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Coccoid pests of plantings and the role of parasitoids in their number regulation in Tbilisi

Abstract - The economic importance of chalcid parasitoids in the regulation of 17 coccoid species in Tiblisi has been established. As a result of previous investigations, it was found that the most significant coccoid pests in Tbilisi were: *Planococcus ficus* (Signoret), *Phenacoccus mespili* (Signoret), *Neopulvinaria innumerabilis* (Rathvon), *Coccus pseudomagnoliarum* (Kuwana), *Parthenolecanium corni* (Bouché), *Ceroplastes japonicus* Green, *Leucaspis pusilla* Löew and *Parlatoria oleae* Colvée. Parasitoids play an important role in the suppression of the populations of some coccoids and include such chalcids as *Microterys clauseni* Compére - parasitoid of *C. japonicus*, *Coccobius sp. aff. kurbani* Myartseva - parasitoid of *Adiscodiaspis tamaricicola*, *Encarsia leucaspidis* Mercet - parasitoid of *Leucaspis pusilla* and *L. loewi*, *Blastothrix longipennis* Howard - parasitoid of *P. corni*, *Microterys hortulanus* Erdös, *Discodes coccophagus* (Ratzeburg) and *Coccophagus lycimnia* (Walker) – all parasitoids of *Sphaerolecanium prunastri* (Fonscolombe).

Key words: Scale insects, Chalcids, Tbilisi, Georgia.

INTRODUCTION

Georgia is located in the South Caucasus on the border of Europe and Asia. The capital Tbilisi is situated at the transitory (border) place, and is distinguished by the rich diversity of its flora and insect fauna.. Currently 85 species of coccoids have been reported in Tbilisi but only 53 species of parasitoids are known. The parasitic chalcids (Hymenoptera: Chalcidoidea) are widely known as effective entomophagous insects of coccoids and are used as biological control agents. Currently, studies on relationships between hosts and parasitoids within towns are common, because of the ecological importance of such interactions. In the classification of harmful insects of towns, great concern centres on those pests that can be transferred on wood, seeds and package materials, without their natural enemies. The aim of this investigation was to elucidate the complex of scales and their effective parasitoids in Tbilisi and their effect on the

suppression of pest populations. These data are important both for ecological studies and practical use in plant protection. No such studies have ever been conducted in Tbilisi.

MATERIALS AND METHODS.

This work reviews the current knowledge of the impact of parasitoids in regulating scale insects in Tbilisi. Investigations were carried out in the field in various parts of Tbilisi and in a laboratory during 1994-2000 to identify and assess the regulation potential of parasitoids. The percentage of damage on plants by pests was established by the formula P=B.100/a, where P = percentage of damage, B = harmed plants among investigated specimens, a = number of investigated specimens (Khadjibeili, 1983). This formula was also used to determine the role of parasitoids in regulating scale insects.

RESULTS

The populations of 17 species of scale insects were found to be affected by parasitoids. Observations revealed that many plants of the town were seriously damaged by the scale insects (Table 1) (Japoshvili, 1998a,b; Japoshvili, 2001;Yasnosh & Japoshvili, 1998). The most harmful species among them were: *Planococcus ficus* (Signoret) on *Ficus*; *Phenacoccus mespili* (Signoret) on *Malus* and *Prunus* spp.; *Neopulvinaria innumerabilis* (Rathvon) on *Vitis* vinifera; *Coccus pseudomagnoliarum* (Kuwana) on *Celtis caucasica*; *Sphaerolecanium prunastri* (Fonscolombe) on *Prunus* spp.; *Parthenolecanium corni* (Bouché) on *Fraxinus, Robinia, Ulmus*; *Ceroplastes japonicus* Green on *Prunus domestica* and *Laurus nobilis*; *Leucaspis pusilla* Löew and *L. löewi* Colvée on *Pinus spp, Parlatoria oleae* (Colvée) on *Prunus* spp. All other species were less important because of their parasitoids (Table 2).

Populations of *S. prunastri, L. pusilla, L. löewi, C. japonicus* and *P. corni* were more or less regulated by the parasitoids. In contrast, populations of *Pl. ficus, Ph. mespili, C. pseudomagnoliarum, N. innumerabilis* were not effectively suppressed by the parasitoids.

Parasitoids occurred in *C. pseudomagnoliarum* and *N. innumerabilis* but did not exceed 3-5%. For *Parlatoria oleae* and *Parthenolecanium rufulum* Cockerell, levels of parasitization were also low (2-3%), but damage by populations of *P. rufulum* was not high. The lowest level of parasitization was found in *P. oleae* (2%) and the highest in *Kermes roboris* (98%).

Parasitoids play an important role in regulating populations of some coccoids. These parasitoids include the chalcids *Microterys clauseni* Compére, parasitoid of *C. japonicus*; *Coccobius sp. aff. kurbani* Myartseva, parasitoid of *Adiscodiaspis tamaricicola* Malenotti; *Encarsia leucaspidis* Mercet, parasitoid of *Leucaspis pusilla*

Table 1 - Percentage of plants infested by scale insects in Tbilisi.

Scale insect species	host plant GENUS	Mean no. scales/10cm of branch	infested plants (%)
Adiscodiaspis tamaricicola	*Tamarix*	26	85%
Carulaspis carueli	*Thuja*	11	40%
Ceroplastes japonicus	*Prunus*	19-21	90%
Coccus pseudomagnoliarum	*Celtis*	6	90-95%
Gossyparia spuria	*Ulmus*	1	5%
Kermes roboris	*Quercus*	1	3%
Leucaspis pusilla	*Pinus*	4-5	98%
Leucaspis loewi	*Pinus*	1-2	25%
Planacoccus ficus	*Ficus*	35	10%
Phenacoccus mespili	*Malus, Prunus*	15	70%
Sphaerolecanium prunastri	*Prunus*	35	15%
Neopulvinaria innumerabilis	*Vitis*	3 (32/one leaf)	42%
Parlatoria oleae	*Prunus*	2	97%
Parthenolecanium corni	*Fraxinus*	27	99%
Parthenolecanium rufulum	*Quercus*	3	80%
Physokermes hemicryphus	*Picea*	3	10-20%
Pseudococcus comstocki	*Punica*	45	2%
Rhodococcus spiraeae	*Spiraea*	2	70%
Salicicola kermanensis	*Populus*	4	95%
Unaspis euonymi	*Cotinus*	6	13%

and *L. löewi*; *Blastothrix longipennis* Howard, parasitoid of *P. corni*; *Microterys hortulanus* Erdös, *Discodes coccophagus* (Ratzeburg) and *Coccophagus lycimnia* (Walker), parasitoids of *S. prunastri*.

DISCUSSION

Based on the above findings, comments and conclusions can be made regarding the role of parasitoids in the regulation of scale insects on plants in Tbilisi. Both secondary and primary parasitoids have positive or negative effects, and population dynamics of pests depends on the relationship among these groups of parasitoids. We divided the scale insects in two groups: potentially dangerous pests and dangerous pests. Among the dangerous pests we included: *Pl. ficus, Ph. mespili, N. innumerabilis, C. pseudomagnoliarum, P. corni, C. japonicus, L. pusilla, P. oleae.* Less dangerous pests are: *Pseudococcus comstocki* (Kuwana), *P. rufulum , Rhodococcus spiraeae* Borchsenius, *S. prunastri, Carulaspis carueli* (Targioni Tozzetti), *L. loewi, A. tamaricicola* and *Salicicola kermanensis* (Lindinger). Among the primary parasitoids, effective biocontrol agents are: *E. leucaspidis, M. clauseni, B. longipennis, M.*

Table 2 - Host-parasitoid relationships in Tbilisi in 1994-2000.

Host	**Parasitoids**	**Degree of parasitization 1994-2000(%)**
Adiscodiaspis tamaricicola	*Zaomma lambinus, Marietta sp. aff. karakalensis, Coccobius sp.aff. kurbani*	66% (1998)
Carulaspis carueli	*Aphytis hispanicus*	20% (1998)
Ceroplastes japonicus	*Microterys clauseni, Cheilonerus claviger*	47.3% (1995-1997) 15% (1999)
Coccus pseudomagnoliarum	*Microterys tricoloricornis, Coccophagus lycimnia, C. semicircularis, C. proximus*	5% (1997-2000)
Gossyparia spuria	*Coccophagus gossypariae*	29% (1998)
Kermes roboris	*Microterys ferrugineus*	98% (1998)
Leucaspis pusilla	*Anthemus pini, Azotus atomon, Aspidiotiphagus citrinus, Encarsia leucaspidis*	42,3% (1995-2000)
Leucaspis loewi	*Anthemus funicularis, Azotus atomon, Encarsia leucaspidis*	33% (1995-2000)
Neopulvinaria innumerabilis	*Coccophagus lycimnia, C. semicircularis*	3% (1998)
Parlatoria oleae	*Aphytis hispanicus, A. proclia, A. maculicornis, Aspidiotiphagus citrinus, Pteroptrix lauri*	2% (1998)
Sphaerolecanium prunastri	*Microterys hortulanus, Discodes coccophagus, Cerapterocerus mirabilis, Coccophagus lycimnia, Marietta picta*	32,4%(1994), 55% (1995), 90% (1996), 91,4% (1997)
Parthenolecanium corni	*Microterys duplicatus, Trichomasthus albimanus, Blastothrix longipennis, Metaphycus insidiosus, Coccophagus lycimnia, Pachineuron muscarum, genus aff. Bureshiella*	40% (1998), 65% (1999), 58% (2000)
Parthenolecanium rufulum	*Blastothrix longipennis, Coccophagus lycimnia*	3% (1998)
Physokermes hemicriphus	*Aphycoides clavellatus*	68% (1998)
Pseudococcus comstocki	*Pseudaphycus malinus*	77% (2000)
Rhodococcus spiraeae	*Blastothrix nikolskajae, B. sp. aff. nikolskajae, Cheilonerus claviger, Microterys sylvius*	38.5% (1998), 17% (1999), 6% (2000)
Salicicola kermanensis	*Pteroptrix lauri*	60% (1998), 56% (2000)

ferrugineus Fulmek and *Pseudaphycus malinus* Gahan. These species may be used for the biological control of specific pests in Tbilisi.

Although the above findings are based on an extensive amount of material, the data are still far from being complete. Our work continues in Tbilisi and in all Georgia and more extensive investigation and time are needed to make definitive conclusions regarding pest-parasitoid relationships.

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