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PREDATORY INSECT POPULATIONS IN THE HOST-PLANT COMMUNITY OF THE RED PEPPER (CAPSICUM)

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Abstract

The host-plant community of the red pepper *(Capsicum)* was investigated from 1971 to 1973. The food of *Orius niger* WOLFF is: aphids, Acarideae, and *Empoasca fabae* HARR. These Hemiptera lay their eggs in the parts of the flowers, and this is harmful. Apart from the species *Coccinella septempunctata* L. and *Adonia variegata* GOEZE, *Nabis feroides* REM. also occurred every year. The propagation of Chrysopa species and Syrphidae larvae is linked to cool, wet weather, while the changes in the individual numbers of spiders depends less upon abiotic factors.

Introduction

An effective defence against the insect populations damaging the red pepper may be to employ insect predators. In the literature, only the predators of aphids have been dealt with so far. From among these, the major species mentioned from the Coccinellidae family are: *Coccinella septempunctata* L., *Adalia bipunctata* L., and *Chilocorus* sp. (SZALAY—MARZSÓ, 1961). These species are efficient mainly in the estival phase, for at this time the aphid nymphs are not yet being looked for by parasites. However, they are destroyed by the predatory *Coccinellida* larvae (STARY, 1972). The first two Coccinellidae have been examined with regard to biological protection against *Myzus persicae* SULZ, and it was found (GURNEY—HUSSEY, 1970) that the insects were more voracious at a lower temperature than at a higher one. As a result of the activity of *Coccinellida* populations, the aphids may disappear completely from the paprika fields, e.g. in 1957 when there occurred even ten larvae of *Coccinella septempunctata* L. on each paprika plant (SOLYMOSY—SZALAY—MARZSÓ, 1959). On a small plot of land, Chrysopa spp. was a more efficient predator than *Coccinella septempunctata* L. against a medium or low aphid contamination (SHANDS—SIMPSON—STORCH, 1972). Of the species of the Syrphidae family, *Epistrophe balteata* DEG., *Sphaerophoria scripta* L., *Syrphus lunulatus* MEIG., *Sirphus ribesii* L., and *Chrysotoxum intermedium* MEIG. have also been mentioned as predators (SZALAY—MARZSÓ, 1969). In 1957 *Epistrophe balteata* DEG. predominated in Szeged (SOLYMOSI—SZALAY—MARZSÓ, 1969). The activity of the larvae and imagos of Anthocoridae was regarded as important only against the aphids of fruit-trees (SZALAY—MARZSÓ, 1969). Spiders are important only in the period of hatching of the aphid fundatrices (REMAUDIERE—LECLANT, 1971).

Materials and Methods

The soil of the area investigated, a condiment-paprika field 23.6 ha in size in the environs of Szeged, was carbonate meadow chernozem on the surface. The paprika (*Capsicum annuum* L. convar. *longum*) was planted in rows at 60 cm intervals, with 60 cm (possibly less) between plants. In 1971—1973, insect nets were used for collections from the individual plants, according to the „hundred plant" method (SZALAY—MARZSÓ, 1969). 5×20 plants were generally netted on each occasion. The material was separated after ether anaesthesia. The mean daily temperature values were obtained from the meteorological station beside the collecting area. Collections were generally made in the morning hours, on one occasion a week.

Results

As regards the predatory populations, *Aeolothrips intermedius* BAGN., not mentioned in the literature, was conspicuous with the highest number of individuals. This species will be dealt with elsewhere.

The Anthocoridae family was represented by two species, *Orius niger* WOLFF. and *Orius majusculus* RENT. In 1971, *Orius majusculus* RENT. constituted 22 per cent, and in 1972 11.3 per cent, while in 1973 its ratio was insignificant: the data on it are therefore given combined (Figs. 1—3). It turns out from the data for all three years that plant-bugs begin breeding in early July. A cause of this is that plant-bugs not only find their food in red pepper but also lay their eggs in the flowers. As seen from the data for 1971, blooming begins from the end of July. Before this, a few flowers can be found. Eggs were found in the most various parts of the flowers:

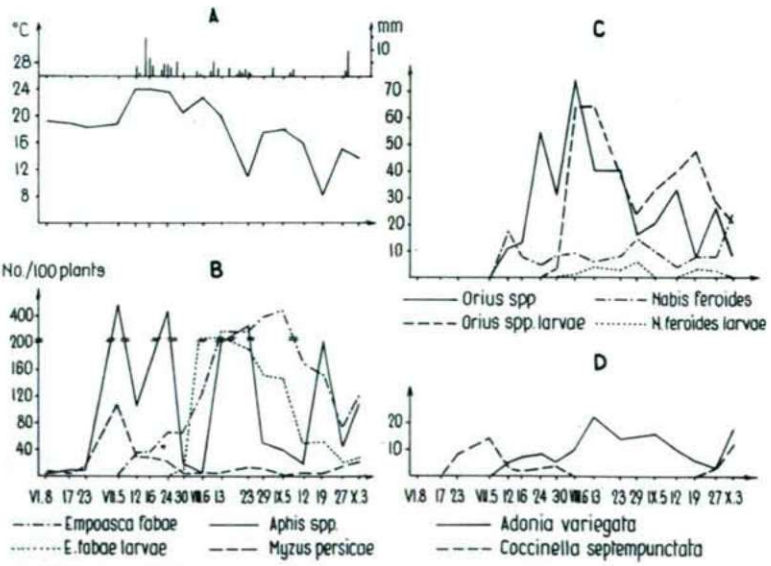

Fig. 1. a) Mean daily temperature and precipitation values in 1971.
b) The main plantivorous populations in 1971.
c) Predatory populations in 1971, I.
d) Predatory populations in 1971, II.

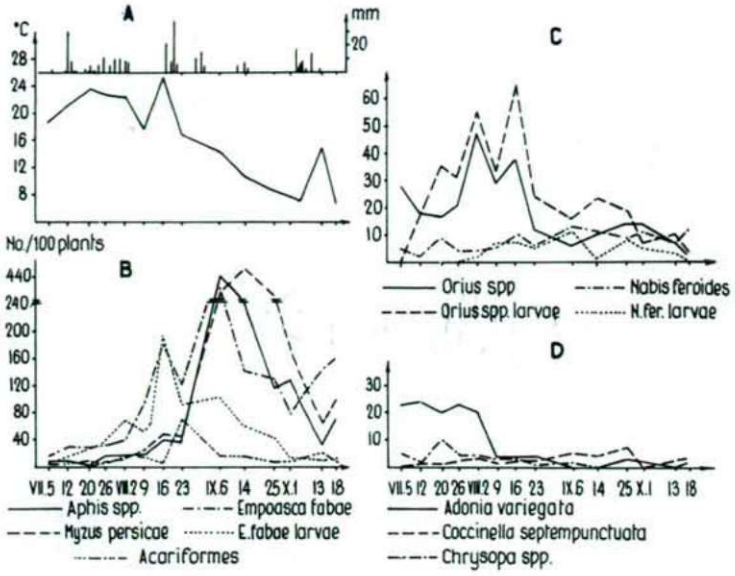

Fig. 2. a) Mean daily temperature and precipitation values in 1972.
b) The main plantivorous populations in 1972.
c) Predatory populations in 1972, I.
d) Predatory populations in 1972, II.

petal, filament, and pollen sacs. In one flower there occurred as many as 3 to 5 eggs, impeding the fastening and formation of the crop.

Until the red pepper is suitable for plant-bugs, they can be found in the borderland, with low individual density. After it has become suitable for them, they migrate almost completely onto it. In favourable warm weather, the plants become populated with bugs already in June. Two generations develop a year, following one another at an interval of about forty days.

After egg-laying, depending upon the blooming, the larvae are hatched in about eight days. Their development, and size of the population are strongly temperature-dependent. The individual density maxima coincide with the mean temperatura maxima.

The mean-temperature curves in 1971 and 1972 exhibit a striking parallel with the individual-density curves.

The population is considerably reduced by a decrease in temperature and by rainfall, even if the quantity of food-animals is large (e.g. August 23, 1971). The main food of bugs is aphids, with mites as second favourite but Empoasca larvae are not rejected either. This shows up in the high individual density in August 1971, which cannot be explained on the number of aphids: the larva-population of Empoasca fabae Harr. joined the community here. The initial propagation of aphids could not be impeded by bugs. Later too, the activity of these is considerable only above a daily mean temperature of 10 °C. Because of their thermophilous nature, they can be of importance only from middle July to late August. In the course of the three years, the conditions were more favourable for *Orius niger* WOLFF. *Orius majusculus* RENT.

was driven more and more into the background. The activity of *Nabis feroides* REM. also had to be taken into consideration evary year (Figs. 1—3). This species is a polyphagous enemy of Herbivores. It survives the winter in a fully-developed form. Its eggs are laid on the first spring days, mainly in the tissues of clover, wheat and other cereals (BJEGOVIC, 1968). The imagos were active in the borderland already in March. Larvae appeared in early June; the generation developing out of these migrated onto the red pepper from late June. Nabis likes to lay its eggs on the inner surface

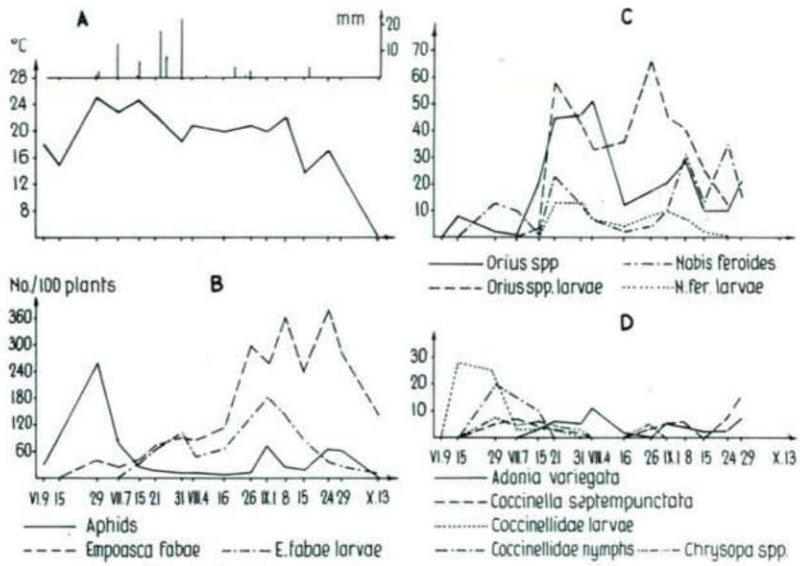

Fig. 3. a) Mean daily temperature and precipitation values in 1973.
b) The main plantivorous populations in 1973.
c) Predatory populations in 1973, I.
d) Predatory populations in 1973, II.

of the petals. The larvae also stay in the flowers for a long time. The larvae of the second generation (on the pepper the first one) are hatched in the middle of July. The plant-bug is not linked to any food-animal exclusively.

On the red pepper, two species of the Coccinellidae family: predominated: *Coccinella septempunctata* L. and *Adonia variegata* GOEZE; in addition, in 1972, *Hyppodamia 13-punctata* L. and *Halyzia 14-punctata* L. appeared. The insects can be found in the borderland already in early spring. First, *Coccinella septempunctata* L. migrates to the paprika, followed two weeks later by *Adonia variegata* GOEZE. The time of migration, its intensity, and the propagation of the insects depend mainly upon the quantity of food-animals (aphids). It was therefore possible in 1973 to find a large number of eggs already on May 26. *Coccinella septempunctata* L. prefers to consume *Myzus persicae* SULZ, while *Adonia variegata* GOEZE prefers *Aphis craccivora* KOCH. The overpropagation of aphids can only be impeded if first of all the individual density is depressed to a duly low level. After spraying on July 6,

1973, the predators already proved to be sufficient for preventing the aphids from mass multiplication.

The multiplication of Chrysopa species *(Chrysopa carnea* STEPH., *Chrysopa ingens* STEINM.*)* is promoted by cool, rainy weather. It is therefore worthwhile to mention them only for 1972, because the weather was then particularly rainy.

In the case of the larvae of the Syrphidae the situation is similar. They appeared in large numbers only in 1972, and even then only in the middle of September, at a mean temperature of 10 °C, accompanied by a high humidity (Fig. 2).

The representatives of the Araneidea group appear with similar individual density every year (Fig. 4). Their number rose from the middle of June uniformly,

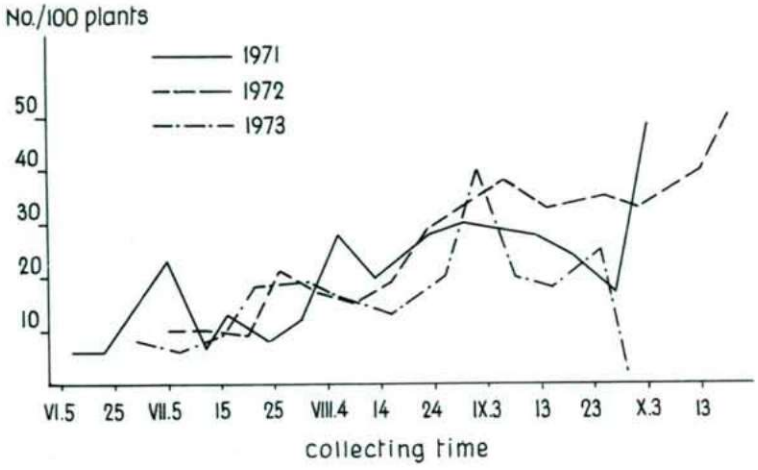

Fig. 4. Changes in the individual densities of Araneidea spp. in 1971—1973.

Table 1. Predatory populations in 1971.

Species	June				July				August				September				October
No./100 plants	8	17	23	5	12	16	24	30	6	13	23	29	5	12	19	27	3
Orius niger WOLFF.	—	—	—	—	11	9	47	20	42	36	36	14	17	38	7	23	8
Orius majusculus RENT.	—	—	—	—	—	4	7	11	32	4	4	2	3	—	1	3	—
Orius spp. larvae	—	—	—	—	—	—	—	3	64	64	38	24	33	40	47	28	20
Nabis feroides REM.	—	—	—	—	17	8	5	8	9	6	8	14	10	4	—	8	24
Nabis feroides REM. larvae	—	—	—	—	—	—	—	—	1	4	2	6	—	—	3	2	—
Coccinella septempunctata L.	—	—	8	14	3	2	3	4	—	—	—	—	—	—	—	3	12
Adonia variegata GOEZE.	—	—	—	—	5	7	8	5	10	22	14	14	16	10	6	3	18
Chrysopa spp.	—	—	—	2	—	1	3	1	—	—	—	4	—	—	—	—	—
Araneidea	8	6	6	23	7	13	8	12	28	20	28	30	29	28	24	17	44

Table 2. Predatory populations in 1972

Species No./100 plants	July				August				September			October		
	5	12	20	26	2	9	16	23	6	14	25	1	13	18
Orius spp.	28	18	17	21	47	29	38	12	6	10	14	14	7	2
Orius spp. larvae	—	17	35	31	55	33	65	24	16	23	19	7	10	3
Nabis feroides REM.	5	3	9	4	4	5	10	6	13	11	10	11	7	12
Nabis feroides REM. larvae	—	—	—	—	2	6	7	5	11	1	9	5	3	—
Coccinella septempunctata L.	—	1	1	2	3	1	2	1	5	4	7	—	2	2
Hyppodamia 13—punctata L.	—	—	—	—	3	2	1	1	—	4	—	—	1	—
Halyzia 14-punctata L.	5	—	—	3	1	2	4	3	2	3	4	4	—	2
Adonia variegata GOEZE.	23	24	20	23	20	4	4	4	—	—	3	2	—	2
Coccinellidae larvae	—	—	—	—	—	—	—	—	2	—	14	7	7	5
Chrysopa spp.	5	2	10	5	4	4	4	1	1	—	—	—	—	—
Araneidea	10	10	9	21	17	15	19	29	38	33	35	33	40	50

Table 3. Predatory populations in 1973

Species No./100 plants	June			July			August				September				
	9	15	29	7	15	21	31	4	16	26	1	8	15	24	29
Orius spp.	—	8	2	1	20	45	46	51	12	17	20	28	10	10	21
Orius spp. larvae	—	—	—	—	3	58	41	33	36	66	45	41	25	12	20
Nabis feroides REM.	—	—	13	10	1	23	12	7	2	4	10	31	13	35	15
Nabis feroides REM. larvae	4	—	—	—	—	13	13	7	4	8	10	7	2	—	—
Coccinella septempunctata L.	—	—	5	7	3	1	1	—	—	3	5	6	—	7	15
Adonia variegata GOEZE.	—	—	—	—	3	6	5	11	1	—	5	4	2	2	7
Halyzia 14-punctata L.	—	—	—	2	3	—	—	—	1	—	—	2	3	2	—
Coccinellidae larvae	—	28	25	3	3	1	—	—	—	—	—	2	2	2	—
Coccinellidae nymphs	—	—	20	10	15	—	—	—	—	—	—	—	—	—	—
Chrysopa spp.	—	—	7	4	6	4	3	—	—	5	—	—	—	—	—
Araneidea	—	—	8	6	9	18	19	17	13	20	40	20	18	25	2

achieving its maximum in early September. The cause of the rise in October. 1972 was the mass multiplication of flying insects (mainly *Scaptomyza pallida* ZETT., and *Oscinella frit* L.). The dynamics of spiders follows the individual densities of other insects well. Their multiplication is scarcely influenced by weather factors.

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