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GATHERING OF FUNGAL HONEYDEW BY *POLISTES* SPP. (HYMENOPTERA: VESPIDAE) AND POTENTIAL TRANSMISSION OF THE CAUSAL ERGOT FUNGUS

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Ergot honeydew is a sweet, viscous exudate found on flowering cereal heads infected by *Claviceps* spp. (Ascomycetes). The honeydew is a complex mixture of mono-, di- and oligosaccharides resulting from fungal conversion of host phloem constituents (Mower & Hancock 1975a,b). Infective fungal conidia are protected from desiccation by the exudate (Mower & Hancock 1975a), which also assists in dissemination of the fungus by attracting insects that feed on it (Langdon & Champ 1954, Moreno et al. 1971, Carter 1973).

Many insect species are known or suspected vectors of ergot conidia. Diptera and Coleoptera comprise the majority of insects on record (Atanasoff 1920), although other orders, including Hemiptera, Lepidoptera and Hymenoptera have been reported also (Atanasoff 1920, Langdon & Champ 1954, Parris & Moore 1961, Mongolkiti et al. 1969, Moreno et al. 1971, Sharma et al. 1983). The present report describes foraging behavior of several species of *Polistes*, confirms their exploitation of ergot honeydew as a nutritional resource and implicates these wasps as potential vectors of the fungus.

Observations were made from 14 July to 18 August 1987, in a five-ha field of mixed grasses in Baton Rouge, Louisiana, between 1600 and 2000 hours at temperatures of 27° to 32° C. Fifty individuals were observed. The majority were *Polistes fuscatus* (F.) and *Polistes metricus* Say (n = 40), but *Polistes dorsalis* (F.) (n = 10) also were recorded. Observation periods for individual wasps rarely exceeded 10 min and were terminated by observer intervention or by flight of the wasp beyond following distance. Individuals of all three species were seen collecting droplets of honeydew on infected florets of dallis grass, *Paspalum dilatatum* Poir, which was abundant in the field and had a high incidence of infection by *Claviceps paspali* F. L. Stevens & J. G. Hall. Infection was determined by visual inspection of florets for the presence of honeydew droplets. Similar foraging activities on inflorescences of vasey grass, *Paspalum urvillei* Steud., and bahia grass, *Paspalum notatum* Flugge, led to observations of honeydew-producing fungal infections on these grasses as well. Individual wasps alternated freely between these grasses while collecting honeydew during a single observation period. All three grasses are reported hosts for *C. paspali* (USDA 1960).

Wasp foraging behaviors appeared to be focused exclusively on locating and collecting ergot honeydew. Typical foraging activities began with flight to and contact with infected grass heads. Wasps often landed at the top of a floret and walked downward in a spiraling pattern, imbibing honeydew as it was encountered. Movement to adjacent florets on the same plant was accomplished by crawling or by short, hopping flights. Occasionally, individuals were seen to carry droplets in their mouthparts during flight.

Wasps quickly differentiated infected, uninfected and infected-senescent inflorescences, often prior to contact. Only active infections elicited honeydew-searching behaviors. Between periods of active foraging, individuals always flew to grass heads bearing no sign of infection or to vasey grass leaf sheaths and groomed antennae, eyes, forelegs and gaster extensively. With one exception, grooming behavior was observed only on uninfected grasses.

Polistes are known to utilize considerable quantities of carbohydrate-rich liquids in nest cell provisioning and larval rearing (Rau 1928, Rabb 1960). Sources of carbohydrates reported include floral and extrafloral nectar and aphid honeydew (Rabb 1960). Rabb (1960) also reported heavy foraging of dallis grass heads by *Polistes* spp. in July and August but made no mention of accompanying fungal infection, although his observations typify those reported here.

Eight individuals, six *P. fuscatus* or *P. metricus* and two *P. dorsalis*, collected while foraging on infected grasses, were examined microscopically for the presence of fungal conidia. Conidia were confirmed from each individual on the antennae, tarsi, mouthparts and in the gut. Conidial presence suggests that these wasps might readily transmit the ergot fungus from infected to uninfected grasses. Langdon & Champ (1954) reported *C. paspali* transmission to dallis grass by the green fly, *Pyrellia coerulea* (Wied.) and found fungal inoculum both externally and in the gut of these flies. In a controlled study, Moreno et al. (1971) confirmed transmission of *Claviceps purpurea* (FR.) by adult cabbage looper, *Trichoplusia ni* (Hubner), in barley.

By selecting only uninfected grasses as grooming sites, *Polistes* increase the likelihood of successfully spreading fungal infection. Honeydew foraging activity by individuals that visit several grass species also would promote greater host distribution of the fungus.

The assistance of M. Blackwell and M. Stovall (fungal identification) and M. Israel (wasp identification) is greatly appreciated. R. G. Danka, B. M. Gregory and A. M. Hammond reviewed an earlier draft of the manuscript. This paper approved for publication by the Director of the Louisiana Agricultural Experiment Station as manuscript number 87-17-1595.

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DAILY AND SEASONAL FLIGHT OF MALE
PARANTHRENE DOLLI (LEPIDOPTERA: SESIIDAE),
MONITORED BY PHEROMONE TRAPS

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Interest in the management and culture of cottonwood, *Populus deltoides* (Bartr.), has drawn attention to one of its major pests, generally known as the cottonwood clearwing borer, *Paranthrene dollii* (Neum.). In nurseries, the larvae damage the stools and switches of cottonwood by boring into the wood and pith, and constructing open tunnels up to 16 cm in length (Solomon & Abrahamson 1972). Culling of potentially usable cuttings in cottonwood nurseries has ranged from 12% (Solomon et al. 1976) to 20% (Nebeker 1980-unpublished data) because of *P. dollii* damage. Current control methods for *P. dollii* involve insecticide applications and mechanical means, such as removal and burning of infested stools, switches and cuttings. Additional information on the biology and behavior of the species is needed to aid in the development of pest management program in cottonwood nurseries. Therefore, this study was conducted to determine the daily and seasonal flight periods of adult males.

Flight periods of males in 1980 and 1981 and daily flight activity in 1981 were determined by using pheromone traps in Mississippi. Pherocon 1-C® traps (Zoecon Corp., Palo Alto, Calif.) were baited with male sex attractants (Nielsen et al. 1979), (*Z,Z*)-3,13-octadecadien-1-ol (ZZ-ODDOH) and (*E,Z*)-3-13-octadecadien-1-ol (EZ-ODDOH). The two alcohol isomers were prepared separately at a concentration of 2 mg/ml of hexane, and then blended at a 1:3 ratio of ZZ-ODDOH and EZ-ODDOH. Aliquots of 0.25 ml of the prepared mixture were impregnated into rubber stopper (no. 8753-DD2, A. H.