



CHARACTERISTICS OF DEVELOPMENT AND DAMAGE OF STICTOCEPHALA BUBALUS F. IN VERISHEN COMMUNITY OF SYUNIK MARZ

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The geographical location of the Syunik region of the Republic of Armenia, the global warming of the climate, the presence of fodder plants have ensured the survival, reproduction and territorial settlement of *Stictiocephala bubalus* F., in new, more southern settlements. As a result of our research in 2019-2021, in the orchards of Verishen community of Syunik marz, we have registered the harmfulness of *Stictiocephala bubalus* F., which is located at an altitude of 1645-1650 m.

At the initial stage damage was observed on several cultivated fruit species, and later to wild species. The pest damages the trees both during feeding and during spawning, causing cuts. In Vernashen *Stictiocephala bubalus* F. mostly damages pears and apples from fruit trees.

Stictiocephala bubalus – cut – ovary – fruit giving

ՀՀ Սյունիքի մարզի աշխարհագրական դիրքը, կլիմայի գլոբալ տաքացումը, կերաբույսերի առկայությունն ապահովել են գոմշանման ցիկադայի գոյատևումը, բազմացումը և տարածքային բնակեցումը նոր, ավելի հարավային բնակավայրերում: 2019-2021թթ. մեր կողմից կատարված ուսումնասիրությունների արդյունքում Սյունիքի մարզի Վերիշեն համայնքի, որը գտնվում է 1645-1650 մ բարձրության վրա, պտղատու այգիներում արձանագրել ենք գոմշանման ցիկադայի վնասակարություն: Սկզբնական փուլում վնասը դիտվել է պտղատու մի քանի մշակովի տեսակների վրա, իսկ հետագայում՝ նաև վայրի տեսակների: Վնասատուն ծառերին վնասում է ինչպես սննդառության ընթացքում, այնպես էլ ձվադրման ժամանակ՝ առաջացնելով կտրվածքներ: Վերիշենում ցիկադան պտղատեսակներից առավել շատ վնասում է տանձենուն, խնձորենուն:

Գոմշանման ցիկադա – կտրվածք – ձվադիր – պտղատու

Географическое положение Сюникской области Республики Армения, глобальное потепление климата, наличие кормовых растений обеспечили выживание, размножение территориальное расселение буйволовидной цикадки в новых, более южных местообитаниях. 2019–2021г. в результате наших исследований мы зафиксировали вредоносность буйволовидная цикадка в садах общины Веришен Сюникской области, которая расположена на высоте 1645-1650м над уровнем моря. В начальной фазе повреждения наблюдались на нескольких культивируемых видах плодов, а затем и на дикорастущих видах. Вредитель, нанося надрезы, повреждает деревья, как во время питания, так и в период яйцеклада. В садах общины Веришен из плодовых деревьев больше всего цикадка повреждает груши и яблони.

Буйволовидная цикадка – надрез – яйцеклад – плодовые

Armenia is an ancient fruit-growing country. In the Armenian Highlands, fruit growing was especially developed between 11 BC-1 AD. Greek and Armenian historians Herodotus (5th century BC), Strabo (1st century BC), Agatangeghos, Movses Khorenatsi, Anania Shirakatsi, Stepanos Orbelyan and others mentioned about fruit growing of Armenia. Armenia is one of the ancient places of cultivation of many fruit trees (apricot, pear, plum, etc.) [10].

In recent years, according to the alarms received from different fruit-growing regions of the Republic of Armenia, (*Hadrophallus bubalus* F., syn. *Stictocephala bubalus* F., *Ceresa bubalus* F.) began to spread widely in stone fruit and nuts orchards. Cicadellidae are members of the family of insect Homoptera, body length reaches 2-24 mm [1].

The homeland of *Stictocephala bubalus* is North America, from where it moved to Europe in 1912 [2,9]. It was first registered as a pest in Moldavia in the former USSR in 1954 by A. Abramov [8], then in Armenia in 1959 [3], in Georgia and in the western territories of Azerbaijan in 1960 [4]. The biophenology description of the pest was given by B.V. Vereshchagin in 1957 [6].

In Armenia, *Stictocephala bubalus* F. is widespread in the Northeast. According to literary sources, massive damage of the *Stictocephala bubalus* F. in Armenia was observed in a young irrigated garden at the height of 390-700 m above sea level [3], and the maximum height, where the upper limit of the *Stictocephala bubalus* F. was observed, was 1400 m above sea level in Moldova [3]. It is interesting to note that in Georgia the pest is found at an altitude of 1300 m above sea level, and in Siberia up to 930 m above sea level [5, 7].

Materials and methods. Observations and records have shown that the *Stictocephala bubalus* F. is selective for spawning towards fruit trees. For that purpose, during 2019-2021 observations and calculations were carried out during the year by the following methodology - twenty branches aged 2 to 4 years, were selected from each fruit species from the garden, and their degree of damage was calculated. The degree of infection was determined by recording the cuttings on 2-3-year-old 2 m branches from each tree.

The population of trees with *Stictocephala bubalus* F. was assessed on a five-point scale.

- 0 point - cuts on the branches are absent,
- 1 point - the number of cuts on the branches reaches 5 to 25,
- 2 points - the number of cuts on the branches reaches 26-55,
- 3 points - the number of cuts on the branches reaches 56-70,
- 4 points - the number of cuts on the branches reaches 71 and more.

The degree of population of trees with *Stictocephala bubalus* F. was assessed on the scale below.

- 0 points - pest-free plants
- 1 point - very poorly populated (damaged) plants (up to 25 %),
- 2 points - poorly populated (damaged) plants (25-50 %),
- 3 points - moderately populated (damaged) plants (50-75 %),
- 4 points - moderately populated (damaged) plants (75 and more %).

The population (damage) level of plants was determined by the following formula:

$$D = \frac{\sum \alpha, b, c}{N - 4} \times 100, \text{ where}$$

D - is the average population (damage) level,

$\sum_{\alpha, b, c}$ - is the sum of points

N - is the total number of registered plants,

4 - is the highest score.

Results and Discussion. The geographical location of Syunik marz of the Republic of Armenia, global warming, high ecological resilience of the species, the presence of fodder plants, the absence of extreme situations for the pest, ensured the survival, reproduction and territorial settlement of *Stictocephala bubalus* F. into new, more southern settlements.

As a result of our research conducted in 2019-2021, in the orchards of Verishen community of Syunik region, we have registered the harmfulness of *Stictocephala bubalus* F., which is located at an altitude of 1645-1650 m.

Integrating into the local ecosystem, *Stictocephala bubalus* F. has recently become a permanent component of the Syunik region. In the early stages of habitation, the pest adapted to feeding on several cultivated fruit species, and later expanded its food specialization to include wild species.

In the conditions of Syunik region, *Stictocephala bubalus* F. develops in one generation (tab. 2). Eggs overwinter, which are laid on annual branches, rarely on tree trunks, especially in the tissues of young fruit trees, only in living plants. If the branches dry out, the eggs die.

Depending on the weather conditions, the larvae hatch in May-June, the adult flight is observed from the beginning of July to the end of August. The results of the studies are presented in tab. 1.

Table 1. Stages of development of *Stictocephala bubalus* F.

N	Stages of development	2019			2020			2022		
		Average air temperature: °C	Medium air humidity, %	Duration in days	Average air temperature: °C	Medium air humidity, %	Duration in days	Average air temperature: °C	Medium air humidity, %	Duration in days
1	larva	17,5	70,5	52	18,6	67,5	44	17,5	69,0	55
2	Adult	17,7	70,0	70	17,6	69,3	73	18,9	65,3	63

As shown in tab. 1, the developmental length of adult and larvae depends mainly on climatic conditions. The higher the temperature, the faster the development. In 2019 at an average air temperature of 17.5 °C and 70.5 % average humidity (from the 2nd decade of May to the 2nd decade of July) the larval stage lasted 42 days. The length of the mature phase was 70 days at an average air temperature of 17.7 °C and average humidity of 70.0 % (from the 2nd decade of July to the 2nd decade of September).

In 2020 the larval stage lasted 64 days at an 18.6 °C average air temperature and average humidity of 67.5 % (from the 3rd decade of May to the 2nd decade of August). The maturity of the adult phase was 73 days at an average air temperature of 17.6 °C and at 69.3% average humidity (from July 1 to December 3).

And in 2021 at an average air temperature of 17.5 °C and at an average humidity of 69.0 % (from the 2nd decade of May to the 2nd decade of July) the larval stage lasted 55 days. The average length of mature phase lasted 63 days, at 18.9 °C average air temperature and 65.3 % average humidity (from the third decade of June to the second ten days of September).

Tab.2 presents the phenological table for the development of *Stictocephala bubalus* F. in Verishen community in 2019-2021.

As can be seen from the data in the table, in 3 years *Stictocephala bubalus* F. developed by 1 generation in the community of Verishen (tab. 2)

Table 2. Phenological table of development of *Stictocephala bubalus* F. in Verishen community (2019-2021)

Number of generation	April			May			June			July			August			September			Winter period
	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	
2019	•	•	•	•	•	•													•
					-	-	-	-	-	-	-	-	-	-	-	-	-	-	
									+	+	+	+	+	+	+	+	+	+	
												•	•	•	•	•	•	•	
2020	•	•	•	•	•	•	•												•
						-	-	-	-	-	-	-	-	-	-	-	-	-	
										+	+	+	+	+	+	+	+	+	
												•	•	•	•	•	•	•	
2021	•	•	•	•	•	•													•
					-	-	-	-	-	-	-	-	-	-	-	-	-	-	
									+	+	+	+	+	+	+	+	+	+	
												•	•	•	•	•	•	•	

Signs of pest development
+ adult, • egg, - larvae

Adult flight in 2019 and 2021 took place on the 3rd decade of June and spawning started on the 3rd decade of July, respectively. In 2020 the flight of adults has been observed since the first decade of July, and the beginning of spawning since the first decade day of August.

After hatching, the larvae fall from the trees and feed on herbs, crawling no more than 1.5-2 m away from the tree. They are less active, sit on the lower parts of plants, suck the juice of stems, young shoots are more shade-loving.

Adults have switched from herbs to tree species for spawning. During spawning, the female makes a pair of cuts on the branches with the ovary, where she places the eggs, seriously damaging the fruit trees. The whole process of cutting or laying eggs takes 12-20 minutes. If the branches dry out, the eggs are destroyed. Incisions made by *Stictocephala bubalus* F. are not repaired. Phytopathogenic fungi, bacteria and carnivores penetrate through these cuttings, which deepens the harmfulness of *Stictocephala bubalus* F. Severely damaged branches dry out (fig. 1).

In 2019-2020 *Stictocephala bubalus* F. spawned on a number of cultivated fruits, and in 2021 also on the young branches of wild fruit and forest trees.

It should be noted that in the areas where the censuses were conducted, the rows of trees were littered with common weed *Xanthium strumarium*.

It also damages the trees during the feeding process, while feeding by sucking the cell sap. It is especially dangerous during mass reproduction. *Stictocephala bubalus* F. is especially harmful for young plantings. The results of the census are presented in tab. 1.



Fig. 1 *Stictiocephala bubalus* F. damage to the pear and apple tree

Table 3. Harmfulness of *Stictiocephala bubalus* F. in Verishen community of Syunik region

Fruit trees	Types	2019		2020		2021	
		Damaged trees %	Number of cuts on 2 – 3 year old branches 2 m long, pcs	Damaged trees %	Number of cuts on 2 – 3 year old branches 2 m long, pcs	Damaged trees %	Number of cuts on 2 – 3 year old branches 2 m long, pcs
Apple tree	Renet Simirenko	100	127	100	146	100	151
	Winter Banana	85	110	100	138	94	123
	Saffron	96	130	100	180	100	168
	Shakarkeni	100	103	81	97	100	117
	Sarisinap	74	99	86	115	83	102
	Belflor red	100	169	100	142	100	154
	Wild Apple tree	0	0	67	78	100	167
Pear tree	Forest beauty	100	180	100	139	100	162
	Zmernuk	100	197	100	151	100	177
	Wild Pear tree	0	0	45	62	100	154
Quince		67	78	46	54	78	107
Cornus		0	0	0	0	12	18
Juglans		25	32	28	58	37	64
Corylus avellana		38	51	45	60	48	64
Ribes uva-crispa		7	11	20	29	25	35
Ribes		12	18	16	25	32	42
Blackberry		0	0	15	28	37	9
Prunus subg. Cerasus		0	0	9	17	31	43
Prunus avium		3	5	8	12	26	37
Prunus		0	0	0	0	42	65
Rose		36	52	51	73	53	77

As can be seen from the data in the tab. 1, *Stictocephala bubalus* F. most damages pears, followed by apple tree, quince, rose, corylus avellana, juglans. Relatively less damages ribes, ribes uva-crispa, blackberry, prunus subg. cerasus, prunus avium, prunus, cornus. Ovary cuts were found on oak, populus, fraxinus excelsior.

Conclusion

Stictocephala bubalus is considered to be one of the main fruit pests, which damages the trees both during feeding, when sucking the cell sap, and during spawning, causing cuts, seriously damaging the fruit trees. The cuts made by the *Stictocephala bubalus* F. are not repaired.

As a result of our research in 2019-2021, in the orchards of Verishen community of Syunik region, we have registered the harmfulness of *Stictocephala bubalus* F., which is located at an altitude of 1645-1650 m. Among fruit trees it mostly damages pear tree and apple tree, the damage of which is was 100 %.

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