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First report of the ash leaf curl aphid, *Prociphilus fraxinifolii* in Kyrgyzstan

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ABSTRACT

Ash trees provide important ecosystem services and are considered of high value both as ornamental trees and as a forest component. Recently, numerous reports containing detailed information about the situation of ash pests in different countries have been published. For this reeson, we performed a small survey to detect invasive pests of ash trees in Kyrgyzstan. Between 2018-2020 malformations and some curled leaves were observed at the base of a number of *Fraxinus pennsylvanica* Marsh. trees in landscaped areas in Djal microdistrict in Bishkek city, capital of the Kyrgyz Republic. In July 2021, a survey has been conducted throughout city to check the presence of the newly emerged exotic pest and colonies of ash leaf curl aphid. *Prociphilus fraxinifolii* (Riley, 1879) were observed on the green ash trees, *Fraxinus pennsylvanica* Marsh. It was detected from 3 localities out of 11 in Bishkek. The rate of infestation were determined between 12 and 42%. This is the first record of the species in Kyrgyzstan.

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INTRODUCTION

Prociphilus (Meliarhizophagus) fraxinifolii (woolly ash aphid) (Hemiptera:Aphididae) is an exotic invasive pest of ash trees (*Fraxinus* spp.) (Hałaj and Osiadacz 2017). Origin of this pest is Mexico, United States and Canada (Smith and Parron 1978). It was first recorded in Europe in 2003, in Budapest (Remaudière and Ripka 2003), and then began to spread quickly in the region. *P. fraxinifolii* has been reported excluding native range in the following countries: Chile, South Africa (Blackman and Eastop 1994), China (Yu et al. 2015), Iran (Tajmiri et al. 2016), Kazakhstan (Kadyrbekov 2017), Armenia, Belarus, Bulgaria, Germany, Great Britain, Hungary, Poland, Romania, Serbia, Spain and 16 regions of European Russia (Orlova-Bienkowskaja and Bieńkowski 2021). The expansion speed of this pest is very fast, which can be understood from European diffusion (Baker and Martin 2011).

The present study investigates the incidence and distribution of exotic invasive pest, *P. fraxinifolii* in Bishkek urban areas.

MATERIALS AND METHOD

Between 2018-2020 malformations and some curled leaves were observed at the base of a number of *Fraxinus pennsylvanica* Marsh. trees in landscaped areas in Djal microdistrict in Bishkek city, capital of the Kyrgyz Republic. In July 2021, survey was conducted throughout city to check the presence of the newly emerged exotic pest. During survey more than 300 ash trees belonging to the genus *Fraxinus* were examined in 11 localities of Bishkek (Figure 1). If the characteristic leaf nests of the pests were detected, they were collected, placed in eppendorf tubes containing 70% alcohol and then examined in the laboratory. The species identified based on morphological characters according to Blackman & Eastop 1994 and Petrović-Obradović et al. 2007. All specimens were deposited in the Entomology Laboratory of the Plant Protection Department, Kyrgyz Turkish Manas University, Bishkek, Kyrgyzstan.

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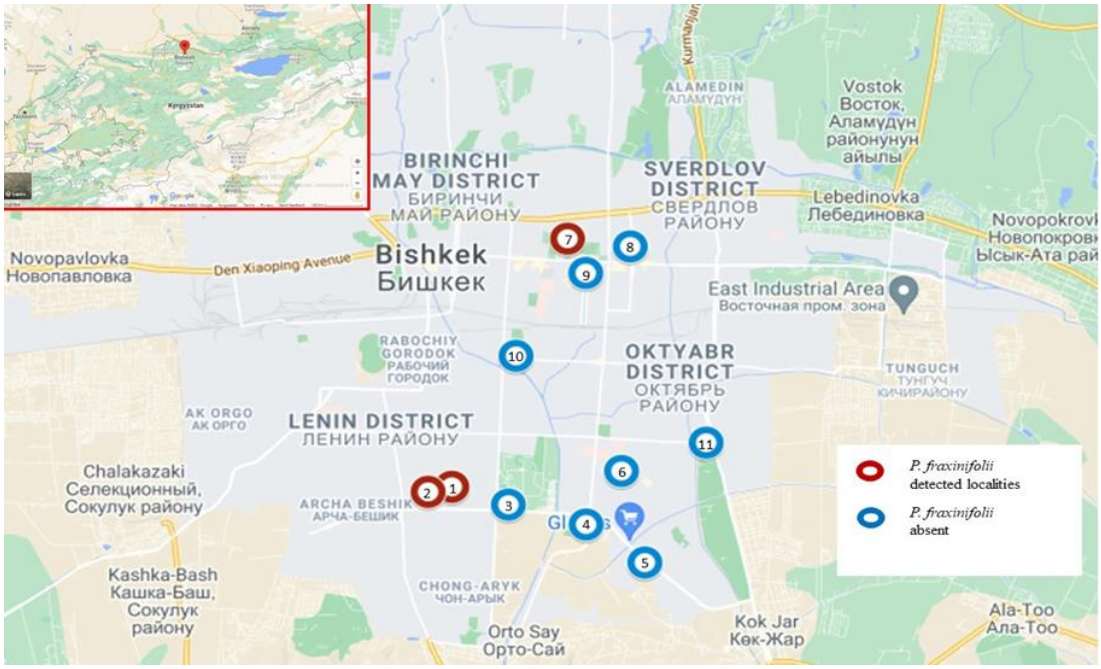

Figure 1. Surveyed localities of *P. fraxinifolii*

RESULTS AND DISCUSSION

We have detected *P. fraxinifolii* in 3 localities out of 11 in Bishkek (Table 1; Figure 2). It was detected only on *F. pennsylvanica* at three localities, first; artificial plantings in campus area of the Kyrgyz Turkish Manas University, second; roadside plantings along Tynalieva street and third; urban planting on the western side of Panfilov park. The rate of infestation for three localities were determined as 29,5; 42 and 12% respectively. We could check only three *Fraxinus* species in our survey. These species were *F. pennsylvanica, F. excelsior* and *F. mandschurica*. *P. fraxinifolii* not found on *F. excelsior* and *F. mandschurica* in our study.

Table 1. Localities of detection of *Prociphilus fraxinifolii* in 2021

	Locality	Number of Examined/ Infested *Fraxinus* Trees			Date of Survey
		F. pennsylvanica	*F. excelsior*	*F. mandschurica*	
1	Manas Uni. campus	61/18	10/0	-	16 July 2021
2	Tynalieva street	38/16	-	-	16 July 2021
3	Yntymak park	31/0	14/0	-	16 July 2021
4	Pobeda park	-	22/0	-	18 July 2021
5	Asanbai park	10/0	-	-	18 July 2021
6	Pudovkina avenue	15/0	-	-	18 July 2021
7	Panfilov park	23/3	30/0	-	28 July 2021
8	Ibraimov street	15/0	-	-	28 July 2021
9	Erkindik boulevard	-	27/0	-	28 July 2021
10	Gorkiy Botanical garden	-	25/0	8/0	08 Aug 2021
11	Ulan microdistrict	17/0	-	-	08 Aug 2021

P. fraxinifolii forms colonies on the tips of the branches, cause leaf curling, deformation and malformations (Figure 2). In summer, the wingless aphid can be found in the curling leaves of the branch end. The woolly ash aphid is very easy to identify. The body is covered with white wax silk, the body is small, and the body length is less than 3mm. Infested curled leaves turn to yellow, hidden aphids inside the leaves secrete honeydew during feeding which causing the formation of fumagine and thus the leaves cannot perform the process of photosynthesis.

According to observations during survey, *P. fraxinifolii* found mostly on the young trees (87 % of observed trees were younger than 5 years). Our findings are supported by the results of the other studies. Halbert and Blackman (2004) reported that the pest damage ash nursery stock on both above- and below-ground parts of the trees. Gubin (2021) detected pest distribution primarily on the shoots of young trees. Orlova-Bienkowskaja and Bieńkowski (2021) also observed leaf nests of the pest usually on seedlings or epicormic shoots.

Figure 2. Malformations caused by *Prociphilus fraxinifolii* on *Fraxinus pennsylvanica*

As of July 2021, *P. fraxinifolii* was locally distributed in Bishkek (Djal district). This pest was firstly recorded in south Kazakhstan among Central Asian countries in summer 2012 (Kadyrbekov 2017) which is the border country in the north with Kyrgyzstan. Information about the presence of the pest from other Central Asian countries is absent. Possibly, it was entered Kyrgyzstan before 2017 with infested nursery stock. Therefore, for the areas where ash tree needs to be introduced, quarantine must be strengthened when the seedlings are transported to prevent the introduction of this kind of aphid. Further surveys are necessary to determine pest's wider distribution throuought the country.

Currently, *P. fraxinifolii* has recorded only *F. pennsylvanica* as a host tree, with few recordings on *F. excelsior* in Europe (Hałaj and Osiadacz 2017). In Kyrgyzstan, following six ash tree species registered *F. americana*, *F. excelsior*, *F. lanceolata*, *F. mandschurica*, *F. pennsylvanica* and *F. velutina*. Among them, *F. excelsior* is dominant throughout the country (Andreychenko and Malosieva 2011).

Impact of this invasive pest on ash plantations in different countries would be different depending on the frequency of occurrence of *F. pennsylvanica* (Orlova-Bienkowskaja and Bieńkowski 2021). Pérez Hidalgo and Mier Durante (2012) reported that even spectacular malformations and large quantities of honeydew excreted by colonies of aphid, do not seem to cause any significant harm to trees, though the leaves they colonize frequently dry prematurely. Even though *P. fraxinifolii* is classified as a species with low harmfulness, regularly monitoring of *P. fraxinifolii* is recommended.

CONCLUSION

P. fraxinifolii poses threat to ash plantations in Kyrgyzstan as well as in Central Asia. Aphid development recorded exclusively on *F. pennsylvanica* in our observations. But it could attack for *F. excelsior*, which ecologically important tree in green areas and parks of the city. Therefore, further surveys are necessary to determine pest's wider distribution, natural enemies and whether *P. fraxinifolii* infests *F. excelsior*.

ETHICAL STATEMENT

Ethics approval was not required for this study.

CONFLICT OF INTERESTS

There is no conflict of interest between the authors

AUTHORS CONTRIBUTION

T.E.U. and H.G. carried out the research. T.E.U. wrote the manuscript with support from H.G. All authors discussed the results and contributed to the final manuscript.

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