

PARASITISM IN XIMENIA (OLACACEAE)

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Ximenia is a small genus of tropical shrubs and trees in the dicotyledonous family Olacaceae. A trend of parasitism occurs in the order Santalales, which includes Olacaceae, Loranthaceae, Viscaceae, Santalaceae, and Misodendraceae, as circumscribed by Kuijt (1968). In the Olacaceae, which is thought to be the plexus from which all other Santalalean families take their origin, parasitism has been documented in three of the approximately twenty genera: *Ximenia*, *Olax*, and *Ptychopetalum*.

Root-hemiparasitism in the Olacaceae was first reported by Heckel (1900), who observed haustoria of *Ximenia americana* L. var. *americana* attached to *Piper chaba* Hunter. He planted *Ximenia* seeds collected near Libreville, Gabon, in individual pots containing *Tamarindus indica* L. (Leguminosae), *Erythroxyylon coca* Lam. (Erythroxylaceae), *Hura crepitans* L. (Euphorbiaceae), *Ficus laurifolia* Hort. (Moraceae) and *Piper chaba* Hunter (as *Chavica officinarum* Mig., Piperaceae). Of these intended host species, only *Piper* was attacked after two years.

Barber (1907) observed haustoria of *Ximenia americana* var. *americana* in Madras, India, attached to roots of a dicotyledonous plant. Some haustoria attained the large size of one square inch in surface area. The haustorial and host tissues were illustrated, but the host species was not named.

The present study was made to confirm parasitism in *Ximenia*. In November, 1965, shrubs of *X. americana* var. *americana* were received from a natural habitat near Immokalee, Florida, and specimens of *Pelargonium hortorum* Bailey (Geraniaceae) were later placed in a pot with one of them. When harvested in June 1968, numerous haustoria were found attached to the host roots (Fig. 1). Several of the large *Ximenia* shrubs are now growing in the absence of host plants, which may indicate that these organisms are facultative, rather than obligative, parasites.



Fig. 1. Haustoria of *Ximenia americana* L. var. *americana* (pale) attacking roots of *Pelargonium hortorum* Bailey (dark) and concomitantly parasitizing itself (arrows), $\times 1$.

Seeds of *Ximenia americana* var. *americana* were obtained from Immokalee in September 1966 and grown in individual pots. In May, 1967, these intended host species were selected arbitrarily and introduced into the pots: *Bryophyllum pinnatum* (Lam.) Oken (Crassulaceae), *Rhoeo spathacea* (Swartz) Stearn (Commelinaceae), *Zamia floridana* DC. (Cycadaceae). All of the host plants, harvested in October, 1967, and January, and June, 1968, had haustoria attached to their roots. This caused neither a visible lack of vigor in the hosts nor increase in vigor in the parasites.

Heckel (1899, 1900) noted that *Ximenia americana* var. *americana*, when growing in the absence of a host, will produce haustoria which attack its own roots, the subterranean portion of the stem, and the endosperm of the seed from which the plant grows. In the present study, the shrub which parasitized *Pelargonium* concomitantly produced haustoria which attached to its own roots (Fig. 1). A specimen of *X. caffra* Sonder var. *natalensis* Sonder, grown alone from seed obtained from Salisbury, Rhodesia, also formed a number of haustoria which parasitized its own roots. Other examples of this phenomenon in the Santalales are cited by Fineran (1965).

The attachment of *Ximenia* haustoria to non-living objects has not been previously reported; prior reports exist for *Olax* (Olacaceae) and genera in the Santalaceae, Loranthaceae and Scrophulariaceae. In this study, haustoria on roots of *X. americana* var. *americana* shrubs were observed attached to a small stone, a piece of charcoal, bits of plastic intentionally sown in potting soil, and to the cellophane-like coating on the interior of a metal can in which one specimen was growing (Fig. 2). Therefore, the presence of living host roots is not always necessary for the initiation of *Ximenia* haustoria. A similar conclusion was made by Piehl (1962) for *Melampyrum* and Fineran (1965) for *Exocarpus*.

The attachments to non-living objects are FAA-preserved in the Southern Illinois University Herbarium. Histological

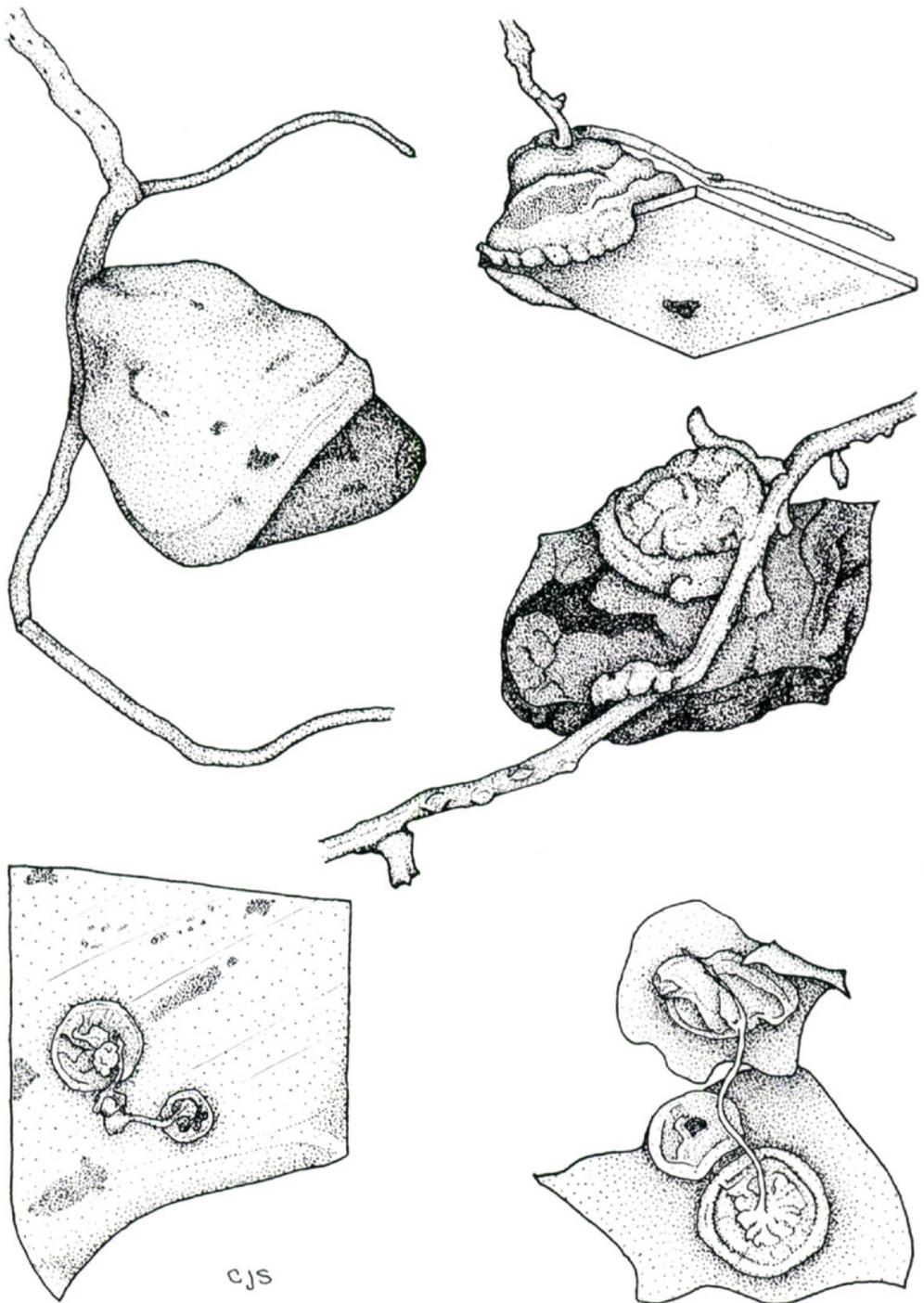


Fig. 2. Haustoria of *Ximenia americana* L. var. *americana* attached to non-living objects. Upper left: Stone, $\times 10$. Lower left: Cellophane-like coating on metal, $\times 2$. Upper right: Plastic, $\times 3.5$. Center right: Charcoal, $\times 4$. Lower right: Cellophane-like coating removed from metal, $\times 2$.

studies of the parasite-host attachments and attachments between *Ximenia* roots on the same plant are in progress in the laboratory of Dr. B. Fineran, Botany Department, University of Canterbury, Christchurch, New Zealand.

Plants were grown in the Production Greenhouse, Southern Illinois University, Carbondale. Mr. R. Wadlow, of Immokalee, Florida, supplied seeds and shrubs of *Ximenia americana*. Mr. T. Miller and Dr. H. Wild, Chief Botanist, Federal Herbarium, Salisbury, Rhodesia supplied seeds of *X. caffra*. The figures are by Mr. C. Seliger.

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