

## RELATION BETWEEN APHID AND LADYBIRD POPULATIONS IN THE MAIZE FIELD

Ludovít CAGÁŇ

Department of Plant Protection, Slovak Agricultural University, Faculty of Agronomy, A. Hlinku 2, 94976 Nitra, Slovak Republic

### Summary

During 1987-1995, population dynamics of aphids and coccinellids was observed at Nitra-Janíkovce locality in south-western Slovakia. From three aphid species, *Metopolophium dirhodum* (Walk) was the most numerous during all years of study. More than 90% of ladybird beetle population was formed by two ladybird species. They were *Coccinella septempunctata* Linneus and *Propylea quatuordecimpunctata* Linneus. When relationship between aphid populations and ladybirds was calculated (all calculations were made between *M. dirhodum* – the most numerous aphid and ladybirds), it was found that it was significant between the number of aphids and ladybird larvae ( $r = 0.818$   $P = 0.007$ ), and also significant between number of aphids and number of ladybird adults (*C. septempunctata*  $r = 0.711$ ,  $P = 0.032$ ; *P. quatuordecimpunctata*  $r = 0.859$ ,  $P = 0.003$ ). In 1990, when more than 900 aphids per one maize plant were found, together 73 ladybird adults were found on the maize plants. In 1993, when maximum was only 6 aphids per one maize plant, the maximum of 6 ladybird beetles per 100 plants was observed.

### Introduction

According to Cagáň et al. (1998) the first aphids on the maize plants in south-western Slovakia can be found at the beginning of June and the number of aphids grew until the end of June. In Europe, maximum of aphid population depends on locality. In Spain it is in the first quarter of June (Pons et al., 1989), in Poland on July 11 (Kot a Bilewicz-Pawinska, 1989), in western France at the end of July (Henry and Dedryver, 1989).

The most usual cereal aphid predators are ladybirds (*Coccinellidae*). The analysis of intestinal tract of *Coccinella septempunctata* L., showed that 76,9-91,7 % of its content was formed by aphids (Triltsch, 1997a). Except of *C. septempunctata*, a very important aphid predator was *Propylea quatuordecimpunctata* L., which was the most important aphid in Upper Hessen (Germany) (Storck-Weyhermuller, 1988).

During 9 years, a population dynamics of aphids and ladybirds was observed at Nitra-Janíkovce in Slovakia. The aim of this work was to explain how coccinellid populations in maize depend on the populations of aphids

### Material and methods

During 1987-1995, population dynamics of aphids and coccinellids was observed at Nitra-Janíkovce locality in south-western Slovakia. Aphids and coccinellids were counted on 100 maize plants that were randomly selected at 10 maize field sites (at each site 10 plants). Maximum of population density of aphids was related to maximum of coccinellid population density and correlation coefficient was calculated between aphids and coccinellid larvae and adults.

### Results and discussion

Table 1 shows numbers of aphids and the numbers of ladybirds on the maize plants at the locality Nitra-Janíkovce during nine years. From three aphid species, *Metopolophium dirhodum* (Walk) was the most numerous during all years of study. Numbers of *Rhopalosiphon padi* (Linneus) and *Sitobion avenae* (Fabricius) created nearly 10% of aphid population. During nine years, more than 90% of ladybird beetle population was formed by two ladybird species. They were *Coccinella septempunctata* Linneus and *Propylea quatuordecimpunctata* Linneus. Similar ladybird populations were observed by Attia (1985) and Reh (1985) in Germany. In Poland, *C. septempunctata* dominated in the maize fields. *P. quatuordecimpunctata* formed only 16.5 % of ladybird population (Plewka and Pankanin-Franczyk, 1989).

Table 1 shows that maximum number of ladybird beetle larvae can achieve very various values. In 1990 it was 285 larvae per 100 maize plants. In 1993 and 1995 it was only 3 larvae per 100 plants.

When relationship between aphid populations and ladybirds was calculated (all calculations were made between *M. dirhodum* – the most numerous aphid and ladybirds), it was found that it was significant between the number of aphids and ladybird larvae ( $r = 0.818$   $P = 0.007$ ), and also significant between number of aphids and number of ladybird adults (*C. septempunctata*  $r = 0.711$ ,  $P = 0.032$ ; *P. quatuordecimpunctata*  $r = 0.859$ ,  $P = 0.003$ ). In 1990, when more than 900 aphids per one maize plant were found, together 73 ladybird adults were found on the maize plants. In 1993, when maximum was only 6 aphids per one maize plant, the maximum of 6 ladybird beetles per 100 plants was observed. Rautapää (1976), Basedow (1982) and Poehling (1988) found positive correlation between the population density of *C. septempunctata* and aphids on cereals. No correlation was found between *C. septempunctata* and aphid density in Germany (Triltsch, 1997b). The occurrence of predators depends on many factors. In the vicinity of pea and sugar beet fields adults and larvae of *P.*

*quatordecimpunctata* and *C. septempunctata* were the most numerous predators in wheat. Syrphid larvae dominated in the wheat field when potato was in their vicinity (Freier et al., 1997).

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Table 1

Maximum number of aphids and ladybird beetles at the locality Nitra-Janíkovec (Slovakia) during 1987-1995. Numbers of aphids was calculated as an average per one plant (from 100 plants). Number of ladybird beetles and larvae is a result of 100 maize plants observation.

MD – *Metopolophium dirhodum*, SA – *Sitobion avenae*, RP – *Rhopalosiphon padi*, C7 – *Coccinella 7-punctata*, P14 - *Propylea 14-punctata*, Clarvae – larvae of ladybirds

Year	Maximum MD	Maximum SA	Maximum RP	Maximum C7	Maximum P14	Maximum C larvae
1987	366	11	24	20	26	10
1988	351	11	12	13	7	24
1989	404	12	26	28	13	53
1990	891	10	19	27	45	285
1991	165	5	12	8	18	47
1992	435	6	26	3	15	11
1993	4	1	1	2	4	3
1994	20	1	1	3	3	12
1995	4	1	0	10	8	3