

Swartzia pinnata (Fabaceae) seeds are dispersed by bats

Christopher K. Starr

Dept of Life Sciences, University of the West Indies, St Augustine, Trinidad & Tobago. ckstarr@gmail.com

(Received: March 23, 2012)

KEY WORDS. arilloid, *Carollia perspicillata*, Seed dispersal, *Swartzia*

It has long been recognized that many flowering plants are adapted for seed dispersal by animals, the most common agents being birds, mammals and ants (Stiles 2000). The identity of the main dispersal agent(s) can often be predicted with some confidence from features of the fruit and/or seeds (Pijl 1982).

Swartzia is a genus of neotropical trees comprising about 180 known species, found mostly in lowland rain-forests (Torke & Schaal 2008). The large seeds of many species are at least partly enveloped in an arilloid that is presumed to attract birds or mammals. Two species with bright red arilloids are known to be dispersed in large part by monkeys and toucans, respectively (Boucher 1981, Zamora *et al.* 2000).

The three species of *Swartzia* found on the island of Trinidad, West Indies are readily distinguished by physical features of the leaves, seed pods, and numbers of seeds per pod (Williams 1931). Of these, *S. pinnata* (Vahl) Willd., known locally as "bwa pwa", occurs as a substantial, cauliflorous tree in the understory of relatively dense forest. The inflorescences are borne on relatively slender stalks, typically at least 10 cm long (pers. obs.). The mature fruit contains from one to several seeds, each capped with a distinctly sweet white arilloid.

The seeds show only moderate size variation. A sample of 20 seeds had a mean length of 25.7 mm, mean maximum diameter of 17.2 mm, and mean fresh weight of 4.54 g. The seed coat is not especially tough, varying in thickness from about 0.08-0.24 mm. The texture and taste of the storage cotyledons are, to me, those of a typical edible nut, with a mildly unpleasant aftertaste, although with none of the bitterness that one normally associates with chemical protection against herbivores. The arilloid, with a volume of roughly 1 ml, is easily stripped from the seed with the teeth. At maturity, the fruit dehisces to expose its seeds (Fig. 1).

These features speak in favour of adaptation to seed dispersal by bats. The colourless arilloid is inconsistent with adaptation to attract birds, and it seems very unlikely that the seed could pass uncrushed through the gizzard of any parrot or

other bird large enough to swallow it. Fallen seeds can be expected to attract agoutis (*Dasyprocta* spp.), but this large rodent would seem indifferently suited to disperse viable seeds. Although agoutis often cache seeds, they commonly eat them on the spot, and they can penetrate even hard seed coats (Eisenberg 1989, Smythe 1983). It seems out of the question that any non-flying mammal could access the seeds before they drop. Marshall (1939) stated, without adducing evidence, that "Bats assist in seed distribution" of this tree and suggested caching by other mammals as a contributing factor.

My house, Obronikrom, at 10°40'N 61°21'W in Trinidad's Northern Range consistently has bats roosting under the eaves and occasionally inside the house. Most or all of these are *Carollia perspicillata* (Linnaeus, 1758) (Phyllostomatidae), the lesser short-tailed fruit bat, a major seed disperser in neotropical forests, as indicated by casual observations of the bats and the frequent presence of partly stripped *Piper* sp. (Piperaceae) infrutescences under the roosts (Eisenberg 1989, Fleming 1983).

Over the course of six weeks in 2009, beginning in mid-August and ending abruptly around the end of September, one or more bats left a total of 174 *S. pinnata* seeds on the floor inside the house, mostly in one little-used room. The maximum number of seeds deposited in one night was nine. Some of these retained vestiges of the arilloid, but in most it had been stripped away cleanly. Smaller numbers of seeds were deposited in the same manner in 2010 and 2011. A search of an area of at least 50 m radius from the house revealed no fruiting *S. pinnata* tree, consistent with the hypothesis of dispersal by bats over a significant distance.

Thanks to Winston Johnson and Mike Oatham for advice on the plants and to Tom Kunz for advice on the bats. The fruits of *S. pinnata* first came to my attention on a field trip led by Ishmael Samad.

LITERATURE CITED

- Boucher, D.H. 1981. The "real" disperser of *Swartzia cubensis*. *Biotropica* 13 (Supplement): 77-78.
 Fleming, T.H. 1983. *Carollia perspicillata* (murciélago

- candelaro, lesser short-tailed fruit bat). *In*: D.H. Janzen (ed.), *Costa Rican Natural History*. Univ. of Chicago Press, Chicago, pp. 457-458.
- Eisenberg, J.F. 1989. *Mammals of the Neotropics: Panama, Colombia, Venezuela, Guyana, Suriname, French Guiana*. Univ. Chicago Press, Chicago. 449 p.
- Marshall, R.C. 1939. *Silviculture of the Trees of Trinidad and Tobago, British West Indies*. Oxford Univ. Press, Oxford. 247 p.
- Smythe, N. 1983. *Dasyprocta punctata* and *Agouti paca* (guatusa, cherenga, agouti, tepezcuintle, paca). *In*: D.H. Janzen (ed.), *Costa Rican Natural History*. Univ. Chicago Press, Chicago, pp. 463-465.
- Stiles, E.W. 2000. Animals as seed dispersers. *In*: M. Fenner (ed.), *Seeds: The Ecology of Regeneration in Plant Communities*. 2nd ed. CABI, Wallingford, pp. 111-124
- Van der Pijl, L. 1982. *Principles of Dispersal in Higher Plants*. Springer, New York. 214 p.
- Torke, B.M. & G.A. Schaal. 2008. Molecular phylogenetics of the species-rich neotropical genus *Swartzia* (Leguminosae, Papilionoideae) and related genera of the swartzioid clade. *Amer. J. Botany* 95: 215-228.
- Williams, R.O. 1931-32. Dicotyledons. Group 1. Polypetalae. Cohort 11. Rosales. *Flora of Trinidad & Tobago* 1: 197-321.
- Zamora V., N., Q. Jiménez. & L.J. Poveda. 2000. *Árboles de Costa Rica*. Vol. 2. INBio, Santo Domingo de Heredia, 374 p.



Figure 1. Terminal part of two pods in a *Swartzia pinnata* infructescence. The pericarp of the right-hand pod has split naturally to expose the seeds and their white arilloids. Length of seed plus arilloid about 30 mm. Photo by M.P. Oatham.