NOTES

The Possible Beginning of Adaptation to a New Host by Bruchid Beetles in Venezuela

On 10 and 12 July 1982, my wife and I collected several hundred bare seeds of *Acacia flexuosa* and *Parkinsonia aculeata* covered with many eggs of bruchids from the surface of the ground and in cattle dung about 2 km west of Puerto Cabello, Carabobo, Venezuela. Twenty-three adults of *Stator vachelliae* emerged from the seeds of *A. flexuosa,* and one adult emerged from a seed of *P. aculeata* (Table 1).

Another sample on 12 July 1984 revealed that *P. aculeata* seeds were heavily oviposited, and again only one *S. vachelliae* was reared from the seeds; but many of these bruchids were reared from seeds of *A. flexuosa* (Table 1).

What is remarkable about these records is that this bruchid has only five known natural hosts, all in the genus *Acacia.* Here, it was able to feed and develop in the very odd host, *P. aculeata,* in a natural situation. Five species of bruchids feed naturally in the seeds of *P. aculeata,* but these bruchids do not develop as well in *P. aculeata* as they do in their other hosts (Johnson 1981b). I have reared many bruchid beetles from seeds exposed on the ground, but I have never reared any from *P. aculeata* before this.

While collecting from 1982 till 1985 in other localities in Venezuela, I reared many *S. vachelliae* from acacia seeds collected from the ground, so I consider species of *Acacia* to be the primary hosts of this bruchid. Because of this, we visited the same locality on 19 January 1985 to determine if the bruchids were attracted to seeds of a particular species or if the eggs were oviposited by "mistake" on the seeds of *P. aculeata.*

Puerto Cabello is in a lowland tropical deciduous forest. *A. flexuosa* was scattered among other vegetation, but *P. aculeata* grew in dense stands in low areas where water tended to accumulate during the rainy season. In a few places the two species were within 10–12 m of one another, and the upper limbs of the two species of trees overlapped so that seeds of both species accumulated beneath the overlap and intermingled on the ground. Only very few eggs were laid on seeds of the stands of *P. aculeata* that were not mixed with seeds of *A. flexuosa* on the ground (see 1985 data in Table 1. When these seeds were under the overhang of both tree species and were intermingled, many more eggs were oviposited on the seeds of *P. aculeata.* Only one adult emerged from these seeds, however (Table 1). More bruchids (in some cases many more) were reared from seeds of *A. flexuosa* sampled from the same area of overlap.

TABLE 1. *Data from collections of seeds of* P. aculeata *and* A. flexuosa, *and emergence of* S. vachelliae *from them, near Puerto Cabello, Carabobo, Venezuela, on 10 and 12 July 1982, 12 July 1984, and 19 January 1985. Lot numbers are in parentheses.*

	No. of seeds collected	No. of eggs laid	No. of *S. vachelliae* emerged
1982			
Parkinsonia (2410)	148	143	1
Acacia (2400 & 2418)	414	213	23
1984			
Parkinsonia (3347)	545	283	1
Acacia (3345)	800	1000	200+
1985			
Parkinsonia (3697) (not overlapping)	417	19	0
Parkinsonia (3698) (overlapping)	285	214	1
Acacia (3696) (not overlapping)	10	30	3
Acacia (3699 & 3700) (overlapping)	215	303	200+

From the data in Table 1, I interpret that seeds of *A. flexuosa* on the ground beneath this plant are preferentially oviposited. Once the plant is found, the bruchids search for smooth objects about the size of seeds of acacia upon which to oviposit. (I have seen small pebbles with bruchid eggs on them when the pebbles are mixed with seeds of *Enterolobium cyclocarpum* beneath the parent plant in Venezuela.) If the correct set of variables is available, then oviposition behavior is released and the smooth objects are oviposited upon. Because *S. vachelliae* has been reared from seeds of *P. aculeata*, it appears that this is what has happened in this instance.

Therefore, because the published data on the oviposition tactics of *S. vachelliae* indicate that it will rarely oviposit upon nonhost seeds and develop in even fewer (Johnson & Kingsolver 1976; Johnson 1981 a, b, 1984), it is remarkable that it oviposited upon seeds of *P. aculeata* and even more remarkable that it was able to complete its development in them. I attribute this to the presence of *A. flexuosa* plants and seeds that triggered ovipositional behavior and subsequent mistakes by ovipositing females of *S. vachelliae*. This may be the beginning of adapting to a new host by *S. vachelliae*.

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Altitudinal Distribution of the Hemiparasitic Loranthaceae in Southwestern Saudi Arabia[1]

Studies of hemiparasitic flowering plants have dealt with their description and biology (Kuijt 1969, Visser 1981), evolution (Atsatt 1973), water and nutrient relations (Glatzel 1983, Schulze *et al.* 1984), photosynthetic characteristics (De La Harpe *et al.* 1981), host range (Sampathkumar 1970, Abu-Irmaileh 1979), nutritive value (James 1978), natural enemies (Baloch & Ghani 1980), biological control (Mushtaque & Baloch 1979), and chemical control (Mishra *et al.* 1982). This study concerns the influence of an elevation gradient on the distribution of hemiparasitic Loranthaceae and their hosts in southwestern Saudi Arabia. The degree of association between hemiparasites and hosts is also evaluated.

The study was conducted in Jizan area in two locations (Samba and Wadi Kholab) at elevations ranging from zero to 200 m; in Rijal Alma'a at two locations (Al Reem and Al Selail) ranging from 1000 to 1500 m; over Asir Plateau at five locations (Khamis Mushayt, Hijla, Al Mahala, Ahad Rafidah, and Al Qarah) at elevations ranging from 2000 to 2400 m; and on Al Soudah Mountain at elevations ranging from 2400 to 3000 m (Fig. 1).

Meterological information for the period between 1977 and 1979 showed average annual rainfall, mean maximum temperature, mean monthly temperature, and mean minimum temperature: respectively, 63 mm, 34.5°C, 30.3°C, and 26°C in Jizan (100 m); 392 mm, 22.3°C, 17.8°C, and 13.3°C in Abha (2200 m); and 460 mm, 18.5°C, 14.2°C, and 10°C in Al Soudah (3000 m).

We used 5 quadrats of 20 × 20 m chosen at random along the elevation gradient in each location to estimate the ratio of hemiparasite volume to host crown volume and percentage of trees infested. The volume of the tree crown or hemiparasite was determined according to simple calculations using the formula of the sphere, $V = (4/3)\pi r^3$, or the cone, $V = (\pi r^2 h)/3$, since most of the plant growth fell into these forms. In these formulas V refers to volume, r to radius, and h to height. Plant identification followed Abulfatih (1984a, b) and Collonette (1985).

The three prominent tree species, *Acacia ehrenbergiana*, *Tamarix aphylla*, and *Ziziphus spina-christi*, did not