IMPORTANT ORNAMENTAL HOST PLANTS FOR MEALYBUGS (*COCCOMORPHA: PSEUDOCOCCIDAE*) IN GREENHOUSES

Cristina Elena MAROCICO[1], Andreea Sorina SAMAN[1], Ramona ȘTEF[1], Ana – Maria VÎRTEIU[1]
[1]Department of Biology and Plant Protection, Banat's University of Agricultural Sciences and Veterinary Medicine "King Michael I of Romania" from Timisoara
Corresponding author: anamariavarteiu@usab-tm.ro

Abstract. *Mealybugs (Hemiptera: Coccomorpha: Pseudococcidae) are common in greenhouses, and in the recent years have become an increaseing problem in Romania. During the last twenty years, several pseudococcidae mealybugs species have been established in western Romania after introduction as a result of international trade. This family compries world – wide a 2032 species belonging to 258 genera. The aim of this paper is to highlight the main pest species to ornamental plant in terms of taxonomic hierarchy, morphological characteristics, quantitative ratio and preferred host plants. The paper is mainly based on sampled taken by the authors during 2020 – 2021, useing direct observation method, from a private greenhouses, located in Timisoara. Biological material was identified at species level. This study highlighted the presence of three mealybug species infesting various ornamental host plants in western Romania greenhouses. The most important species, that is mentionated in the scientific literature, to be wide – spread arround the world , occuring predominatly on a wide range of indoor and outdoor host plants, is Pseudococcus longispinus. This species is the only species that can be regarded as native. Planococcus citri and Pseudococcus viburni are introduced species, established on indoor ornamental plants. The host plants preferred by these species, in relation to the number of specimens, were: Olea europaea; Cycas revoluta and Citrus limon.*

Keywords*: ornamental host plants, Pseudococcus longispinus, Pseudococcus viburni, Planococcus citri, greenhouses*

INTRODUCTION

Mealybugs (*Hemiptera: Coccomorpha: Pseudococcidae*) includes economically important insect pests, especially for woody and herbaceous ornamental plants (ZARKANI *et al*., 2021).

After GARCIA *et al.* (2016) this family is one of the most important families in the infraorder, and it is composed world – wide of 2032 species belonging to 258 genera, while according to BEN-DOV *et al*. (2015) this family is considered to be the second largest family of scale insects, after the *Diaspididae* family, with approximately 2012 described species in more than 273 genera worldwide.

About 140 species of mealybugs are recorded in Europe and most of them are plant – parasitic insects (polyphagous species) (BEN-DOV *et al*., 2006; PELLIZZARI & GERMAIN, 2010) that have been accidentally introduced in western Romanian greenhouses as a result of ornamental trees, shrubs and flowers trade.

Insects from this family are characterized by the accumulation of a white mealy or powdery wax produced by the females (WILLIAMS, 2004; KAYDAN, 2015) and usually small body length range from 0.5 – 10 mm and not easily seen in their early stages of development (SCHREAD, 1970). The female having an oval or round but flat to fairly convex body form, sometimes bud shaped (PELLIZZARI & GERMAIN, 2010) and the male are tiny and winged (COX, 1987).

These insect species cause direct damage to ornamental plants when insert their mouthparts like needles into host and sap plants (FRANCO *et al*., 2009, DAANE *et al*., 2012); but

also indirectly by promoting sooty mold growth and transmission of plant viruses (HERRBACH *et al.*, 2016).

MATERIAL AND METHODS

Collecting – the samples were collected useing direct observation method. The experiment was conducted in already existing private greenhouse, located in Timisoara. Specimens of mealybugs were taken during 2020 – 2021 from the aerial parts ((fruits, trunks, and leaves) of different ornamental plant species, and taken to the Laboratory of Plant Protection and Phytosanitary Expertise, Faculty of Agriculture (BUASVM Timisoara) for examination.

Slide-mounted specimens – the specimens and parts of the infestated plants were collected and placed in labeled plastic bags, only adult females specimens were slide-mounted and identified at species level. The first stage of this methods of preparation consist in picking off each specimen from host plants with the help of an fine brush wetted with 70% alcohol; after this operation the specimen were preserved in 70% alcohol (ELHAM *et al.*, 2019;). Each specimen was labeled by the recorded information of host plant and collecting date.

Morphological identification - the main taxonomic characters of the adult females were evaluated and quantified using the following determination key of COX & BEN-DOV (1986), WILLIAMS (2004) and KAYDAN & GULLAN (2012).

RESULTS AND DISCUSSIONS

Data presented here are results of two years survey studying the mealybugs species (*Coccomorpha: Pseudococcidae*) and the main host plants. These results show the presence of three important species and a wide range of host plant distribution in greenhouses.

Two species *Planococcus citri* (citrus mealybug) and *Pseudococcus viburni* (obscure mealybug) has been identified and considered to be invasive species for indoor greenhouse plants. The longtailed mealybug, *Pseudococcus longispinus*, wich represents more than 75% of the collected mealybugs samples throughout the study period, is a widely-distributed pest, common in our country, feeding on many economically important indoor and outdoor ornamental host plants. The study conducted by DAANE *et al.* (2012) and PALMA-JIMÉNEZ *et al*. (2018) revealed that *Pseudococcus longispinus* and *Pseudococcus viburni* have been commonly encountered together.

The extremely high density of all three mealybugs species, during the research period, is mainly due to the temperatures that are kept constant: between November - April - 17 degrees Celsius, and in May - October - around 25 degrees.

Key to the investigated species of family *Pseudococcidae*

Pseudococcus longispinus (Targioni Tozzetti, 1867)

Description: females – body - elongate-oval to oval form, measuring 1.6-4.6 mm in length and 0.7-2.5 mm in width and grayish pink color, also covered with powdery white wax extending into 17 lateral pairs of long filaments, the posterior 2 pairs as long as the body (COX, 1987).

Material examined: 248 adult females and 52 first instars nymphs collected from *Olea europeaea;* 57 females, 45 first instars nymphs and 23 female, 34 first instars nymphs were collected from *Dracaena fragrans,* respectively *Dracaena marginata; Cordyline fruti* - 19 female specimens and 28 young instars nymphs; from *Cycas revoluta* the highest number of adult females was collected – 328 specimen and 75 young nymphs; 20 female specimens and 39 young instars nymphs also picked up from *Phalaenopsis sp.*(figure 1).

Remarks: this cosmopolite species cause severe damage to the leaves, preferring the lower surfaces, but in high density would feed on barks, on branches, almost all over the aerial parts of ornamental plants. However, the trunk remains the part of plants preferred by reproductive females. It was first recorded in Romania by KNECHTEL (1930) and afterwards by SĂVESCU (1985).

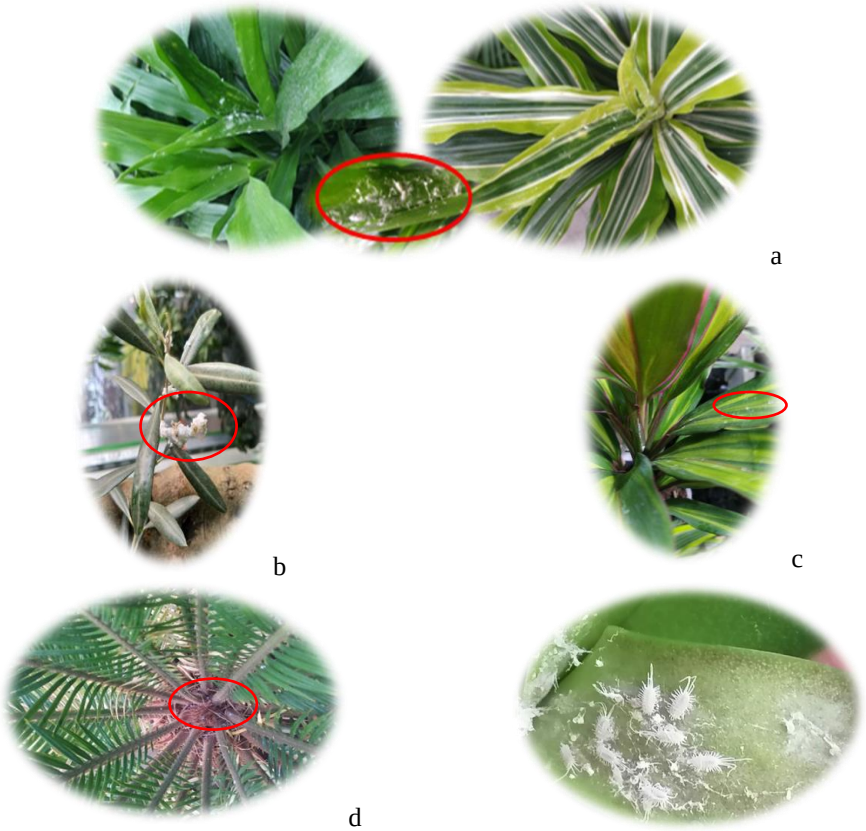


Fig. 1. Live specimens of *Pseudococcus longispinus* (Targioni Tozzetti, 1867) on different host plants: a - *Dracaena sp.*; b - *Olea europeaea*; c- *Cordyline fruti*; d - *Cycas revolute*; e - *Phalaenopsis sp.*

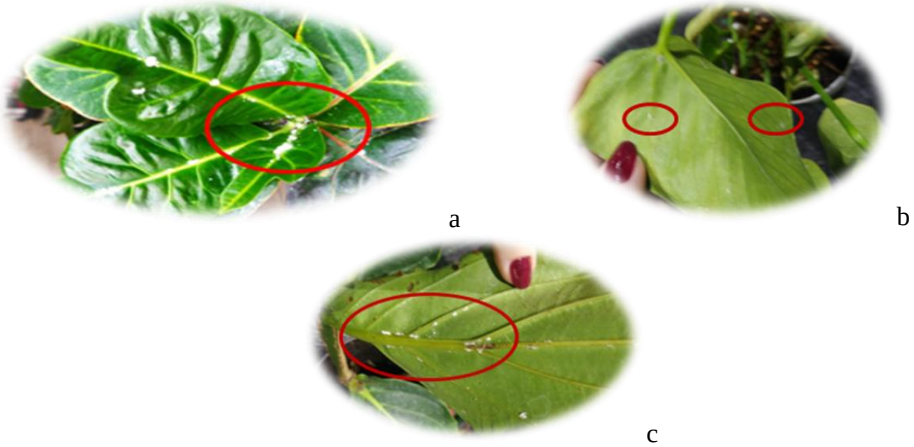
Pseudococcus viburni (Signoret, 1875)

Description: females are flightless, with a rectangular body form and rounded anterior and posterior ends; with length range from 1-5 mm and a darker pinkish gray color. Also, with a set of two to four exceptionally long caudal filaments growing from the posterior end of its body. The body is covered in a white, waxy secretion which accumulates in clumps along thin filaments protruding from its exoskeleton (HAMLET, 2005).

Material examined: from *Codiaeum variegatum* on the research period were collected 15 female and only 3 first instar nymphus; 47 adult females and 40 young nymphs collected from *Mandevilla sundavil* and also, 58 females and 37 young instars on *Medinilla magnifica* (figure 2).

Remarks: this species occurs on all parts of the host-plant, especially on leaves and flowers, excreting copious quantities of sugary honeydew, which fouls the plant surfaces and gives rise to sooty mould growth (PHILLIPS & SHERK, 1991). The study confirms the

importance of obscure mealybug species and also revealed the polyphagy of this species and the rapid escalation in Western Romanian greenhouses due to international ornamental plants trade. It was recorded for the first time by FETYKÓ *et al.* (2010).



a b c

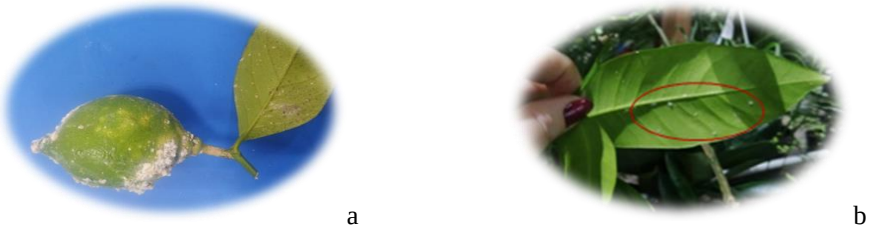
Fig. 2. Live specimens of *Pseudococcus viburni* (Signoret, 1875) on different host plants: a - *Codiaeum variegatum*; b - *Mandevilla sundavil*; c - *Medinilla magnifica*

Planococcus citri (Risso, 1813)

Description: females – body – oval, with 1.6-3.2 mm in length and a orange-pink color, covered with powdery white wax except for a longitudinal stripe down midline, the wax extending into 18 pairs of short lateral filaments (COX, 1987).

Material examined: 94 females and 17 first instars nymphs taken from *Citrus limon* and a number of 87 female and 27 first instar nymps from *Citrus aurantifolia "aranciata"*; *Strelitzia reginae* - 24 females and 7 young instars; *Anthurium andraeanum* – a 54 female specimens and 17 nymphs; *Ficus microcarpa* – 15 females and 7 nymphs; 63 female and 85 young nymphs collected from *Ficus benjamina; Ficus americana* subsp. *guianensis* – only 7 females and 2 first instars nymphs (figure 3).

Remarks: this species seams to by one of the major mealybugs pests throughout the world, and fairly common and wide - spread in Romanian greenhouses, after *Pseudococcus longispinus.* It was found mainly on ornamental trees and shrubs, and exceptionally on flowering ornamental plants, like *Strelitzia* and *Anthurium*. Was recorded for the first time in Romania by Săvescu (1960) and after a long period of time the species is mentionated by TEODORESCU & MATEI (2010) and FETYKÓ *et al.* (2010).



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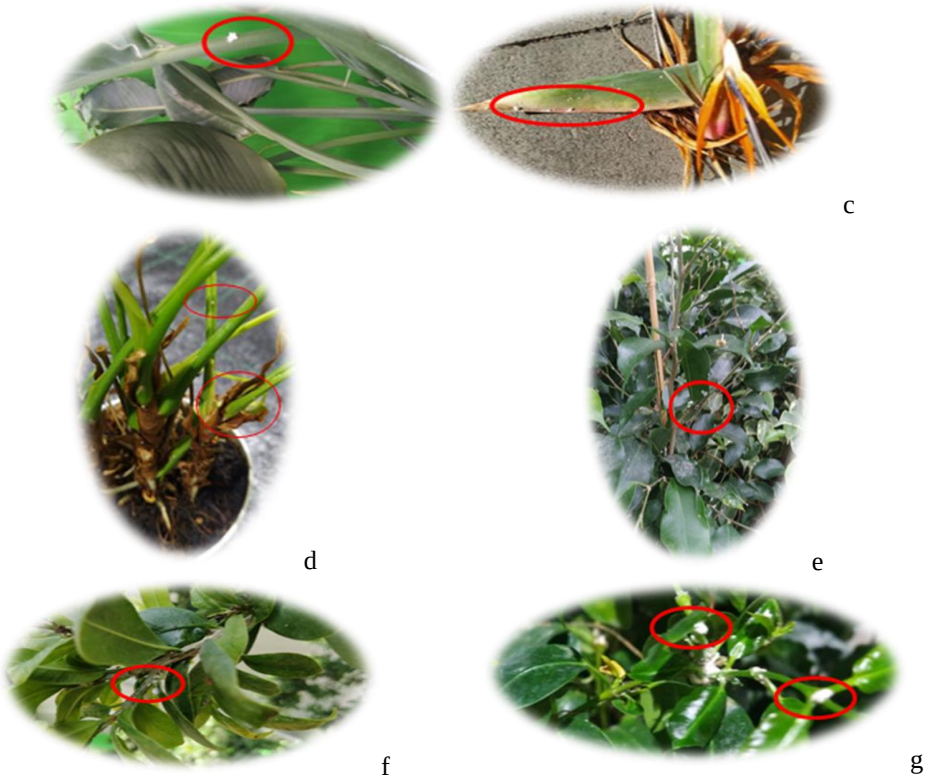

Fig. 3. Live specimens of *Planococcus citri* (Risso, 1813) on different host plants:
a - *Citrus limon*; b - *Citrus aurantifolia* "*aranciata*"; c - *Strelitzia reginae*; d - *Anthurium andraeanum*; e - *Ficus benjamina*; f - *Ficus microcarpa*; g - *Ficus americana* subsp. *guianensis*

CONCLUSIONS

The ornamental plants existing in the private greenhouses in Timisoara provides a suitable habitat for the annual cycle of all the three species of mealybugs to be completed.

During the growing season ornamental plants provide food and shelter for mealybugs to develop, the most damaged plant species being *Cycas revolute*, followed by *Olea europeaea.*

The results revealed that *Planococcus citri* has the highest number of host plants (7 ornamental plants), but in the case of *Pseudococcus longispinus*, the highest population density, together with the highest intensity of the attack shows that this pest is the most important in region, in greenhouses, and can cause considerable damage and it is necessary to continue with monitoring their populations.

This basic information presented in this paper will be useful to start studies about its biology and ecology of this species in order to define efficient management strategies.

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