PREY RECORDS OF THE WEB-BUILDING SPIDERS

**DICTYNA SEGREGATA** (DICTYNIDAE), **THERIDION AUSTRALE** (THERIDIIDAE), **TIDARREN HAEMORRHOIDALE** (THERIDIIDAE), AND **FRONTINELLA PYRAMITELA** (LINYPHIIDAE)

IN A COTTON AGROECOSYSTEM

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Abstract—Diets of the four small-sized web-building spiders *Dictyna segregata* Gertsch and Mulaik, *Theridion australre* Banks, *Tidarren haemorrhoidale* (Bertkau), and *Frontinella pyramitela* (Walckenaer) were studied in an unsprayed cotton agroecosystem in eastern Texas by analyzing prey found in these spiders' webs. Aphids were the most dominant food category in the potential prey complex (D-Vac samples) as well as in the actual prey (insects found in webs) of the four spider species. Since these spiders captured mainly small insects with a size of $<$5mm, they can be considered to be potential predators of the cotton fleahopper.

Little published information exists of the diets and predatory importance of spiders in cotton agroecosystems. Observational studies on this subject were carried out by Kagan (1943) in central Texas and by Whitcomb et al. (1963) in Arkansas. The release and recapture of different stages of radioactive-labelled lepidopterans in field experiments had been conducted in Texas by Clark and Glick (1961) and McDaniel and Sterling (1982). These authors found evidence of predation by different species of spiders on key pests in cotton, including *Anthonomus grandis* Boheman (boll weevil), *Pseudatomoscelis seriatus* (Reuter) (cotton fleahopper), different stages of *Heliothis zea* (Boddie) (bollworm) and *Heliothis virescens* (F.) (tobacco budworm). Quantitative data of spiders' diets in cotton are needed to complement these studies.

Prey records in a cotton agroecosystem are presented for four web-building spiders: Dictynidae—*Dictyna segregata* Gertsch and Mulaik; Theridiidae—*Theridion australre* Banks, *Tidarren haemorrhoidale* (Bertkau); Linyphiidae—*Frontinella pyramitela* (Walckenaer). Studies on the ecology of other spider species occurring in this eastern Texas cotton agroecosystem are presented elsewhere (Nyffeler et al., 1986, 1987a, 1987b, 1987c).

Materials and Methods—Investigations were conducted in an unsprayed cotton field in eastern Texas (Houston Co.), 8 km west of Austin, from June to mid-September 1985. The cotton field (6.5 ha) was surrounded by and bordered on extensive, rarely mown meadows (composed of various grasses and low growing annual Dicotyledonae). The lateral distance between rows was 1 m, with an average of 10.1 plants/m of row. The cotton (variety CAMD-E) was planted on 27 May and emerged during the first week of June.

Evidence of predation by web-building spiders in cotton was obtained indirectly by removing the remains of dead insects from the spiders' webs. All insects found dead in webs are considered prey, regardless if the spiders were observed feeding on them or not. At different times of the day
and season, vegetation of the cotton fields was thoroughly searched for spider webs containing prey by walking along the rows. Prey items were collected from those webs with forceps, preserved in 70% ethyl alcohol and later identified and counted under the microscope. In order to compare the actual prey found in the spider webs with the potential prey, 25 semi random D-Vac suction samples (Dietrick, 1961), each of one m of row, were taken weekly for a 14-week period during the summer of 1985. Samples were begun away from the edge of the field and taken in a circular pattern throughout the season. The collected arthropods were returned to the laboratory and later identified and counted under the microscope.

RESULTS AND DISCUSSION—The spider species considered in this paper are all small-sized predators (average total length <4 mm) which build irregular webs on the plant foliage of cotton. The webs of D. segregata can be found throughout the entire plant. Theridion australis constructs its webs on the base of fruit bracts and under leaves. The webs of F. pyramitela and T. haemorrhoidale are found in the middle part of the plant. Dictyna segregata and T. australis occur in cotton from early to late summer, while F. pyramitela and T. haemorrhoidale were found from late July to August.

Prey records for these four species of web-building spiders are compiled in Table 1. The prey items collected from webs consisted exclusively of small insects, with aphids constituting the most dominant prey category. No key pests of cotton were found among the prey items. A few predaceous insects (Geocoris, Scymnus, Solenopsis) were represented as spiders’ prey. However, the number of prey items (n = 81) found by us is too small to infer about the spiders’ importance as predators of cotton arthropods. Frontinella pyramitela, called Frontinella communis (Hentz) by Pointing (1966), was found to be a predator of the forest pest Rhyacionia buoliana (Schiffermuller) (Lepidoptera) in Canada.

Dictyna segregata has been described in the literature as a common spider in cotton (Whitcomb et al., 1963, Dean et al., 1982) and, therefore, is of ecological interest. Although nothing has been previously published of this species’ diet, there are several published reports on the diets of other Dictyna sp. in different crop systems. Studies about Dictyna volucripes Keyserling in alfalfa (Wheeler, 1973) and guar (Rogers and Horner, 1977) revealed that this species captured small Diptera, small wasps, thrips, and Orius bugs. In Florida citrus orchards, Dictyna flores Ivie and Barrows was observed capturing Diptera (Muma, 1975), while in California citrus groves in the webs of Dictyna calcarata Banks, the remains of Diptera, leafhoppers and red scales were found (Carroll, 1980). In an apple orchard, Dictyna sublata Hentz captured aphids and leafhoppers (McCaffrey and Horsburgh, 1980). The general pattern from these data is that spiders of the genus Dictyna are primarily predators of small soft-bodied insects, such as Diptera, aphids, and leafhoppers, which agrees with our observations in eastern Texas.

Within the same cotton agroecosystem, the four orb-weaving spiders Gea heptagon (Hentz), Acanthepheira stellata (Walckenaer), Tetragonatha laboriosa Hentz, and Uloborus glomosus (Walckenaer) also primarily captured aphids, which composed 35 to 90% of their diets (Nyffeler et al., in press). It is not surprising that aphids were so dominant in the diet of the orb-weaver and irregular web-builder group since they were the most abundant
potential prey for spiders, constituting 75% of all cotton arthropods ($n = 58,537$) sampled by D-Vac during summer 1985.

During summer 1985, the cotton fleahopper occurred in low numbers in this eastern Texas agroecosystem, and, coupled with the fact that the number of prey samples were small, this may explain why this key cotton pest was missing in the spiders' diet. The cotton fleahopper fits the prey size range of the four web-building spiders $D.\ segmented$, $T.\ australis$, $T.\ haemorrhoidalis$, and $F.\ pyramitela$. Thus, these spiders may be considered as potential predators of the cotton fleahopper.

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