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Aphids (hemiptera: Aphididae) on plum in kosovo

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Abstract
The species composition of aphids on plum trees (*Prunus domestica*) in three localities of Kosovo (Prishtinë, Obiliq, and Drenas) was investigated during the period 2021-2022. The experimental work was conducted via Fisher randomized Blocks Design in three repetitions. Five aphid species were identified: leaf curling plum aphid (*Brachycaudus helichrysi* Kaltenbach), Black peach aphid (*Brachycaudus persicae* Passerini), Mealy plum aphid (*Hyalopterus pruni* Geoffroy), Green peach aphid (*Myzus persicae* Sulzer), and Hop aphid (*Phorodon humuli* Schrank). The most widespread and significantly high population density aphid species was *B. helichrysi* which represents a serious threat to plum production in Kosova. The rest of the species occur far less and in low density, thus being of no great importance as pests in plum orchards.

Keywords: pyraloidea**,** cirrhochrista, diaphania, herpetogramma, orphanostigma, morphology, fauna, distribution, arabian peninsula

Introduction
Plum (*Prunus domestica*) is a perennial fruit crop, one of the most widely cultivated fruit crops in the world. In our country, it is one of the most cultivated fruit crops, due to its high nutritional values and ability to adapt to different agroecological conditions (Zajmi *et al*. 2006) [18]. It belongs to the family *Rosaceae*, subfamily *Prunoideae*, and genus *Prunus*.
In the intensive production of plums, there is the massive appearance of various pests, causing significant damage to this crop, which requires an efficient system of strategies for the protection of leaves, wood, and foliage. Among important plum pests that attack plums are red plum maggots, plum sawflies, and some aphids.
Aphids are economically important sucking insects that feed on different cultivated crops, weeds, shrubs, and plants that naturally occur in the landscape. Around 5000 species of aphids are known (Favret *et al*. 2013) [5], with 450 aphid species significantly important for agricultural crops worldwide (Blackman and Eastop 2000) [4]. In addition to directly damaging plants by sucking up their content, they are also important by transmitting viruses to the plants (Wallis *et al*. 2005 [17]; Adalet *et al*. 2021 [1]). In Poland, of eight aphid species collected in plum trees, only four species were the plum tree host plant in which breeding and development occurred, while the other species appeared only occasionally during probing feeding when they were looking for the specific host plant. The aphid species reported were *Hyalopterus pruni*, *Brachycaudus cardui*, *B. helichrysi*, and *Rhopalosiphum nymphaeae* (Strażyńsk 2004) [14]. In Bulgaria, nine aphid species were found feeding in plums, with the most dominant species being *H. pruni* and *B. helichrysi* (Vasilev *et al*. 2020) [16]. According to (Lecheva *et al*. 2006) [10] the most harmful pests from aphids are considered to be only three species: *Brachycaudus cardui*, *Hyalopterus pruni*, and *Hyalopterus amygdali*.
Taking into account that the plum crop is the primary host plant of several aphid species, our objective was to investigate the composition of aphids in the plum orchard in Kosovo.

Material and methods
For the needs of the research on aphids in the plum orchard, the experiment has been set up during the two years 2021-2022, in the plum plantation in three localities (Prishtinë, Obiliq, and Drenas). Stanley was the only cultivar included in this experiment. The experiment was carried out according to Fisher's randomized block methods in three repetitions. In a repetition, at random, 10 plum trees (leaves and shoots) were checked at 15-day intervals, starting from the month of April-September, where the present aphids were collected.
The collected aphids were placed in tubes where 70% ethanol was placed for the conservation of the specimens and provided with data such as the date of sampling, locality, number of samples, etc.
The specimens collected in plum orchards were identified according to the morphological keys provided by Blackman and Eastop 1984 [4]; Leclant 2000 [11].
The results were analyzed statistically using two-way ANOVA and LSD of 1% and 5%, with MSTA-C software from Michigan University, whereas data processing was performed using Microsoft Office 2007.
Since temperature and rainfall have a great influence on aphid distribution, we have collected meteorological data from Obiliq, Prishtinë, and Drenas meteorological stations (Table 1).

Table 1: Temperature and precipitation during the vegetation season (2021 - 2022)

Month	Obiliq		Prishtinë		Drenas	
	Temp. (ºC)	Precip. (mm)	Temp. (ºC)	Precip. (mm)	Temp. (ºC)	Precip. (mm)
April	13.7	41.9	13.8	54.0	13.5	63.1

May	16.2	65.2	16.4	63.4	15.4	70.3
June	19.5	56.8	16.9	57.5	16.1	59.4
July	22.6	51.5	22.7	68.2	23.2	66.5
August	21.9	40.8	22.5	35.7	20.8	37.4
September	17.4	47.3	16.2	52.9	17.5	64.2
October	16.8	54.5	15.1	65.3	14.0	67.8
Average	18.3	51.1	17.7	56.7	17.2	61.2

Results and discussion

Regarding the aphid species composition in plum trees, five species of aphids were identified: *Brachycaudis helichriysi, Brachycaudis persicae, Hyalopterus pruni, Myzus persicae,* and *Phorodon humuli* (Table 2). There were also other aphids recorded during these surveys, which we could not determine precisely. These undetermined aphids were present in three of the localities with a different number on different sampling dates, thus causing notable damage to the plums.

The average number of different aphid species collected during two years of investigation at each sampling date was different, and their distribution was very heterogeneous in three of the localities (Table 2).

Table 2: Aphid composition in plums during vegetation season (2021-2022)

Locality	Aphid species	Frequency of aphid sampling								Sum
		1	2	3	4	5	6	7	8	
Prishtinë	*B. helichrysi*	91	43	102	157	218	135	109	142	997
	B. persicae	46	19	43	61	54	75	48	20	366
	H. pruni	17	6	14	23	10	19	29	11	129
	M. persicae	83	54	19	81	16	32	46	23	354
	Ph. humuli	42	28	80	65	37	74	37	52	415
	Other	12	4	7	13	5	0	2	9	52
Obiliq	*B. helichrysi*	112	241	197	154	233	210	151	82	1380
	B. persicae	1	15	10	2	9	11	4	5	57
	H. pruni	6	7	14	7	3	26	12	19	94
	M. persicae	20	35	16	24	37	5	12	8	157
	Ph. humuli	4	0	12	21	8	3	2	0	50
	Other	5	2	6	2	0	7	5	3	30
Drenas	*B. helichrysi*	35	16	28	44	19	10	17	26	195
	B. persicae	12	9	45	21	36	15	10	31	179
	H. pruni	5	11	17	43	16	9	6	14	121
	M. persicae	13	25	10	15	44	27	13	5	152
	Ph. humuli	2	5	1	7	12	10	4	9	50
	Other	0	0	2	6	11	8	2	7	36

The majority of the aphid species were collected in the second half of the season respectively when temperatures were increased (Table 2).

With respect to the total number of aphids collected (4,814) regardless of the type of aphid species, the majority of them were found in plums cultivated in Prishtina whereas the lowest number was in Drenas (Fig. 1).

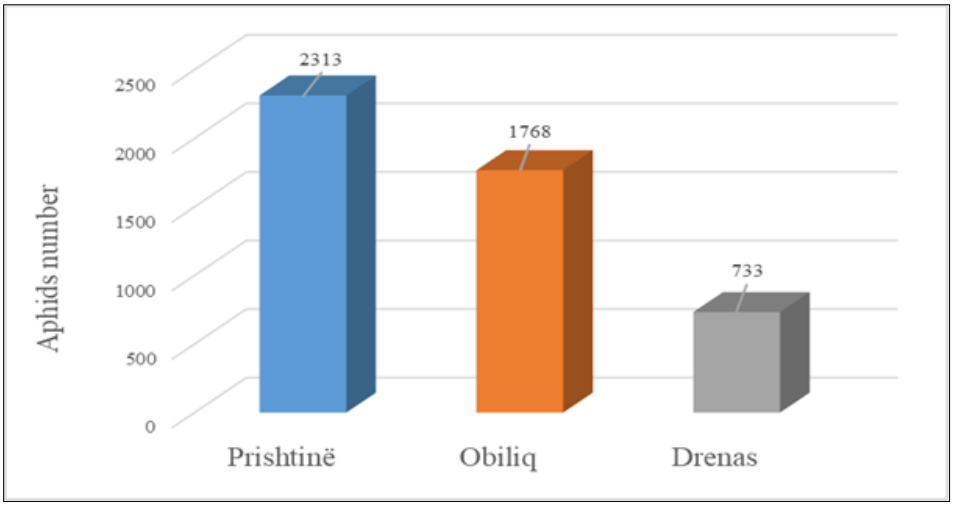

Fig 1: The number of aphids collected by localities (2021-2022)

Regardless of the locality, the *B. helychrisi* was the most prevalent among the aphid species recorded in plums (Fig. 2). Its occurrence is also reported in peaches (Arora *et al.* 2009) [2]. Its life cycle is described as heteroecious, with alternation between Prunus species, mainly (Prunus domestica) and peach (Prunus persica) trees, as primary

hosts for its sexual phase (Bennett 1955 [3]; Gupta and Thakur 1993 [8]) and several secondary herbaceous host plants, mainly from the Asteraceae and Boraginaceae families. Our findings are roughly in line with the results of the other studies that confirmed the aphid species compositions and their abundance in plum trees (Janiszewska-Cichocka 1966 [9]; Ruszkowska and Wilkaniec 2002 [12]; Vasilev *et al*. 2020 [15]; Shevchuk and Shevchuk 2022 [13]). Regardless of the aphid species present or the plant part where they were concentrated, the damage was considerable. During feeding, the aphids extract nutrients from the affected parts of the plants, especially from the leaves, with their piercing and sucking mouthparts, leading to plant deformations such as twisting, and shoot stagnation.

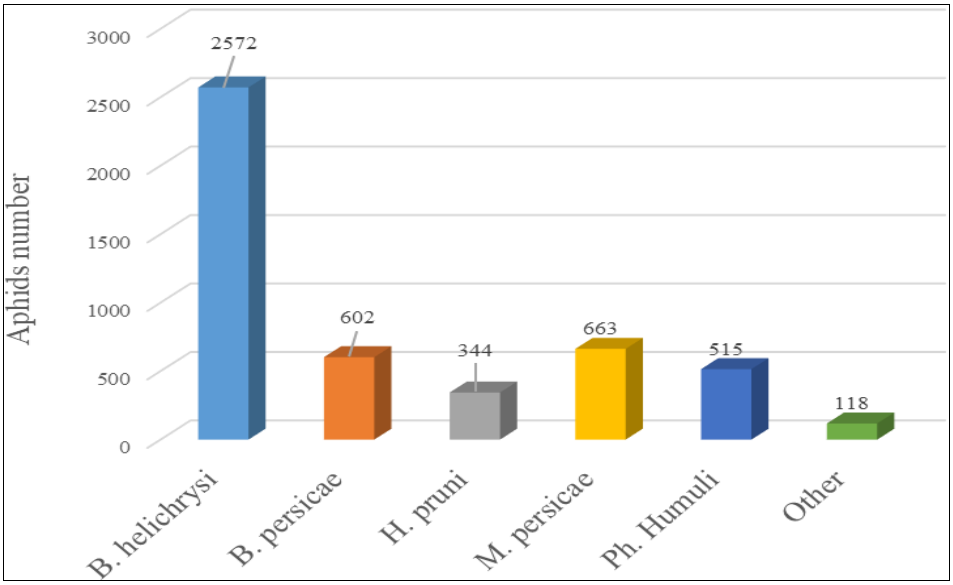

Fig 2: The ratio among aphid species during the vegetation season 2021-2022

From the analysis of variances and LSD testing (Table 3), there were significant differences between the three localities where the plums were cultivated (Prishtinë, Obiliq, and Drenas). The highest number of aphids, regardless of aphid species, was found in the locality of Prishtina (48.19 aphids), whereas the lowest number of aphids was found in the Drenas (15.27 aphids). The differences observed regarding the number of aphids in Prishtinë compared to Drenas on one side and Obiliq with Drenas on the other side proved to be highly significant, while the differences between Prishtinë and Obiliq are statistically significant. In this regard, we can say that the plums cultivated in the locality of Prishtinë have been the most affected by plant aphids whereas the least affected were plums cultivated in Drenas. Plums cultivated in Obiliq were somehow in between Prishtinë and Drenas regarding the number of aphids recorded (Factor A).

Table 3: The analysis of variances and LSD testing (ANOVA)

Locality (A)	**Species of aphids (B)**						**Average (A)**
	B. helychrisi	*B. persicae*	*H. pruni*	*M. persicae*	*Ph. humuli*	Other	
Prishtinë	124.63	45.75	16.13	44.25	51.88	6.50	48.19**
Obiliq	172.50	7.13	11.75	19.63	6.25	3.75	36.83*
Drenas	24.38	22.37	15.13	19.00	6.25	4.50	15.27**
Average (B)	107.17	25.08	14.33	27.63	21.46	4.92	Interaction A x B**
F a c t o r		A		B	A x B		B x A
LSD	1%	13.8018		15.6221	29.0052		27.0584
	5 %	9.9445		11.8680	21.5766		20.5560

Legend: ** = highly significant, * = Significant, NS = No significant

Significant differences were similarly seen with the species of aphids (Factor B). The highest number was recorded with *B. helychrisi* (107.17 aphids), while the lowest number of individuals was confirmed with *H. pruni* (14.33). The differences concerning aphid numbers recorded between *B. helychrisi* and all of the other aphid species were statistically highly significant (Table 3), whereas, among *B. persicae, M. persicae,* and *Ph. Humuli*, these differences were statistically not significant. Differences regarding the aphid number between *Ph. humuli* and *H. pruni* are statistically significant.

The interaction of factors AxB (locality x aphid species) were also statistically significant at a different level, concerning the aphid number in the plums (Table. 3).

Seven aphid species that have infested plums were described in Bulgaria (Grigorov 1980 [6]; Grigorov *et al*. 2004 [7]). *H. pruni* was found to be the most distributed and high-density aphid species in Southern Central Bulgaria (Vasilev and Andreev 2013 [15]), compared to our study, in which it was the least abundant species in plums cultivated in Kosovo. *H. pruni* is a holocyclic, facultatively migratory species. The primary host plants are *Prunus domestica*, *P. cerasifiera*, *P. spinosa*, etc., which in late spring and early summer migrate to its secondary host, Common Red (*Phragmites australis*).

Conclusions

In conclusion, we found five aphid species present in plums cultivated in three different localities in Kosovo. Among them, *B. helychrisi* was the most prevalent aphid species. Regarding the other aphid species, their distribution was more or less present at the same level in plum trees. The highest number of aphids recorded was in Prishtinë, and the lowest number was in Drenas. The maximum number of all aphid species was recorded in the second half of the vegetation when necessary measures should be in place to prevent damage that might be caused by the aphids in plum trees. With the aim of getting rid of aphids from plum trees, we suggest an integrated strategy for pest management at the farmer level.

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References

1. Adalet H, Melike Y, Hakan F. Potential Aphid (Hemiptera: Aphididae) Vectors of Plum-pox Virus (Virus: Potyviridae) and Status of Sharka Disease in Stone Fruit Orchards in the East Mediterranean Region of Turkey. Journal of Agricultural Sciences,2021:27(4):484-492.
2. Arora RK, Gupta RK, Bali K. Population dynamics of the leaf curl aphid, *Brachycaudus helichrysi* (Kalt.) and its natural enemies on subtropical peach, Prunus persica cv. Flordasun. Journal of Entomology and Nematology,2009:1(3):036-042.
3. Bennett SH. The biology, life history and methods of control of the leaf curling plum aphid, *Brachycaudus helichyrsi* (Kalt). Journal of Horticultural Science,1995:30:252–259.
4. Blackman RL, Eastop VF. Aphids on the World's Crops: Identification and Information Guide. John Wiley Sons, London, 1984, 476.
5. Favret C. Aphid Species File. Version 5.0/5.0, 2013. http://aphid.speciesfile.org. Accessed 16 March 2016.
6. Grigorov S. Aphids and their control. Zemizdat. Sofia, 1980, 285.
7. Grigorov S, Tashev D, Grigorov P. Aphids (Aphidoidea, Homoptera) in Bulgaria and their control. Academic Press at Agricultural University, Plovdiv, 2004, 423.
8. Gupta PR, Thakur JR. Sexual generation and overwintering of the peach leaf curling aphid *Brachycaudus helichrysi* (Kalt.) in Himachal Pradesh, India. Annals of Applied Biology,1993:122:215–221.
9. Janiszewska Cichocka E. Mszyce (Homoptera, Aphidodea) roślin sadowniczych Polski. III. Gatunki występujące na Prunoideae. Fragmenta Faunistica,1966:73:33-49.
10. Lecheva I, Petrov P, Nakova M, Borovinova M, Velcheva N, Simova S, *et al*. Good plant protection practices in orchards with stone fruits. In book "Rules of good plant protection practices in agriculture": National services of Plant Protection, Sofia, 2006:379-415.
11. Leclant F. Les Pucerons des plantes cultivees clefs d'identificatin. III – Cultures fruitieres. INRA, Paris, France, 2000.
12. Ruszkowska M, Wilkaniec B. Urban fauna of aphids (Homoptera, Aphidoidea) related to trees and shrubs in the Poznań district, Journal of Plant Protection Research,2002:42(3):205-214.
13. Shevchuk I, Shevchuk O. Complex of Aphidophagous Predators of Mealy Plum Aphid *Hyalopterus pruni* Geoffr. and Their Efficiency in Pest Control. Biology and Life Sciences Forum,2022:15:1-20.
14. Strażyński P. First infestation level and population growth dynamics of aphids inhabiting plum trees - chance for monitoring. Aphids and Other Hemipterous Insęcts,2004:10:111-117.
15. Vasilev P, Andreev R. Aphids on plums in the region of Plovdiv. Acta Entomologica Bulgarica,2013:1(2):23-30.
16. Vasilev P, Andreev R, Kutinkova H. Aphids (Hemiptera: Aphididae) On Plum And Cherry Plum In Bulgaria. Acta Horticulturae et Regiotecturae,2020:1:12–16.
17. Wallis CM, Fleischer SJ, Luster D, Gildow FE. Aphid (Hemiptera: Aphididae) species composition and potential aphid vectors of plum pox virus in Pennsylvania peach orchards. Journal of Economic Entomology,2005:98(5):1441-1450.
18. Zajmi A, Sylanaj S, Berisha B. Pemëtaria Praktike. USAID. Prishtinë, 2006.