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Efficiency of Entomophages Against Winter Moth (*Operophtera Brumata*) in Georgia

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Abstract **– The article describes efficacy of entomophages on population dynamics of winter moth in Georgia. Were found 5 species of entomophages *Apanteles ater* Ratz., *Pholodromus histrio* Latr., *Pimpla instigator* F. *Copsilura concinnata* Mg. *Lypha dubia* Fll. From them 2 species mostly reduce the number of winter moth population: parasites of larvae *Apanteles ater Ratz* and flies of pupae *Copsilura concinnata* Mg. Based on the data most effective were Entomophages of larvae. Annually pest population is regulated about 10 -15%.**

Keywords **– Winter Moth, Entomophages, Efficiency**

I. Introduction

The Winter Moth (*Operophtera brumata*) is a moth of the family Geometridae. It is an abundant species of Europe.

The female of this species is virtually wingless and cannot fly, but the male is fully winged and flies strongly. Winter Moths are considered an invasive species in North America. The host plants were mainly deciduous trees, oak being the main food plant, and also many fruit trees, especially Apples. Winter Moths can be identified at various life stages, depending on time of year (1, 2).

Winter Moths are typical Lepidoptera in that they follow complete metamorphosis: egg, larva, pupa and adult. Moths emerge from the pupa cases after the first hard frost in late October or early November. Adult male moths generally emerge four days prior to the females. Males fly in the evening. The flightless females crawl up the tree trunks to lay eggs in the tree crown (3, 4). Females can lay up to 400 eggs, one at a time, either in loose clumps or individually. Eggs hatch in early spring and larvae disperse by walking and by ballooning from silk threads, like spiders. It has been suggested that hatching may be synchronous to, or occur just prior to, bud breaking and that the phenology (timing) of these two events may be a significant factor of outbreaks. First instars larvae generally embed themselves within buds which they will consume from the inside. Larvae develop and grow over 3–4 weeks when air temperature is suitable (14°C–20°C). Later in stars are inactive and can be found on the underside of leaves. At the end of their feeding period, Winter Moth larvae drop to the ground to pupate. Pupation occurs below the soil (1.5 cm–15 cm) and lasts 3–4 months.

Because of their broad host range, Winter Moths are able to occupy many habitat types. The larvae are generalist feeders and will defoliate a variety of tree and shrub species. This insect favors mild climates at northern latitudes and can tolerate temperatures to -15°C in the short term. The adult males are most often observed flying after twilight at temperatures between 7°C–12°C and are strongly attracted to light. With changing climate, Winter Moth outbreaks are enduring longer and are now reaching historically colder regions in Europe (5, 6, 7).

It is wide spread in Georgia, especially eastern part of Georgia. Under natural condition population dynamics of winter moth is regulated by entomophages. We decide to study efficiency of entomophages on the population dynamics of winter moth in the apple orchards near town Tbilisi and Gori, Georgia.

II. Materials and Methods

The aim of our work was to study the impact on the population dynamics of entomophages of winter moth. To determine the entomophages were used method of shaking (3). When tapping or shaking branches insects fell to the canvas, from where they were collected sent to the laboratory. Collection entomophages were carried out in the morning hours in 2010-2011. To determine the species of beneficial insects were use determinants of Didmanidze 2000; etc (8).

III. Results and Conclusions

In the testing gardens of Tbilisi and Gori, we have found 5 species entomophages reduce the number of winter moth: *Apanteles ater* Ratz., *Pholodromus histrio* Latr., *Pimpla instigator* F. *Copsilura concinnata* Mg. *Lypha dubia* Fll. From them 2 species mostly reduce the number of winter moth population: parasites of larvae *Apanteles ater Ratz* and flies of pupae *Copsilura concinnata* Mg. Based on the data most effective were Entomophages of larvae. Annually pest population is regulated about 10 -15%.

Mortality of Caterpillars and Pupae of Winter Moth

Table 1.

Years	Stage of development	entomophages.	mortality		
			all	pcs	%
2015	caterpillars	925	753	18	1,3
	pupae	259	221	8	0,09
2016	caterpillars	306	28	8	2,6
	pupae	400	63	3	0,7
2017	caterpillars	274	96	18	6,6
	pupae	314	23	1	0,3

References

[1] Yu. A., K., Tshistjakov, E.A Eda Beljaev. A contribution to the knowledge of the larger moth fauna (Lepidoptera, Macrolepidoptera) of Mt. Litovka (Ptimorye Territory, Russia), Trans. lepid. Soc. Japan. Vol. 49, N 1, 1998, pp. 73–84.

[2] O. Tikkanen, P.Niemelä, J. Keränen „Growth and development of a generalist insect herbivore, Operophtera brumata, on original and alternative host plants" Ecologia (Ecology) Vol. 122(4). doi: 10.1007/s004420050976, 2000 pp.529-553.
[3] D.S. Fletcher Geometridae, The generic names of moths of the world. London 1979, pp. 30-31.
[4] M. Koch Wir bestimmen schmetterlinge. Berlin 1976, pp.100-1003.
[5] E. B. Polivoda,, Biological features and regulation of the winter moth count (Operophthera brumata L.) in the apple orchards of the Republic of Adygea" Diss.06.01.11 2007, pp. 14-16.
[6] http://www.rcfh-saratov.ru/depredator/Operophtherabrumata.htm
[7] http://borrozaz.ru/zaschita_lesa_ot_vreditelej_i_boleznej/uchet_zimnej_pyadenicy
[8] E. Didmanidze, A. Supatashvili, N. Goginashvili „Dendrophilic insects of Georgia" Vasil Gulisashvili Forest Institute, Tbilisi 2000 pp.300-500.

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Miranda Tserodze – Ecological characteristics of pests in Adjara subtropical zone – monograph – ISBNN 978-9941-435-20-1 p. 3-112 Batumi, Georgia 2013.
Miranda Tserodze, Nikoloz Meskhi - „Biological control of Winter Moth" - Book of proceedings - International meeting UIFRO – Integrated management of forest defoliated insects – 9-14 April 2014, p. 105-106 Antalya Turkey.
Miranda Tserodze, Nikoloz Meskhi, Otar Skhvitaridze - The research results of spreading of American white moth in Georgia – International Journal „Intellectual" p.100-105, 2017 Tbilisi, Georgia.

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PUBLICATIONS
Miranda Tserodze, Nikoloz Meskhi. 2012. Studying of entomophatogenic fungus beauveria bassiana as a biological agent against harmful insects". Proceedings of international conference radiological and agro-ecological research. Tbilisi, Georgia vol. VIII. P.200-202.
MirandaTserodze, Nikoloz Meskhi. 2011, Biological control of fall webworm". First international forest entomology and phytopathology symposium, Antalya, Turkey p 239-240.
Miranda Tserodze, Nikoloz Meskhi. 2011.,, Strategy of Agriculture development "–Proceedings of research-practical conference, Batumi, Georgia p. 192-195.