

Importance of Monitoring of Brown Marmorated Stink Bug (*Halyomorpha halys*) in Blueberry Orchards

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***Corresponding author:** Aleksandra Konjevic, Department of Environmental and Plant Protection, Faculty of Agriculture, University of Novi Sad, Serbia

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Aleksandra Konjevic*

Department of Environmental and Plant Protection, University of Novi Sad, Serbia

Opinion

Interest in the fruits of high-bush cultivated blueberries, in the last quarter of a century, in the world, and in the Republic of Serbia too, is increasing, due to the preventive anticancer effect which has been determined through the presence of antioxidants which destroy free radicals in the human body [1]. Therefore, there is also an evident increase in interest in the best ways of blueberry cultivation together with qualitative effective pest control measurements. Diseases that can cause damage to blueberries are most often related to the conditions of growing, e.g., the location, soil type, pH and especially planting depth [2]. Among the most important mycoses are root rot (*Phytophthora cinnamomi*), mummy berry disease (*Monilinia Vaccinii-Corimbosi*), grey mould (*Botrytis cinerea*), anthracnose (*Colletotrichum Gloeosporioides*), and septoria leaf spot (*Septoria albopunctata*), including few bacteria. Among insects, the most important are the spotted wing drosophila (*D. suzukii*), different caterpillars (order Lepidoptera), and, in recent years, several species of true bugs (Hemiptera, Heteroptera) [2]. The most important invasive species among them is the Brown Marmorated Stink Bug (*Halyomorpha halys* Stål), for the first time recorded in Serbia in October 2015 [3]. In addition to this species, many other true bug species are present in Europe, and either alien or native, only a few of them cause significant damage in agricultural production, such as the green vegetable stink bug, *Nezara viridula* L., the box bug, *Gonocerus acuteangulatus* Goeze, the green shield bug, *Palomena prasina* L. [4-6], the Italian striped bug, *Graphosoma lineatum* L. [7], mottled shieldbug, *Rhaphigaster Nebulosa* Poda [8] and the hairy shield bug, *Dolycoris baccarum* L. [9]. In Serbia, the increased area of blueberry orchards over the county has contributed to the spread of, the currently most important pest species, *Halyomorpha halys* in this crop, and the first damage were noticed in 2020 on the fruits. Brown Marmorated Stink Bug, *Halyomorpha halys* is native to East Asia [10] and is rapidly spread in North America, and Europe [11], including recent findings in South America - Chile [12], and Oceania [13]. Monitoring of the species was conducted in 2021 in Serbia, using pyramid dead-in traps (AgBio Company) combined with aggregation pheromone (Tréce lures) and results revealed the presence of this species in all five inspected blueberry plantations. At the same time, bushes close to the trap were visually examined and all these inspections also revealed the presence of eggs and nymphs indicating the establishment of the species in blueberries. The harmfulness of the mentioned stink bug species is reflected in the fact that both nymphs and adults feed on a large number of plant species, among which are economically important crops, fruits, vegetables, and ornamental plants [14]. Major economic losses were recorded on crops in the families Fabaceae and Rosaceae [10]. Recently, in Serbia, hazelnut and blueberries are added to the list of endangered species (unpublished data). Damage in hazelnuts is caused by

piercing the hazelnut shell when at first the pale spots are detected and followed by exudate coming out due to rotting and secondary infections [15]. Inside the shell cimiciato symptom is visible on the kernel which is deformed due to enzymes released by the feeding specimens, causing the kernel unusable even for the confectionery industry [16]. Very often the presence of rot or even completely rotten fruits can be observed due to secondary infections, together with spongy and empty fruits, which usually fall off the trees [4]. Damage to blueberry fruits due to the *Halyomorpha halys* feeding has already been observed in the United States, manifested by an increased level of fruit deformation, softening, shrinkage, and internal tissue necrosis. Exposure of berries to the stink bugs feeding is also associated with a decrease in berry weight and lower content of dry matter in fruits [17]. All these symptoms were observed in the examined blueberry plantations on the territory of Serbia, at a certain level, which drew the attention and awareness of producers about the mentioned species. Results of the monitoring revealed that *Halyomorpha halys* in blueberry orchards on the territory of Serbia develop two generations per year, the same as in other crops [14] and that the bushes close to the trap are usually more attacked compared with bushes in the other part of the plantation. This very mobile insect pest can easily move from one to another crop. Many ornamental plants nearby the plantations and cultivated fields often serve as reservoirs of the specimens where they can enlarge their populations in an undisturbed, insecticide-free environment [18] and later on move to the cultivated hosts where their presence is barely tolerant. Consequently, monitoring of the mentioned species is necessary in both urban and agricultural ecosystems in order to get an overall picture of its distribution and damage potential in invaded areas.

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