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THE PARASITOID COMPLEX AND POPULATION DYNAMICS OF THE PLUM SCALE, *SPHAEROLECANIUM PRUNASTRI* FONSCOLOMBE, IN GEORGIA.

ABSTRACT

THE PARASITOID COMPLEX AND POPULATION DYNAMICS OF THE PLUM SCALE, *SPHAEROLECANIUM PRUNASTRI* FONSCOLOMBE, IN GEORGIA.

The plum scale, *Sphaerolecanium prunastri* Fonscolomb, is found infesting stone fruits all over the Europe and in most of the countries of Asia and North America. Its population dynamics and parasitoid complex in Georgia are described and the latter compared with that in other countries in southern Europe. The present rates of parasitism are compared with those of an earlier survey and it is noted that there have been some changes, both in the composition and in effectiveness of the primary and secondary parasitoids. The main primary parasitoids are still *Microterys hortulanus* Erdös and *Discodes coccophagus* (Ratzburg) but, among the secondary parasitoids, *Cerapterocerus mirabilis* Westwood is now the most important species. It was found that the economic importance of *S. prunastri* had become reduced due to a reduction in the number of secondary parasitoids and an increase in numbers of primary parasitoids.

Key words: *Coccophagus lycimnia, C. proximus, C. differens*, *Metaphycus silvestri, Pachyneuron muscarum*, *Marietta picta, Tetrastichus sugonjaevi, Cheiloneurus claviger, Prunus domestica*, *P. spinosa*, *P. divaricata*, *P. cerifera*, Chalcidoidea.

INTRODUCTION

The plum or globose scale, *Sphaerolecanium prunastri* Fonscolombe, is a common species in Palaearctic region and North America (Borchsenius, 1957; Kosztarab & Kozár, 1988), where it is a serious pest of plum (*Prunus domestica* L., *P. spinosa* L., *P. divaricata* Ldb.) and other predominantly stone fruits. The plum scale is heavily parasitized by a large number of species of Chalcidoidea (Hymenoptera), which play an important role in its regulation.

The aim of the present study was to investigate the parasitoid complex of *S. prunastri* and its' role in controlling this scale in Georgia, and to compare the results with similar data from some adjacent regions in southern Europe. The results are significant both ecologically and for the biocontrol of this pest. Plum scale and its parasitoids are relatively well studied in Georgia but long-term observations on its population dynamics and on its parasite complex are still needed.

MATERIALS AND METHODS

The investigations were carried out in the period 1993-1997 on plum trees in the Botanic Garden, Tbilisi, and in the village of Ude in the southern mountains of Georgia. The phenology of the scale was studied by recording the average developmental stage of 200 insects on cherry plum (*Prunus cerasifera* Ehrh.) and scale densities were recorded as the mean number of scales per 10cm of branch. At the same time, the percentage parasitism and the species of parasites were counted (Goantsa *et al.*, 1974). The species of parasitoids were determined in consultation with Prof. V.A. Yasnosh.

RESULTS AND CONCLUSION

The biology of plum scale and its complex of parasitoids are well known in Georgia due the investigations of Borchsenius (1957), Hadzibeyli (1983) and Yasnosh (1967, 1972). In Georgia, as in other countries, the plum scale has one generation per year, with the 2nd-instar nymphs overwintering. These moult to become adult between the middle and end of April; in Hungary, this moult occurs a little later, between the end of April and early May (Kosztarab & Kozár, 1988). After mating, which occurs about mid-May, the females lay up to 800 eggs each from early June onwards. These eggs hatch within a few minutes of oviposition and the young nymphs settle on branches. This process continues for more than a month. The development of the plum scale is similar in the Crimea and in Hungary except that development is slightly faster in Georgia.

Table 1 shows the population dynamics of the plum scale at the two sites during the period of observation. The mean number of *S. prunastri* increased at both sites in the second year (1995) but then decreased quite dramatically

Table 1. Population dynamics of the plum scale and effectiveness of parasitoids, 1994-1997.

Survey site	Year	Mean no. scales/10cm of branch	Total percentage parasitism	Percentage nymphal parasitism	Percentage adult female parasitism
Tbilisi	1994	38.8	32.4	1.0	31.4
	1995	60.7	55.0	6.4	48.6
	1996	33.5	90.0	17.0	73.0
	1997	12.7	91.4	11.7	79.7
Ude	1994	31.0	37.0	2.2	34.8
	1995	59.0	91.4	4.7	80.2

due to parasitoid activity. This increase in activity is clearly shown by the percentage parasitism each month during 1995: May: 36%, June 80% and July-August 55%. The percentage parasitism of the adult scales was more than 4x greater than that of the nymphs.

Table 2 shows the parasitoid species which have been recorded attacking *S. prunastri* in Georgia and three other southern European countries. The greatest number of species (11) has been recorded in Moldova, while 7 are known in Georgia. The main species in all three regions are the primary parasitoids *Microterys hortulanus* Erdös, *Coccophagus lycimnia* Walker and *Discodes coccophagus* (Ratzeburg) and the secondary parasitoid *Ceropterocerus mirabilis* Westwood.

Table 2. Parasitoid complex of the plum scale in some southern European regions.

Parasitoid species	Type	Russia, Krasnodar[1]	Ukraine, Crimea[2]	Moldova[3]	Georgia 1966[4]	Georgia 1968[5]	Georgia 1995[6]
Microterys hortulanus Erdös	1ry	+	+	+	+	+	+
Discodes coccophagus (Ratzeburg)	1ry	+	+	+	+	+	+
Coccophagus lycimnia Walker	1ry	+	+	+	--	+	+
C. proximus Jasnosh	1ry	--	--	+	--	--	--
C. differens Jasnosh	1ry	--	--	+	--	--	--
Metaphycus silvestri Sugonjaev	1ry?	+	+	+	--	+	--
Cerapterocerus mirabilis Westwood	2ndry	+	+	+	+	+	+
Pachyneuronmuscarum L.	2ndry	+	+	+	+	+	--
Marietta picta André	2ndry	--	--	+	--	+	+
Tetrastichus sugonjaevi Kostjukov	2ndry	--	--	+	--	--	--
Cheiloneurus claviger Thomson	2ndry	+	+	+	--	--	--

Where 1ry = primary parasitoid, 2ndry = secondary parasitoid. References: [1]Dubrovskaya (1956); [2]Khersonskaya (1962) *in* Sugonyaev (1984); [3]Goant [5]Yasnosh (1968); [6]Japoshvili, (1995).

Table 3. Percentage parasitism of plum scale by specific parasitoids in Georgia in 1968 and 1995.

Parasitoid species	% parasitism 1968	1995
M. hortulanus	7.2-8.1	36.9
D. coccophagus	47.5-69.1	40.0
C. lycimnia	4.0	10.5
M. silvestri	37.1	0
C. mirabilis	8.3	11.6
P. muscarum	36.1-77.5	0
M. picta	0.4-1.04	1.1

Tables 2 & 3 also show how the percentage parasitism by the seven species known from Georgia has changed between 1968 and 1995. It would appear that it is the fourfold increase in *M. hortulanus* that has produced the significant decrease in the size of *S. prunastri* populations in the last few years.

REFERENCES

BORCHSENIUS, N.S., 1957 - Fauna of USSR IX, Leningrad. Pp 323-330. (In Russian).

DUBROVSKAYA, N.A., 1956 - Scale parasites in the Krasnodar subtropical region. Thesis, 16 pp. (In Russian).

GOANTSA, I.K., 1966 - About parasites of the plum scale (*Sphaerolecanium prunastri* Fonsc.) in Moldova. *Manuscripts of the Institute of Horticulture, Viticulture and Wine-making*, 13: 71-78. (In Russian).

GOANTSA, I.K., SUGONYAEV, E.S., DANZIG, E.M., 1974 - The scales of Moldovia and their natural enemies. Karta. Moldoveniaske, Kishinev, pp 3-110. (In Russian).

HADZIBEYLI, Z.K., 1983 - The Coccids (Homoptera: Coccoidea) of the subtropical zone of Georgian SSR. Meznereba, Tbilisi. 291 pp. (In Russian).

KHERSONSKAYA, E.A., 1962 - The study of the entomophages of Crimea and their role in decreasing the numbers of harmful insects. *Transactions of Plant Quarantine, Moscow,* pp 58-74. (In Russian).

KOSZTARAB, M., KOZÁR, F. 1988. Scale insects of central Europe. Academia; Kiado, Budapest. 455pp.

SUGONYAEV, E.S., 1984 - Chalcid-scale parasitoids of USSR. 232pp. (In Russian).

YASNOSH, V.A., 1967 - Parasitoids of Coccids in the fruit gardens of East Georgia. *Proceedings of the Institute of Plant Protection, Georgian SSR*, XIX: 83-91. (In Russian).

YASNOSH, V.A., 1972 - Chalcid parasites (Hymenoptera; Chalcidoidea) of scale insects (Homoptera, Coccoidea) from Georgian arid light forests. *Proceedings of the Entomological Society of Leningrad, Leningrad*, 52: 217-247. (In Russian).