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A NEW RECORD OF *ARCEUTHOBIUM OXYCEDRI* (*SANTALACEAE* s. l.) ON *PLATYCLADUS ORIENTALIS* (*CUPRESSACEAE*) IN CRIMEA

Key words: *Arceuthobium oxycedri*, *Platycladus orientalis*, *Crimea*, *Sevastopol*

Abstract

The location of massive *Arceuthobium oxycedri* invasion on (*Platycladus orientalis*) within the Sevastopol city boundaries is reported.

The range of the dioecious evergreen hemiparasitic perennial juniper dwarf mistletoe *Arceuthobium oxycedri* (DC.) M. Bieb. (= *Razoumofskya oxycedri* (DC.) F.W. Schultz ex Nyman) extends from west to east to more than 10 000 km — from Spain and Morocco to Tibet and Western China (Ciesla et al., 2004), being restricted mainly within the boundaries of the Ancient Mediterranean floristic province of the Holarctis as delimited by A. Takhtajan (1978). Within its vast geographic range, *A. oxycedri* parasitize various representatives of the family *Cupressaceae* S.F. Gray, mainly species of *Juniperus* L. In the European Mediterranean region, Anatolia, and Middle East the species affects two related junipers: sharp cedar, or cade (*Juniperus oxycedrus* L.), and Eastern prickly juniper (*J. deltoides* R.P. Adams) (Ciesla et al., 2004). The last one, according to the current taxonomic concepts (Adams, 2004; Adams et al., 2005; Yena, 2012), occurs in the mountain part of the Crimean Peninsula, reaching elevations

of 700—800 m above sea level (a.s. l.). *J. deltoides*, a typical element of shyblyak-like plant communities, usually comprises underwood of broadleaf and conifer forests, and in some sites forms light sparse forests in all natural areas of the Crimean Mountains, excluding non-forested uplands (so-called *yaylas*); however, the distribution of its hemiparasite *A. oxycedri* seems to be rather irregular. The juniper dwarf mistletoe infection of various juniper populations varies in a broad range: from its complete absence in the isolated populations of the Main Ridge (Glavnaya Gryada) to 90.6 % of the infestation rate in some localities of the Crimean South Coast (Ruguzova, 2002). According to our observations in 2012—2013, the most invaded populations of *J. deltoides* are those in the South Coast (specifically between Simeiz and Goluboy Zaliv settlements, Yalta City Council), as well as in adjacent coastal plots of the Main Ridge of the Crimean Mountains (vicinity of Balaklava) and the South-Western Crimean Foothills (Fig. 1, a, b).

Aside from its main host, *A. oxycedri* also occasionally occurs on other native *Juniperus* species, on Greek juniper (*J. excelsa* M. Bieb.) *inter alia* (Isikov, 1986; Lazarev, Grygorov, 1989), and on some exotic representatives of *Cupressaceae* cultivated in the peninsula (Isikov, Zakharenko, 1988). Among the

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Fig. 1. *Arceuthobium oxycedri* on *Juniperus deltoides* in the South-Western Crimean Foothills: *a* — Sevastopol, Fraternal (Bratskoe) Cemetery; *b* — Mount Zybuk-Tepe between Ternovka and Rodnoye villages, Balaklava District of Sevastopol



Fig. 2. *Arceuthobium oxycedri* on *Platycladus orientalis* (Sevastopol, Fraternal Cemetery): *a* — massive infestation on an old specimen; *b* — close up: harp-shaped incurvation and terminal thinning of the host plant branch

18 species and ornamental forms of *Cupressaceae* invaded by juniper dwarf mistletoe in Crimea, these authors mention Oriental thuja (*Platycladus orientalis* (L.) Franco) that naturally occurs mainly beyond the native range of *A. oxycedri*, in Northern China (including Inner Mongolia), Korean Peninsula, Russian Far East, and some Central Asian republics (Farjon, 2013).

In the course of surveying the area of the Fraternal (Bratskoe) Cemetery at the North Side of Sevastopol (44°38'10.61"N, 33°33'30.17"E), on March 8, 2014 an interesting case of massive invasion of *A. oxycedri* on old-growing stands of *P. orientalis* was revealed. The locality is the slightly sloping (5–10° incidence angle of different areas) southern slope of the hill (up to 60 m a.s. l.) facing Sevastopol Bay. The native flora of the locality, rather well preserved in considerably large areas, is represented by Sub-Mediterranean woodland formed by *Pistacia mutica* Fisch. et C.A. Mey. and *J. deltoides*, with shrubby underwood with *Jasminum fruticans* L.

and *Ligustrum vulgare* L.; old trees of *J. excelsa* solely occur as well. We have investigated the top of the hill and the adjacent areas of 7.13 ha on March 8 and 14, 2014. Hundreds of *P. orientalis* trees grew in the Fraternal Cemetery area, and old individuals attain 5–7 m in height and 0.45–0.55 m of trunk diameter. It has to be noted that Oriental tuga occurs here as a naturalized alien species actively invading the native plant community, since the multiple young trees of 0.7–1.5 m in height not affected by *A. oxycedri* vegetate under the woodland canopy. At the same time, almost 100 % of mature specimens of *P. orientalis* growing in the Fraternal Cemetery area, from the base to the top of the hill, bear *A. oxycedri*. Generally, *A. oxycedri* localizes at the upper 2/3 of the host crown of *P. orientalis*, and the infestation rate runs to 5–9 points (of 12 maximum possible) in accordance with the Hawksworth (1977) six-class dwarf mistletoe rating system modified by D. Gajšek et al. (2013) (Fig. 2, a).

Separate *A. oxycedri* specimens could exceed 25–30 cm in diameter. Our data suggest that the observed case of such a massive invasion of *P. orientalis* by juniper dwarf mistletoe is unique for Crimea. In the Nikita (Nikitsky) Botanical Garden (Yalta City Council) and Novyi Svet settlement (Sudak City Council) *A. oxycedri* was found on single *P. orientalis* specimens; 40 % of Oriental tsga trees in the Foros Park were invaded by the hemiparasite, but less than a half of the trees were severely damaged (Isikov, Zakharenko, 1988). Here-with, *P. orientalis* in those localities occupies smaller areas than in the Fraternal Cemetary Park, where it is the prevailing species.

The infestation rate of *J. deltooides* in the Fraternal Cemetary population is high as well: approximately 70–80 %. Therefore, the infection of the alien species (*P. orientalis*) occurs under the direct contact with this representative of the native dendroflora, but not by the scheme suggesting that one more exotic *Cupressaceae* species, Monterey cypress (*Cupressus macrocarpa* Hartw. et Gordon), is required as an "intermediate link" (Isikov, Zakharenko, 1988). At the North Side of Sevastopol, juniper and Oriental tsga trees often grow close to each other, touching by their branches. Certainly, close planting of *P. orientalis* in the alleys near St. Nikolas Church on the top of the hill also favoured the hemiparasite spread. *A. oxycedri* seed dispersal in the populations of the host plants is provided by the viscin-mediated ballistic mechanism that allows to disseminate the seeds to the distance comparable to the infected tree height; ornithochory occurs rarely as well (Isikov, Zakharenko, 1988; Hawksworth, Wiens, 1996).

Arceuthobium oxycedri has not been found on two other species growing in the Fraternal Cemetary area (*J. excelsa* and *Cupressus sempervirens* L.), which suggests their higher resistance to this hemiparasite, as it has been supposed earlier (Isikov, Zakharenko, 1988).

Juniper dwarf mistletoe infection can be easily revealed due to the typical morphological changes: namely, cylindrical thickening (muft-like swellings) in sites of shoots germination, and harp-shaped incurvations and terminal thinning of the host plant branches (Fig. 2, b). In comparison, on the invaded *J. deltooides* branches only the "muft" formation occurs.

Parasitizing by *A. oxycedri* causes photoassimilates outflow, inhibits host plant growth, lowers its drought resistance, and enhances viral, bacterial and fungal invasions (Hawksworth, Wiens, 1996). In compliance with this statement, we have found many died and dying stag-headed *J. deltooides* and *P. orientalis* at the Fraternal Cemetary.

Oriental tsga is cultivated in Crimea from the beginning of the 19th century. Almost all findings of *A. oxycedri* on *P. orientalis* are restricted to Crimea (Ciesla et al., 2004). Despite the fact that this species is widely used for landscape design, all cases of its invasion by *A. oxycedri* have been described for old parks and dendrological collections 130–200 years of age, such as those of the Nikita Botanical Garden arboretum, and parks in Foros and Novyi Svet settlements. It has to be mentioned in this respect that the Fraternal Cemetary Park has been planted in the second half of the 19th century (probably not later than 1870), and the Oriental tsga planting stocks were delivered from the Nikita Botanical Garden and Odessa nursery. However, there are stands of younger age here also invaded by *A. oxycedri* that could have been growing in the Fraternal Cemetary area since the mid-20th century. Besides the prolonged contact of the exotic species with *A. oxycedri*, one more condition that increase the probability of *P. orientalis* invasion might be its proximity of artificial stands to juniper forests (both at present and in the past).

Specimens of *A. oxycedri* samples on branches of *P. orientalis* collected on March 8 and 14, 2014, are deposited at the herbaria of the M.G. Kholodny Institute of Botany, National Academy of Sciences of Ukraine (*KW*), and Karadag Nature Reserve (*PHEO*).

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НОВА ЗНАХІДКА *ARCEUTHOBIUM OXYCEDRI* (*SANTALACEAE*) НА *PLATYCLADUS ORIENTALIS* (*CUPRESSACEAE*) У КРИМУ

У повідомленні міститься інформація про виявлення на території м. Севастополя випадку масового ураження арцеутобієм ялівцевим (*Arceuthobium oxycedri*) насаджень біоти східної (*Platycladus orientalis*).

Ключові слова: *Arceuthobium oxycedri*, *Platycladus orientalis*, Крим, Севастополь.

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НОВАЯ НАХОДКА МОЖЖЕВЕЛОЯДНИКА *ARCEUTHOBIUM OXYCEDRI* (*SANTALACEAE*) НА *PLATYCLADUS ORIENTALIS* (*CUPRESSACEAE*) В КРЫМУ

Сообщается о выявлении на территории г. Севастополя случая массивного поражения можжевелядником (*Arceuthobium oxycedri*) насаждений плоскочеточника восточного (*Platycladus orientalis*).

Ключевые слова: *Arceuthobium oxycedri*, *Platycladus orientalis*, Крым, Севастополь.