

Mini review

Planococcus citri (Risso) (Hemiptera: Cocomorpha: Pseudococcidae) on Strawberry (*Fragaria vesca* L., Rosaceae) in Silifke, Mersin, Turkey

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Fragaria vesca L. (Rosaceae), called “wild strawberry”, “woodland strawberry”, “Alpine strawberry”, “Carpathian strawberry” or “European strawberry” is grown naturally throughout much of the Northern Hemisphere and produces fruits. The plant can be spread mostly by stolons as well as by the seeds to establish new populations. Recently tissue culture is also very common to produce new seedlings. The wild woodland strawberry is native to Europe and Asia and is the most widely distributed species of the genus *Fragaria* occurring throughout Europe, Northern Asia, North America, and Northern Africa (PIER, 2013; USDA NRCS, 2012). Their flesh develops from the receptacles of pollinated flowers that open in May or June and in sunny locations continue to flower until the first frosts come. Strawberries can be economically produced in various climatic and soil conditions. Strawberries, with their rich mineral content and unique flavor and aroma, are also an important source of antioxidant compounds such as anthocyanins and phenolic acids [1]. In the world, China (3,2 billion tonnes) is the biggest strawberry producer followed by America (3,2 billion tonnes) and Mexico (861 billion tonnes) FAO, 1/Trade Map (27.v.2021). Strawberry production in Turkey country is concentrated in the Mediterranean, Aegean, and Marmara regions, respectively [2]. In the Western and Central-Eastern Anatolia Region and the Black Sea Region, the interest in strawberry production is also increasing [3]. In 2020 strawberry production was the highest in the Mersin province with 188 Thousand tonnes, second in Aydın with 68 thousand tonnes, and third in Konya with 51 thousand tonnes [4].

Pests, diseases, and problems caused by weeds are the most important factors negatively affecting strawberry production. Pests that cause productivity to go down in strawberries are *Chaetosiphon fragaefolli* Cockerell (Hemiptera: Aphididae), *Tetranychus urticae* Koch, and *T. cinnabarinus*

(Boisduval) (Prostigmata: Tetranychidae), *Aphis gossypii* Glover (Hemiptera: Aphididae) and *Frankliniella intonsa* (Thysanoptera: Thripidae). The spider mites (*T. urticae* and *T. cinnabarinus*) are known to be the pests that do the most harm to production [5,6].

There were 33 scale insect species (Hemiptera: Cocomorpha) belonging to eight families namely, Acanthococcidae, Diaspididae, Margarodidae, Monophellidae, Ortheziidae, Pseudococcidae, Putoidae, and Rhizoceidae recorded on Strawberry all over the world [7]. Among them, *Planococcus citri* Risso (Pseudococcidae) is a highly polyphagous, adaptable mealybug that can feed on many host plants in a variety of conditions, and can reproduce rapidly. It has been reported on over 200 host-plant species belonging to 191 genera and 82 families [7]. Although *Planococcus citri* is of Old World origin [8], it is now established in all the temperate and tropical zoogeographic regions and lives under glass in higher latitudes. Citrus mealybug is recorded in America previously by McKenzie [9] on *Fragaria vesca*. Madanlar and Yoldaş [6] also recorded that *Planococcus citri* was present on Strawberry plantations in İzmir province in Turkey.

Citrus mealybugs are primarily pests of citrus but have been collected from at least 27 host plant families including indoor ornamentals, vegetables, and fruits. Host plants include *Amaryllis* sp. (Jersey lily), *Ananas comosus* (pineapple), *Annona squamosa* (sugar-apple), *Asparagus* sp., *Begonia* sp.,

More Information

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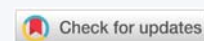
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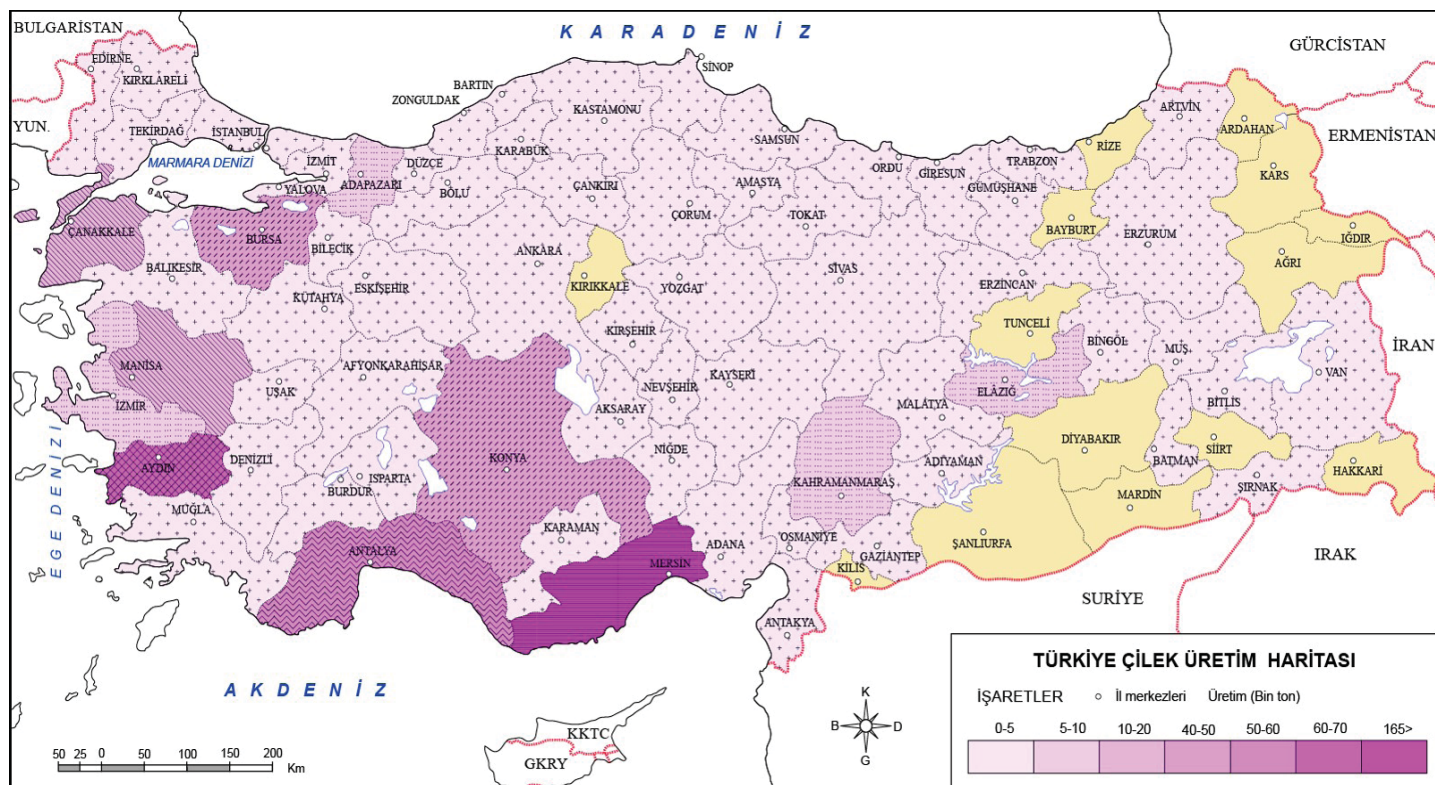
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Bougainvillea sp., *Cactus* sp., *Canna* sp. (canna lily), *Citrus* sp., *Cocos nucifera* (coconut), *Solenostemon* sp. (coleus), *Codiaeum* sp. (croton), *Cucumis melo* (muskmelon), *Cucurbita* sp., *Cyclamen* sp. (primrose or Persian violet), *Cyperus* sp. (flatsedge), *Dahlia* sp., *Dioscorea* sp. (yam), *Euphorbia* sp. (milkweed), *Ficus* sp. (Figure trees or Figure), *Fragaria* sp. (strawberries), *Gardenia* sp., *Impatiens* sp. (jewelweeds or touch-me-not), *Ipomoea batatas* (sweet potato), *Mangifera indica* (mango), *Musa* sp. (banana), *Narcissus* sp. (daffodil), *Nicotiana* sp., *Oryza latifolia* (grass), *Persea americana* (avocado), *Phoenix dactylifera* (date palm), *Psidium guajava* (guava), *Punica granatum* (pomegranate), *Pyrus communis* (pear), *Pyrus malus* (apple), *Rosa* sp., *Solanum melongena* (eggplant), *Theobroma cacao* (cacao), and *Tulipa* sp. (tulip) [9,10].

In this note, the authors report the presence of *Planococcus citri* in on strawberries and add a new record for Turkey.

The authors noted the species during the surveys on *Fragaria vesca* plantations in Mersin, Silifke. At the collecting sites, the *Planococcus citri* (Figure 1) density was quite high and the infestation was easy to recognize. Samples were

collected on the branches, stems, and leaves of the host plants. This mealybug was collected in eight collection sites among 56 collection sites (Table 1). Each sample was placed into a plastic bag and taken to the laboratory for examination. Specimens were prepared for light microscopy using the slide-mounted method of Kosztarab & Kozar [11] and identified according to the keys in Williams (2004).

The citrus mealybug is regarded as an important plant pest worldwide [7]. This mealybug may reach high populations and may cause reduced plant growth or plant death. Even though *P. citri* is an important pest in Citrus Growings it has the potential to inflict significant damage to many other crops including Strawberries in all growing regions (CABI, 2012). This mealybug rapidly became a very important pest on many ornamental plants, Greenhouses and many fruits it can be a potential pest on Strawberries as well.

Mealybug management on strawberries

For sustainable management of *P. citri* on Strawberries the population dynamics must be monitored and must be kept under control. For this reason, further studies must be done.

Biological control: *Cryptolaemus montrouzieri*, *Nephus includens* (Coleoptera: Coccinellidae) and *Sympherobius* sp. (Neuroptera: Hemerobilidae) with *Leptomastix dactylopii* and *Angyrus psedococi* (Hymenoptera: Encytridae) can be used for biological control of *P. citri*.

Chemical control: The Strawberry is Harvested very frequently. For this reason Chemical application must be done if it is needed. The application must be done correctly time

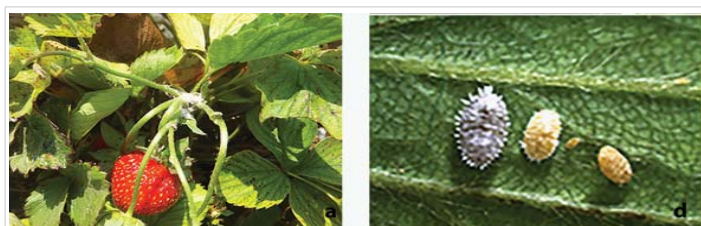


Figure 1: *Planococcus citri* on *Fragaria vesca* a) Infestation, b) Different stages of *Planococcus citri*.

**Table 1:** Information on the collection sites.

No	Date	Location	Space	Present/Absent
1	20.06.2022	Burunucu	15.000	+
2	20.06.2022	Kurtuluş	50.000	+
3	22.06.2022	Bolacalıkoyuncu	2000	-
4	22.06.2022	Bolacalıkoyuncu	7850	-
5	22.06.2022	Taşucu	5000	-
6	22.06.2022	Taşucu	8000	-
7	22.06.2022	Taşucu	9500	+
8	22.06.2022	Taşucu	4300	-
9	22.06.2022	Taşucu	6900	-
10	22.06.2022	Gülümpaşalı	20.000	-
11	22.06.2022	Burunucu	30.000	-
12	22.06.2022	Burunucu	3000	-
13	22.06.2022	Burunucu	15.000	-
14	22.06.2022	Ulugöz	8700	-
15	22.06.2022	Atik	11.400	-
16	22.06.2022	Çeltikçi	38.000	-
17	22.06.2022	Çeltikçi	7000	-
18	23.06.2022	Kapızlı	14.375	+
19	23.06.2022	Kapızlı	14.800	-
20	23.06.2022	Kapızlı	14.625	-
21	23.06.2022	Kapızlı	4800	-
22	23.06.2022	Kapızlı	10.000	-
23	23.06.2022	Kapızlı	7000	-
24	23.06.2022	Olukbaşı	12.250	-
25	23.06.2022	Olukbaşı	11.875	-
26	23.06.2022	Sökün	8550	-
27	23.06.2022	Sökün	27.570	-
28	23.06.2022	Sökün	3153	-
29	23.06.2022	Kurtuluş	17.000	-
30	23.06.2022	Altınkum	10.000	-
31	23.06.2022	Sökün	17800	+
32	23.06.2022	Sökün	34200	-
33	23.06.2022	Sökün	18.848	-
34	23.06.2022	Sökün	24.036	-
35	27.06.2022	Atik	4288	-
36	27.06.2022	Çeltikçi	4000	-
37	27.06.2022	Çeltikçi	15.000	-
38	27.06.2022	Kurtuluş	5000	-
39	27.06.2022	Kurtuluş	5000	-
40	27.06.2022	Kurtuluş	5000	-
41	27.06.2022	Kurtuluş	6400	-
42	27.06.2022	Kurtuluş	13.000	-
43	27.06.2022	Kurtuluş	13.600	-
44	27.06.2022	Kurtuluş	10.800	-
45	27.06.2022	Kurtuluş	7000	-
46	27.06.2022	Sökün	11.000	-
47	27.06.2022	Sökün	3025	-
48	27.06.2022	Sökün	15.000	-
49	27.06.2022	Sökün	8767	-
50	27.06.2022	Sökün	15.400	-
51	27.06.2022	Sökün	10.000	-
52	27.06.2022	Esenbel	12.000	+
53	27.06.2022	Esenbel	6250	-
54	27.06.2022	Esenbel	9375	-
55	27.06.2022	Esenbel	17.900	+
56	29.06.2022	Kabasakallı	2550 (sera)	+

with Selective insecticides such as Spirotetramat, Sulfoxaflor and Pyrethrin according to commercial advice.

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