of back issues #9, 10, 11, 12, 13, and 14 are available free while supply lasts. Photocopies of #1-8 are available from IPFC at US$.50 per issue.

Material from HAUSTORIUM may be reprinted provided that appropriate credit is given.

This issue of HAUSTORIUM was reproduced mailed to you by the Sorghum/Millet Collaborative Research Program, INTSORML. The collaborative research program is supported by a grant from the United States Agency International Development, Contract Number DAN-1254-G-SS-5085-00.