

## **PREDATORY STINK BUG *Perillus bioculatus* Fabricius 1775 (HEMIPTERA, PENTATOMIDAE) IN THE REPUBLIC OF MOLDOVA**

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**Abstract.** In the central and northern part of the Republic of Moldova, at potato plantations, there was detected the stink bug *Perillus bioculatus*, which is considered as the main entomophage of the Colorado potato beetle. According to preliminary data, the conclusion is made that the North American bug has acclimatized spontaneously in the south-east of Europe. It is assumed that the ecological integration of this harmful species in agrocoenosis will reduce essentially the quantitative effect of the phytophage *Leptinotarsa decemlineata*, but excluding the chemical treatments there will be obtained the ecologically pure agricultural products.

**Keywords:** Colorado potato beetle *Leptinotarsa decemlineata*, predatory stink bug *Perillus bioculatus*, ecological integration.

**Rezumat. Ploșnița răpitoare *Perillus bioculatus* Fabricius 1775 (Hemiptera, Pentatomidae) în Republica Moldova.** În partea centrală și nordică a Republicii Moldova în plantații de cartofi a fost descoperită ploșnița *Perillus bioculatus* care este considerată ca entomofag principal al gândacului de Colorado. Conform datelor preliminare se conchide, că heteropterul nordamerican s-a acclimatizat spontan în sud-estul Europei. Se estimează că integrarea ecologică a acestei specii prădătoare în agrocoenoză va reduce esențial efectivul numeric al fitofagului *Leptinotarsa decemlineata*, iar prin excluderea tratamentelor chimice vor fi obținute produse agricole ecologic pure.

**Cuvinte cheie:** gândacul de Colorado *Leptinotarsa decemlineata*, ploșnița prădătoare *Perillus bioculatus*, integrarea ecologică.

### **INTRODUCTION**

Yearly, in the Republic of Moldova, potato is cultivated over an area of 25-28 thousand hectares. In 2013, potato has been planted on a total surface of 23.8 thousand hectares. The harvest has amounted to 320-330 thousand tons, the country average reaching 13 tons a hectare (MAIA, 2013).

For example, in Romania potato is considered as a strategic food, being a component of the food safety insurance system. Energy, protein and dry substance contribution per unit of cultivated area is similar to that one obtained from the major crops – wheat and corn. That is why during the past 50 years the potato-cultivated area has been of 250-316 thousand hectares, granting to Romania the second place in Europe (CHIRU et al., 2006).

Colorado potato beetle is considered the main pest of potato crop on the European continent. Harvest losses due to this species are enormous and potato cultivation without protective measures is impossible.

### **MATERIALS AND METHODS**

As the material for this article was the natural population (108 larvae and adults) of the stink bug *Perillus bioculatus* has been detected near of the Chișinău city on the potatoes. Were also taken into account the data on the registration of this species of other localities – Slobozia Dusca village (Criuleni district); Drochia village, (Drochia district) and Parcova village (Edinet district).

### **RESULTS AND DISCUSSIONS**

**Colorado potato beetle *Leptinotarsa decemlineata* Say 1824 (Coleoptera, Chrysomelidae) – an invasive species in Europe.**

The North American species *Leptinotarsa decemlineata* appeared in Europe in the thirties of the 20<sup>th</sup> century and has become the most dangerous pest of solanaceous crops: potatoes, eggplants, tomatoes, etc. For the first time in Moldova, the Colorado potato beetle has been detected in 1960, in 1964 this pest being already present in all of the republic districts (VOROTYNTSEVA, 1971).

The pest biological cycle is characterized by a long duration of development stages. For example, the hibernated females laying period and larvae occurrence takes 3-3.5 months with numerical maximum level in late May - first half of June. The laying period and larvae hatching of the second generation, is also extended to 3 months with the maximum level in the second half of July - beginning of August.

Due to the large ecological plasticity and to the lack in local fauna of the specialized entomophages, the control of the Colorado potato beetle is based mainly on chemical method (GUSEV, 1991). In the Republic of Moldova, potato plantations are treated with different approved insecticides – Fastac, Arrivo, Confidor, Actelic, etc. (PAMUJAC et al., 2009). The average number of plantation works is of 2-3, but in some cases (torrential rain, influence of ultraviolet solar rays, etc.) can also amount to 4-5 during the crop growing season (FILIPPOV et al., 1986).

In order to protect human health and environment, the future in this area belongs to biological method by the use of entomophages. The study of natural predators and parasites of the Colorado potato beetle has shown that in Europe it is attacked by 270 species of insects (GUSEV, 1991). However, the most effective and voracious (a stink bug

destroys up to 2,500 of the beetle eggs) are the species of North American bug – *Podisus maculiventris* Say 1832 and *Perillus bioculatus*, trophically specialized on Coleopterans of Chrysomelidae family. The species *P. bioculatus* has been considered better for acclimatization, having a vital cycle well harmonized with that of the pest (MOENS, 1963).

**Brief history of works concerning the stink bug *Perillus bioculatus* acclimatization in Europe.** The first attempts to acclimatize the *P. bioculatus* species were conducted by French researchers in the 30's of the 20<sup>th</sup> century – immediately after the Colorado potato beetle emergence (1927) in the province of Bordeaux (MOENS, 1963; TROUVELOT, 1932). However, due to the commencement of the World War II, the investigations stopped and resumed only in 50-60 years, but already in several European countries: France, Germany, Belgium, Yugoslavia, Czechoslovakia, Hungary, Bulgaria, Poland, and USSR (GUSEV, 1991).

The researches with purpose of reproduction, application and acclimatization of *P. bioculatus* species in ex-USSR were conducted during 1960-90 in Lviv, Chernovtsy, Voronezh, Transcarpatia, Krasnodar regions and Moldavian SSR. The biological material was brought from Hungary in 1961. In August, the Quarantine Laboratory of Lviv received for experiments 34 larvae of first and second age (STRADIMOVA, 1967, 1973), and the Ukrainian Institute for Plant Protection of Uzhgorod – 100 eggs, of which 65 stink bug larvae hatched (SIKURA & SMETNIK, 1967). In 1973, a number of 2200 stink bug eggs were brought from Lviv to the Krasnodar region (Lazarevsk district) (GUSEV & ZAYATS, 1978). As a result of multiannual investigations, it was established that in the North and mountain areas, stink bug develops during 2 generations, but in the South – during 3-4 (GUSEV, 1991). It would be logical that, according to all the physiological and biological properties of stink bug (SHAGOV, 1967, 1968, 1969, 1977; SHAGOV & CHESNEK, 1978) and to the climatic parameters of the selected regions, species hibernation finalizes with a high rate of adults survival. However, all attempts failed, demonstrating a successful wintering of the North American stink bug within 7.3-15.7%. The final conclusion was that the stink bug *P. bioculatus* cannot be acclimatized in the South Western part of the former USSR (STRADIMOVA, 1967; ZAYATS, 1968; GUSEV, 1991). Equally, the idea of stink bug acclimatization was abandoned in other European countries, in which this issue was studied and during already 25-30 years anything concerning this matter has not been published in scientific literature.

In the Republic of Moldova investigations concerning *Podisus maculiventris* and *P. bioculatus* species started by elaborating mass reproduction methods (KOLESNICHENKO, 1981) and by applying them in order to control the Colorado beetle within potato and eggplant cultures (FILIPPOV et al., 1986; GUSEV & KOVALI, 1990). Information about the acclimatization attempts in Moldova of the species named above has not been found in special literature.

**Colonization by the species *Perillus bioculatus* of the countries of South Eastern Europe.** First accounts of the species *P. bioculatus* in natural conditions appeared in 2004, when it was detected on potato plants in the European part of Turkey and Greece (KIVAN, 2004; PERICART, 2010).

In 2008, in the Krasnodar region (Russia), some populations of stink bug *P. bioculatus* have been found. Their density on the plants of *Ambrosia artemisiifolia* Linnaeus 1753 (colonized with North American beetle *Zygogramma suturalis* Fabricius 1775 – food for the predatory bug) reached 10-20 larvae and adults per 1 m<sup>2</sup>, in summer 3 generations having developed. The researchers' conclusion was that, for the first time in the history of plants biological protection, a simultaneous acclimatization of two species occurred: of herbivore beetle *Zygogramma suturalis* and predatory stink bug *P. bioculatus* (ISMAILOV & AGASIEVA, 2010).

During the last years, faunistic reports have appeared (based on a few samples of *P. bioculatus*) of Bulgaria (SIMOV et al., 2012) and Serbia (PROTIC & NEBOJSA, 2012).

On July 2013, the stink bug *P. bioculatus* was detected in the Republic of Moldova on potatoes, attacked by the Colorado potato beetle near Chișinău city. The bug population constituted more than 100 larvae and adults, having a viable and very active state (Figs. 1; 2).

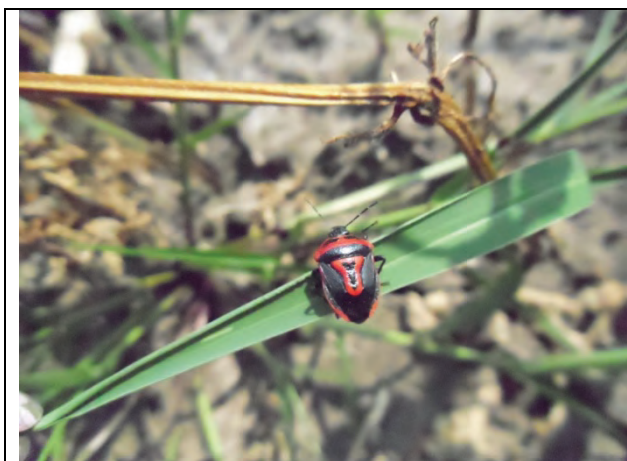


Figure 1. A stink bug adult *Perillus bioculatus* (original).



Figure 2. A stink bug larva of III age attacking a Colorado potato beetle larva (original).

As a result of subsequent investigations, other localities have also been revealed (Slobozia Dusca village, Criuleni district; Drochia village, Drochia district; Parcovă village, Edinet district), where larvae and adults of stink bug *Perillus bioculatus* have been detected on potatoes. But this information requires confirmation, because of the lack of samples.

The first reports concerning this discovery (DERJANSCHI & ELISOVEȚCAIA, 2013; DERJANSCHI et al., 2013) have incited a strong interest within the international scientific groups, because the bug population in the Republic of Moldova is the northernmost and can serve as initial colonization culture in European countries. At the same time, it should be mentioned that the invasive plant *Ambrosia artemisiifolia* is present in our country, but the coleopteran *Zygogramma suturalis* has not been recorded, with which *Perillus bioculatus* is trophically related in Krasnodar region. This is why there are necessary bio ecological researches of the peculiarities of the stink bug *Perillus bioculatus* populations in the Republic of Moldova conditions, which will form the basis for introduction of material collected from nature into laboratory culture and concluding of stink bug mass reproduction methods.

## CONCLUSIONS

The stink bug *Perillus bioculatus* detection in natural conditions on the territory of the Republic of Moldova and other countries (Turkey, Greece, Krasnodar region of the Russian Federation, Bulgaria and Serbia) demonstrates that this North American species has acclimatized spontaneously in the South Eastern Europe.

The integration of predatory bug *Perillus bioculatus* species in agrocoenosis will allow naturally to reduce the Colorado potato beetle numerical effective, to avoid polluting the environment with insecticides and to obtain ecologically pure agricultural products.

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Received: April 30, 2014  
Accepted: May 9, 2014