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Research Article

**BIODIVERSITY AND DIET OF COCCINELLIDAE ON CITRUS IN
METIDJA (ALGERIA)***

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ABSTRACT

*Biological control is a viable alternative to the use of chemical pesticides that are harmful to the environment. From this perspective, this work aims to make an inventory of Coccinellidae and to classify them according to their diet. Sampling by yellow sticky plates is carried out each week from 23 April to 24 July 2014 at the Eastern Metidja very important citrus region in Algeria. A total of 16 ladybug species are sampled in four citrus species, orange, lemon, clementine and pomelo. It is the Coccidiphagous that are the richest with a total of 7 species, followed by the aphidophagous with 5 species and mycophagous with the two species. Finally found the aleurodiphagous and acariphagous, with a single species for each group. With regard to relative abundance, a total of 467 individuals coccinellidae were captured, of which the species *Clitostethus arcuatus* (ladybug aleurodiphagous) alone counted 285 individuals, that is 61.29%.*

Keywords: Biodiversity, Coccinellidae, Diet, Citrus, Mitidja.

INTRODUCTION

Given the human, economic and agricultural importance of citrus growing in Algeria, it is important to ensure the best productivity and to conduct it in good conditions. The enemies that can cause significant damage to citrus, both on the plant itself and on the crop, are extremely varied and numerous. Among these enemies is a whole host of pathogens and pests, more than 120 pests are arthropods (AUBERT, 1992), include aphids, cochineal and whitefly. These pests are fought mainly by pesticides, but the use of chemicals is harmful to human health and the environment. This is why, with a view to sustainable development, this control method is increasingly being replaced by biological control. Auxiliary fauna is one of the major limiting factors for pests. Among this fauna, ladybugs. In the same optics, this study is conducted to provide some data on their biodiversity and diet in Mitidja, citrus growing area by excellence (MOSTEFAOUI and *al.*, 2011), it accounts for 44% of Algerian citrus production (BICHE, 2012).

1. MATERIAL AND METHODS

1.1 Choice of the study station

The study was conducted in the Orangeriaie of the Horticultural Station of the National Agronomic School of El Harrach, a group of small experimental orchards. The study plot is a mixture of different citrus species grown in organic agriculture without recourse to the use of pesticides.

1.2 Sampling methods

The sampling of coccinellidae is carried on citrus: orange, lemon, clementine and pomelo for 12 weeks, going from April 23 to July 24 of 2014, at the Horticultural station of the National Agronomic School of El Harrach, we chose the yellow plates stuck, this kind of trap can catch a very large number of insects including hemiptera, Diptera, hymenoptera and some beetles like ladybugs. It is not a selective trap. It is effective in quantifying a population of pests or beneficials (FRANCK, 2013).

1.3 Treatment of results

In order to evaluate the biodiversity and the diet of ladybugs, we have opted for the use of total wealth and relative abundance.

2. RÉSULTS AND DISCUSSION

2.1-Biodiversity of sampled ladybugs

The different species of ladybugs listed on orange, lemon, clementine and pomelo are listed in the following table

Table 1: Biodiversity of ladybug species recorded on citrus

Sub-Families	Tribes	Species
Chilocorinae	Chilocorini	<i>Chilocorus bipunctatus</i> (Linné, 1758)
		<i>Brumus quadrimaculatus</i> (Linné, 1758)
Coccidulinae	Coccidulini	<i>Rhyzobius lophantae</i> (Blaisdell, 1892)
	Noviini	<i>Rodolia (Novius)cardinalis</i> (Mulsant, 1850)
Scymninae	Scymnini	<i>Clitostethus arcuatus</i> (Rossi, 1794)
		<i>Nephus peyerimhoffi</i> (Sicard, 1923)
		<i>Nephus quadrimaculatus</i> (Herbest, 1783)
		<i>Pullus subvillosus</i> (Goeze, 1777)
		<i>Scymnus (Scymnus)interruptus</i> (Goeze, 1777)
		<i>Scymnus (Scymnus) pallipediformis</i> (Gunther, 1958)
		<i>Stethorus punctillum</i> (Welse, 1801)
Coccinellinae	Coccinellini	<i>Adalia (Adalia) bipunctata</i> (Linné, 1758)
		<i>Adalia (Adalia) decimpunctata</i> (Linné, 1758)
	Tytthaspidini	<i>Tytthaspis (Tytthaspis) phalerata</i> (Costa, 1849)
	Psylloborini	<i>Psyllobora vigintiduopunctata</i> (Linné, 1758)
Sticholotidinae	Sticholotidini	<i>Phoroscymnus setulosus</i> (Chevrolat, 1861)

A total of 16 ladybug species are sampled in four citrus species, orange, lemon, clementine and pomelo. Seven of them belong to the tribe of Scymnini, while the tribes of

Chilocorini and Coccinellini have only two species for each. The least represented are the tribes of Coccidulini, Noviini, Tythaspidini, Psylloborini and Sticholotidini, with one species for each tribe. Similarly SAHARAOUI and HEMPTINNE (2009), studying population dynamics of citrus ladybirds in eastern Mitidja, found that the tribe of Scymnini is the most represented with 8 species, followed by tribes of Chilocorini and Coccinellini represented with three species each. SAHARAOUI and GOURREAU (2000), noted in a study of ladybugs in Algeria, that the Scymnini tribe is the most diversified with 14 species followed by the tribe of Coccinellini with 9 species.

2.1 Diet of sampled ladybugs

The diet of species of ladybugs listed on orange, lemon, clementine and pomelo are listed in the following table

Table 2: Diet of ladybug species recorded on citrus

Species	Clementine		Lemon		Orange		Pomelo		Total
	N	F	N	F	N	F	N	F	
<i>Chilocorus bipunctatus</i>	10	11,90	12	6,38	15	10	3	6,67	40
<i>Brumus quadrimaculatus</i>	0	0,00	0	0,00	1	0,67	0	0,00	1
<i>Rhyzobius lophantae</i>	0	0,00	3	1,60	0	0	4	8,89	7
<i>Rodolia (Novius)cardinalis</i>	3	3,57	20	10,64	19	12,67	6	13,33	48
<i>Nephus peyerimhoffi</i>	5	5,95	13	6,91	4	2,67	0	0,00	22
<i>Nephus quadrimaculatus</i>	0	0,00	3	1,60	0	0,00	0	0,00	3
<i>Phoroscyminus setulosus</i>	0	0,00	1	0,53	0	0,00	0	0,00	1
Total of Coccidiphagous	18	21,43	52	27,66	39	26,00	13	28,89	122
<i>Pullus (Pullus) subvillosus</i>	5	5,95	11	5,85	14	9,33	3	6,67	33
<i>Scymnus (Scymnus)interruptus</i>	2	2,38	0	0,00	0	0,00	0	0,00	2
<i>Scymnus (Scymnus)pallipediformis</i>	2	2,38	1	0,53	1	0,67	1	2,22	5
<i>Adalia (Adalia) bipunctata</i>	0	0,00	1	0,53	0	0,00	0	0,00	1
<i>Adalia (Adalia) decimpunctata</i>	0	0,00	0	0,00	1	0,67	0	0,00	1
Total of Aphidiphagous	9	10,71	13	6,91	16	10,67	4	8,89	42
<i>Tytthaspis (Tytthaspis) phalerata</i>	0	0,00	0	0,00	1	0,67	0	0,00	1
<i>Psyllobora vigintiduopunctata</i>	2	2,38	4	2,13	0	0,00	4	8,89	10
Total of mycophagous	2	2,38	4	2,13	1	0,67	4	8,89	11
<i>Clitostethus arcuatus</i>	53	63,10	117	62,23	93	62,00	22	48,89	285
Total of Aleurodiphagous	53	63,10	117	62,23	93	62,00	22	48,89	285
<i>Stethorus punctillum</i>	2	2,38	2	1,06	1	0,67	2	4,44	7
Total of Acariphagous	2	2,38	2	1,06	1	0,67	2	4,44	7
Total	84	100,00	188	100,00	150	100	45	100,00	467

A total of 467 individuals belonging to the family Coccinellidae are captured by the yellow sticky plates of which the species *Clitostethus arcuatus* (Whitebug Ladybug) alone counted 285 individuals or 61.29%. With regard to the importance of Aphidiphagous ladybirds in relation to all Coccinellidae, this group is represented by 42 individuals divided among 5 species, 9 individuals representing 10.71% of the total clementine population, 13 individuals

(6, 91%) on lemon tree, 16 individuals (10.67%) on orange trees and 4 individuals (8.89%) on pomelo. As a result, Aphidiphages are in third place after Aleurodiphage and Coccidiphages. SAHARAOU I and HEMPTINNE (2009) noted that the Aphidiphagous are in second position after the Coccidiphagous, while the Aleurodiphagous, the latter are represented by a single species *Clitostethus arcuatus*.

Regarding the biodiversity, the coccidiphagous are the richest with a total of 7 species, followed by the aphidiphagous with 5 species either *Pullus (Pullus) subvillosus*, *Scymnus (Scymnus) interruptus*, *Scymnus (Scymnus) pallipediformis*, *Adalia (Adalia) bipunctata* and *Adalia (Adalia) decimpunctata*, Mycophagous with 2 species, *Tytthaspis phalerata*, *Psyllobora vigintiduopunctata*, and lastly, the aleurodiphagous and the acariphagous, with only one species for each group. It is on lemon tree that we have recorded the highest total richness with 12 species, 6 coccidiphagous species, 3 aphidiphagous species and a single species for the mycophagous, white-blooded and acariphagous species. On clementine and orange tree we have identified 9 species for each citrus, of which three species are aphidiphagous. On pomelo, 8 species of lady beetles are sampled, two of them are aphidiphagous.

CONCLUSION AND PERSPECTIVES

A total of 467 individuals shared between sixteen ladybug species belonging to the family Coccinellidae are sampled from four citrus species, orange, lemon, clementine and pomelo. Seven of them belong to the tribe of Scymnini. Regarding the biodiversity, the coccidiphagous are the richest with a total of 7 species, followed by the aphidiphagous with 5 species. With regard to the diet, Aleurodiphagous are the most numerous with the species *Clitostethus arcuatus* who counted 285 individuals, followed by the Coccidiphagous and Aphidiphagous. In perspective we plan to make a comprehensive inventory of the Coccinellidae of fruit trees in general and that of the entire guild entomophagous,

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