ON THE PHENOLOGY AND CONTROL VALUE OF *STETHORUS PUNCTILLUM* WEISE AS A PREDATOR OF *TETRANYCHUS CINNABARINUS* BOISD. IN ISRAEL

BY

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During work on the common red mite (*Tetranychus cinnabarinus* BOISD.), *Stethorus* (*Scymnus*) *punctillum* WEISE was encountered much more frequently and in higher densities — especially in summer — than would be expected from what is known in literature on this subject.

The value of *S. punctillum* as « *a very important predator of* Tetranychus urticae KOCH *in glasshouses* » in Holland has been demonstrated by BRAVENBOER (1959). In the open field it is in some instances credited with a certain amount of beneficial influence on mite populations, e. g. as one of the more important predators of the winter eggs of *Metatetranychus ulmi* KOCH on apples in England (COLLYER, 1953) and Canada (PUTMAN, 1955). In the Middle East, HUSSEINE (1958) suggests that the impact of Endrin sprays on *Coccinellidae* spp. may account for the increase of spider mites on cotton in the lower Jordan Valley. In Egypt, HASSAN & ZAHER (1956) do not mention it among the predators of this mite. HASSAN & *al.* (1959) mention *Scymnus* spec. casually as a predator of spider mites in cotton fields. WILLCOCKS & BAGHAT (1937) mention species belonging to the genus *Triphleps* as the only important predators of the red spider mites in cotton fields.

Three aspects of the phenology and control value of *S. punctillum* as a predator of *T. cinnabarinus* in some areas of the northern part of Israel are dealt with in the following note.

1. Activity during summer

According to our experience, the predator will appear and reproduce from April to November almost whereever there is a dense enough population of common red mites, and no interference of pesticides.

(*) *Contribution from the Nat. Univ. Inst. of Agric.*, Rehovot, Israel, 1964 Series N° 750 E.

Table 1 summaries some typical instances of dense populations of the larvae of the predator encountered during summer in the northern coastal plain, and in the Yesreel and Hula Valleys.

TABLE 1

Some instances of larvae of *Stethorus punctillum* WEISE occuring in considerable density in summer

DATE	LOCALITY	HOSTPLANT	DESCRIPTION OF DENSITY
3.7.1960	Yagur	*Convolvulus arvensis* in cotton fields.	Up to 6 larvae per leaf
24.7.1961	Shomrat	Cotton	Dense population
8.8.1961	Lochamei Hagetaoth	Watermelon	Up to 11 larvae per fruit (the leaves had dried up)
30.7.1953	Hulioth	Apple	Average of 0.5 individuals, mostly larvae, per leaf.
3.8.1953	Mishmar Ha'emek	Apple	Average of 0.4 individuals, mostly larvae, per leaf.
30.8.1953	Misra	Apple	Average of 0.8 individuals, mostly larvae, per leaf.

Some additional cases in evidence have been reported elsewhere (PLAUT, 1962, 1964).

In one case, which proves one point and is a curious exception to another, daily collections of the beetles on two 7-meter-long rows of bush beans of unspecified variety at Neve Ya'ar in 1960, yielded 51 beetles during the last week of July, and 109 during August 1-20. However, not one single larva could be found. Probably the presence of hooked trichomes made the development of larvae impossible (PUTMAN, 1955). The plants were heavily infested by the common red mite.

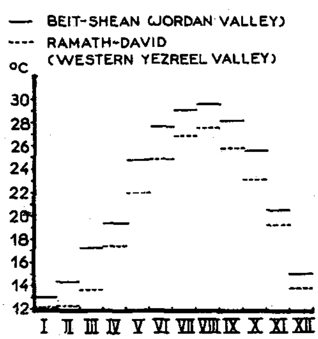
The occurrence of dense populations of the predator in summer is not surprising, when we consider that the maximum temperature for development is 35 °C (BRAVENBOER, 1959), and compare this with the monthly averages of temperatures prevailing in the areas of observation during summer (fig. 1).

Our findings are not in accord with those of BODENHEIMER (1951), who states — in part citing KLEIN (1936) — that in the central coastal area of Israel in summer and winter, only scattered individuals of *S. punctillum* are met with, and that the adults probably migrate to the hills for estivation.

2. Phenology on sugar-beet during spring

During winter *T. cinnabarinus* may infest some host-plant species, notably beet. The threshold of development of the predator is 13 °C for the egg, 15 °C for the other stages (BRAVENBOER, 1959). The threshold of development of the mite being lower (8 °C according to KLEIN, 1938), there is a period at the beginning of spring when with rising temperatures (figure 1) the rate of multiplication of the mite accelerates and dense populations may build up prior to the appearance of the predator. According to many observations, the predator invariably appears in such fields, and builds up its population. In due course the mite population collapses and the field is cleared completely by the roving beetles. During this season, no insecticides are used on beet.

1



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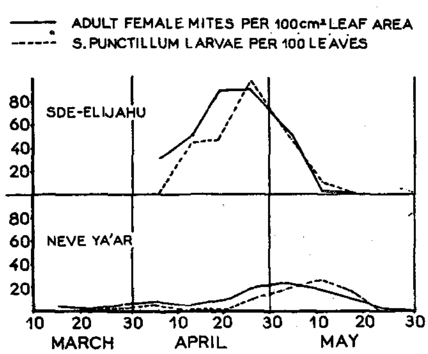

FIG. 1, Mean monthly temperatures in 2 localities in Israel (after ASHBEL 1951).
FIG. 2, Changes in population densities of *Stethorus punctillum* WEISE, and *Tetranychus cinnabarinus* BOISD. in two sugar beet fields in Spring of 1961..

The process has been followed closely in a number of fields. Two instances are summarised in figure 2. Weekly, 100 medium aged leaves, 10 near each of 10 fixed points in the field, were picked at random for examination. On the underside of each leaf, on an area of 32 cm² chosen at random, the living adult female mites were counted, as well as the predators on the entire leaf.

3. The value of the predator as a controlling agent

In order to ascertain the role of *S. punctillum* in the regular collapse of denser mite populations on beet in spring in northern Israel, an experiment was carried out in 1962 in a heavily infested field of fodder beet at Rosh Haniqra, in western Galilee near the coast. While the mite population was in its final decline, three plots of 6 × 10 meters each, with 20 meters between them, were sprayed with Endrin, thus eliminating the larvae of the predator. The three plots of 6 × 20 meters each, alternating with the sprayed ones, served as control. 20 medium aged leaves were taken at random from the center of each plot for examination. The density of the mite population was estimated and the predators were counted. Table 2 summarizes the results.

TABLE 2

The effect of Endrin spray on population dynamics of *Stethorus punctillum* WEISE and *Tetranychus cinnabarinus* BOISD., on fodderbeet at Rosh Haniqra, 1962.

	DATE	% LEAVES DENSE MITE POPULATION	% LEAVES WITHOUT MITES	*S. punctillum* per leaf LARVAE	*S. punctillum* per leaf PUPAE	*S. punctillum* per leaf ADULTS
Unsprayed plots	26.4	96	0	4.4	0.2	0.7
—	30.4	98	0	4.0	1.0	0.9
—	4.5	62	8	2.1	0.8	1.3
—	11.5	0	100	0.0	0.0	0.2
Plots sprayed with Endrin on 6 mai 1962	11.5	36 %	12 %	0.05	0.07	0.7

During the period of observation summarized in Table 2, no probable causes for the decline of the spider mite population other than *S. punctillum* were in evidence. No chamsin (dry hot wind) occurred, no irrigation was given and no spray applied — all of these factors sometimes being held responsible for the collapse of populations of the common red mite in Israel.

One of the most common causes for population collapses of the red spider mite in the field is the depletion of its food resources on continuously and heavily infested plants. The effect of this factor often coincides with the visibly increased activity of *S. punctillum*, the development of the latter being host-density-dependent to a high degree. In the cases of dense *S. punctillum* populations on apple mentioned in Table 1, the appearance of the leaves suggested that depletion of food resources must have been a major contributing factor to the decline and eventual disappearance of the mite population, and the potential economic value of the predator under such circumstances is not easily assessed. But in beet in spring, and in particular in the case summarized in Table 2, the younger leaves in the center of the crown were entirely unaffected by the mites, and thus unimpaired food was available to them in every plant, throughout the period of their decline.

ZUSAMMENFASSUNG

Im Laufe von Arbeiten mit *Tetranychus cinnabarinus* BOISD. im Feld wurde *Stethorus punctillum* WEISE weitaus häufiger beobachtet als der einschlägigen Literatur nach zu erwarten war.

S. punctillum war während des ganzen Sommers in allen Stadien häufig, woimmer entsprechend dichte Milbenpopulationen entstanden und keine Insektizide angewendet worden waren.

In während des Spätwinters mit *T. cinnabarinus* befallenen Zuckerrübenfeldern entwickelte sich im Frühling regelmässig eine verhältnismässig dichte Population von *S. punctillum*, was dann zum Zusammenbruch der Schädlingspopulation führte. Diesem Vorgang wurde in einigen Fällen durch Zählungen nachgegangen, von denen zwei angeführt sind (Tabelle 3). In einem anderen Fall wurden in einer späten Phase dieses Vorgangs die Predatoren-larven durch eine Endrinspritzung eliminiert und die resultierenden Veränderungen in den Populationsschwankungen von Milbe und Predator durch Zählungen — im Vergleich mit nichtgespritzten Parzellen — festgehalten (Tabelle 2).

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