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Aphid fauna (Hemiptera Aphididae) and their host association of chott mariem, coastal area of Tunisia

Monia Kamel Ben Halima

UR.04AGRO4. Invertébrés, microorganismes et malherbes nuisibles: Méthodes alternatives de lutte. Institut Supérieur Agronomique de Chott Mariem, Université de Sousse, 4042 Sousse. Tunisie

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ABSTRACT

This study aimed to find out the Aphidoidea species feeding on different host plant in coastal area of Tunisia. Seventy six species of aphids distributed over 36 genera and 7 subfamilies are known so far in Chott Mariem. The aphids of the subfamily Aphidinae are the most abundant. During the present study 16 species under 7 genera and 31 species under 15 genera were newly reported respectively from Chott Mariem and Tunisia. From these determined species, Aulacorthum circumflexus Buckton, Aphis hederae Kaltenbach, Aphis illinoisensis Shimer, Aphis eugenia Van Der Goot, Aphis maculata (Aphidinae), Eulachnus agilis Kaltenbach, Eulachnus nigricola Pasek, Cinara ferresi Swain, Cinara palaestinensis Hille Ris Lambers, Cinara pinea Mordivilko, Cinara tujafilina Del Guercio, Cinara magrebicha Mimeur, Cinara maritima Dufour (Lachninae), Myzocallis sp., Siculaphis vittoriensis Quednau Barbagallo (Drepanosiphinae) and Greenidea ficicola Takahachi (Greenideinae) were previously recorded from the studied area, while the remaining of the identified species were new records in Tunisia. Aphids are associated with 136 host plant species.

Key words: Aphids, association, host plant, coastal area, Tunisia.

INTRODUCTION

In Tunisia, some preliminary studies made inventory of aphid species in relation with different crops [1, 2, 3, 4, 5, 6, 7, 8]. Species of Aphididae family attack various plants [9] and they cause direct and indirect damage. Aphids are also one of the most variable insects having interesting and complicated life cycles [10]. Members of the Aphididae family are investigated for the economically important groups of insects in Tunisia, as they are in the other countries of the world. Studies of the Tunisian aphidofauna were limited up to the last decade. Ben Halima-Kamel and Mabrouk [11] and Boukhris-Bouhachem et *al*. [7], listed respectively 50 and 103

aphid species by using different sampling techniques. These inventories are very incomplete knowing that theres is about 4700 aphid species in the World [12, 13] and despite the fact that there are fewer species in tropical and equatorial regions [14, 15]. The aphid fauna is poorly documented in other countries around the Mediterranean area: in Egypt, 8 [16] and 99 species [17]; 150 species in Morocco [18]; 24 species in Libya [17] and 116 species in Algeria [19, 20]. The aim of this study was an investigation of aphidofauna species on different host plant in coastal area of Tunisia.

MATERIALS AND METHODS

Area of study

The coastal area of Chott Mariem in Tunisia is characterized by a regular temperatures and arid climate.

Plant material and determination

Herbaria of host plants growing in coastal area of Chott Mariem since 1994 to 2009 were prepared and later these were identified [21, 22, 23]. The aphid species collected were finally deposited in the collection of the Higher Agronomic Institute, Chott Mariem. The preparation of microscopic slides has been done according to Leclant, [24]. Species were identified according to Blackman and Eastop [9, 25, 26, 27].

RESULTS AND DISCUSSION

Repartition of aphid species in their host plant

The classification followed that used by Blackman and Eastop, [25], rather than that of Heie, [28] in [27]. All species recorded belong to the *Aphididae* with 7 subfamilies: *Aphidinae, Lachninae, Calaphidinae*, *Chaitophorinae*, *Pemphiginae, Drepanosiphinae* and *Greenideinae.* In the present research, 76 species of aphid as well as their distributions in their host plants were identified (Table 1) and the highest number of species belongs to Aphidinae under these repartition : Aphidinae-Macrosiphini (26 species, 34,21 %), Aphidinae-Aphidini (28 species, 36,84%), Lachninae-Cinarini (9 species, 11,84%), Lachninae-Lachnini (One specie, 1,31%), Chaitophorinae-Chaitophorini (2 species, 2,63%), Pemphiginae-Eriosomatini (2 species, 2,63%), Pemphiginae-Fordini (2 species, 2,63%), Calaphidinae-Panaphidini (One specie, 1,31%), Drepanosiphinae, Phyllaphidini (2 species, 2,63 %), Greenideinae-Greenideini (One specie, 1,31 %). Aphidinae subfamily includes the majority of agricultural aphid pest species as well as species colonizing wild flora (either herbs or shrubs).

From a systematic point of view the Tunisian aphidofauna doesn't show special characteristics and it consists of already known species in the Mediterranean basin. There are two exceptions concerning the grapevine aphid *Aphis illinoisensis* Shimer, *Greenidea ficicola* Takahachi. However *A. illinoisensis* is a North American species, which has been recorded in the same localities in Tunisia [30]. Previously, the species had invaded Turkey [31], Crete Island [32]. Nevertheless, *G. ficicola* is distributed extensively in India, Bangladesh, Nepal, eastern Siberia, China, Taiwan, Japan, Philippines, Java, Sumatra, Malaya, this aphid has been recorded in Australia, USA and Africa (Burundi) [9]. Recently, it was observed in Florida (USA) [33], Brazil [34], Italia [35] and Tunisia [36].

Table 1: Association of aphids, host plant and botanical families
*(& recorded by [29], * cited by [7] and + species newly recorded).*

Aphididae, Aphidinae, Aphidini	
Acyrthosiphum pisum Harris *&	
Vicia fabae, Pisum sativum	Fabaceae
Aphis eugenia Van Der Goot +	
Hibiscus rosacinensis, Hibiscus mutabilus	Malvaceae
Aphis hederae Kaltenbach +	
Hedera canariensis	Araliaceae
Aphis spirecola Pagenstecher *&	
Schefflera arboricola	Araliaceae
Pittosporum tobira	Pittosporaceae
Eriobotrya japonica,Prunus amygdalus,Pyrus communis,Pyrus malus	Rosaceae
Citrus aurantium, Citrus clementina, Citrus sinensis, Citrus limon.	Rutaceae
Bougainvillea sp.,	Nyctaginaceae
Aphis craccivora Koch *&	
Amaranthus angustiflora	Amarantaceae
Tecoma smithi	Bignoniaceae
Chenopodium album, Chenopodium murali	Chenopodiaceae
Cynara scolymus Picris echioïdes, Sonchus olearacens	Composeae
Ephedra alata ssp alenda	Ephedraceae
Astragulus armatus, Medicago sativa, Vicia sativa, Vicia faba	Legumineuseae
Malva parviflora	Malvaceae
C. clementina, C. sinensis, C. aurantium, Citrus limon.	Rutaceae
Aphis fabae Scopoli *&	
Allium cepa	Alliaceae
Amaranthus hybridus, Amaranthus retroflexus	Amaranthaceae
Fatshedera lizei,Hedera canariensis	Araliaceae
Lactuca sativa romana	Asteraceae
Tecoma *smithi*	Bignoniaceae
Cucumus melo	Cucurbitaceae
Cynara scolymus	Composeae
Pisum sativum, Vicia faba	Fabaceae
Triticum durum	Gramineae
Foeniculum vulgare, Thapsia garganic ssp decussata	Ombellifereae
Pittosporum tobira	Pittosporaceae
Citrus aurantium, Citrus sinensis, Citrus clementina, Citrus limon	Rutaceae
Rosa indica "Major"	Rosaceae
Capsicum annuum, Solanum nigrum	Solanaceae
Eucalyptus grundis	Myrtaceae
Urtica urens	Urticaceae
Vitis vinifera	Vitaceae
Aphis fabae solanella Theobald &	
Vicia faba, Pisum sativum	Fabaceae
Foeniculum vulgare	Ombellifereae Solanaceae
Cestrum nocturnum, Cestrum parquii, S. nigrum	
Aphis gossypii Glover *&	
Gynura sarmentosa	Acanthaceae
Tecoma smithi	Bignoniaceae
Senecio vulgaris,Sanchezia nobilis	Composeae
Citrullus vulgaris, Cucumus melo,Cucurbita pepo,Cucumus sativus	Cucurbitaceae
Marrubium sp.	Labieae
Acacia cyanophylla	Legumineuseae
Lawsonia inermis	Lythraceae
Hibiscus rosa-sinensis, Hibiscus variegata	Malvaceae
Melia azedarach	Meliaceae
Punica granatum	Punicaceae
C. aurantium, C. clementina, C. Sinensis, Citrus limon	Rutaceae
E. japonica, P. amygdalus,Prunus domestica, Pyrus malus, Rosa indica "Major"	Rosaceae
Capsicum annum, Solanum lycopersicum, Solanum tuberosum, Solanum melongena	Solanaceae
Vitis vinifera	Vitaceae
Eucalyptus grundis	Myrtaceae
Aphis illinoisensis Shimer +	
Vitis vinifera	Vitaceae
Aphis lambersi Börner &	
Daucus carota	Ombellifereae
Aphis maculata Oestlund +	

Populus nigra	Salicaceae
Aphis nerii Boyer de Fonscolombe*&	
Nerium oleander	Apocynaceae
Cyperus rotundus	Cyperaceae
Euphorbia sp	Euphorbiaceae
Citrus aurantium	Rutaceae
Aphis pomi De Geer *&	
E. japonica, Pyrus communis, Pyrus malus	Rosaceae
Aphis punicae Passerini &	
Lawsonia inermis	Lythraceae
Punica granatum	Punicaceae
Plambagocinensis	Plambaginaceae
*Aphis sp. *&*	
Rumex bucephalophorus	Amaranthaceae
Chenopodium album, Chenopodium murali	Chenopodiaceae
Aeonium rubrolineatum	Crassulaceae
Medicago soleinolii	Fabaceae
Quercus ilex	Fagaceae
Marrubium sp.	Labieae
Urtica urens	Urticaceae
Aphis verbasi Shrank *	
Buddleja daviidi	Buddejaceae
Brachyunguis harmalae B. Das *&	
Peganum harmala	Papaveraceae
Diuraphis noxia Kurdjumov *	
Hordeum vulgare	Gramineae
Hyalopterus amygdali Blanchard *&	
Prunus persica, Prunus amygdalus	Rosaceae
Hyalopterus pruni Geoffroy *&	
Arundo donax, Phragmites communis	Gramineae
Prunus persicae, Prunus amygdalus, Prunus armeniaca	Rosaceae
Hysteroneura setariae Thomas *&	
Cynodon dactylon, Setaria verticillata, Triticum durum	Gramineae
Echinochloa crus-gali	Fagaceae
Rhopalosiphum nymphaeae L. *&	
Prunus armeniaca	Rosaceae
Rhopalosiphum insertum Walker *&	
Cyperus rotundus	Cyperaceae
Malva parviflora	Malvaceae
Rhopalosiphum maidis Fitch *&	
Arundo donax, Hordeum vulgare, Sorghum sp., Sorghum halepense	Gramineae
Emex spinosus	Polygonaceae
Rhopalosiphum padi L. *&	
Hordeum vulgare, Lycium arabicum, Zea mays	Gramineae
Rodbium porosum Sanderson *&	
Rosa indica "Major"	Rosaceae
Schizaphis graminum Rondhani *&	
Hordeum vulgare	Gramineae
Toxoptera aurantii Boyer de Fonscolombe *&	
Hibiscus rosacinensis	Malvaceae
Citrus aurantium, Citrus clementina, Citrus sinensis, Citrus limon	Rutaceae
Aphididae, Aphidinae, Macrosiphini	
Allocotaphis quaestionis Börner &	
Pyrus malus	Rosaceae
Aulacorthum solani Kaltenbach *	
Pisum sativum	Legumineuseae
Aulacorthum circumflexus Buckton +	
Pinus halepensis	Pinaceae
Brachycaudus cardui L. *&	
Senecio cineraria	Asterraceae
Carduus pterocanthus, Cynara scolymus, Onopordon nervosum	Composeae
Brachycaudus helichrysi Kaltenbach *&	
Cynara Scolymus	Composeae
Pittosporum tobira	Pittosporaceae
Prunus amygdalis	Rosaceae
Brachycaudus persicae Passerini *&	
Cnicus benedictus	Asteraceae

Prunus amygdalis, Prunus persicae	Rosaceae
Brachycaudus prunicola Kaltenbach &	
Senecio vulgaris *Prunus domestica*	Composeae Rosaceae
Brachycaudus amygdalinus Schouteden *&	
Prunus domestica, Prunus amygdalis	Rosaceae
Brevicoryne brassicae L. *&	
Brassica oleracea var botrytis, Brassica oleracea varcapitata *Foeniculum vulgare*	Crucifereae Ombellifereae
Capitophorus elaeagni Del Guercio *	
Cynara scolymus	Composeae
Dysaphis apiifolia Theobald &	
Apium graveolens *Foeniculum vulgare*	Apiaceae Ombellifereae
Dysaphis plantaginae Passerini *&	
Pyrus malus	Rosaceae
Dysaphis crataegi Kaltenbach &	
Daucus carota	Ombellifereae
Dysaphis cynariae Theobald &	
Cynara scolymus, Scolymus hispanicus	Composeae
Dysaphis sp. *&	
Amaranthus angustiflora *Chenopodium murali* Chlorophytum comosum *Ficus benghalensis*	Amarantaceae Chenopodiaceae Liliaceae Moraceae
Hyperomyzus lactucae L. *&	
Sonchus tenerrimus *Chenopodium album*	Composeae Chenopodiaceae
Macrosiphum euphorbiae Thomas *&	
Bougainvillea sp. *Citrus aurantium* *Convolvulus arvensis* *Prunus amygdalis, Rosa indica "Major"* *Solanum tuberosum*	Nyctaginaceae Rutaceae Convolvulaceae Rosaceae Solanaceae
Macrosiphum rosae L. *&	
Rosa indica "Major"	Rosaceae
Metopolophium dirhodum Walker *	
Hordeum vulgare, Tritucum durum	Gramineae
Myzus persicae Sulzer *&	
Chenopodium album *Cynara scolymus, Setaria verticillata* *Convolvulus arvensis* *Brassica oleracea var capitata, Raphanus raphanistrum* *Tulipa darwini* *Hibiscus rosasinensis* *Prunus persica, Rosa indica "Major"* *C. annum, C. aurantium, C. Clementina, C. Sinensis, Citrus limon* *Solanum melongena, Solanum lycopersicum, Solanum tuberosum, Lycium arabicum* *Urtica urens*	Chenopodiaceae Composeae Convolvulaceae Crucifereae Liliaceae Malvaceae Rosaceae Rutaceae Solanaceae Urticaceae
Pseudaphis abyssinicae Hille Ris Lambers &	
Rosa sp miniature	Rosaceae
Sitobion fragariae Walker *&	
Hordeum vulgare	Gramineae
Uroleucon ambrosicae Thomas &	
Artemisia pontica *Centauria nicaeensis, Centauria dimorpha, Sonchus asper, Sonchus tenerrimus, Senecio vulgaris* *Chlorophytum comosum*	Asteraceae Composeae Liliaceae
Uroleucon compositae Theobald &	
Centauria nicaeensis, Carthamus lanatus, Sonchus oleraceus, Sonchus tenerrimus	Composeae
Uroleucon sonchi L. *&	
Sonchus oleraceus	Composeae
Uroleucon sp. *&	
Sonchus oleraceus	Composeae
Aphididae, Lachninae, Cinarini	
Cinara magrebicha Mimeur +	
Pinus halepensis	Pinaceae
Cinara palaestinensis Hille Ris Lambers +	

Pinus halepensis	Pinaceae
Cinara pinea Mordivilko +	
Pinus halepensis	Pinaceae
Cinara maritima Dufour +	
Pinus halepensis, Pinus maritima	Pinaceae
Cinara cupressi Bukton *	
Thuya sp. *Populus nigra*	Cupressaceae Salicaceae
Cinara ferresi Swain +	
Thuya sp. *Populus nigra*	Cupressaceae Salicaceae
Cinara tujafilina Del Guercio +	
Cupressus sempervirens	Cupressaceae
Eulachnus agilis Kaltenbach +	
Pinus halepensis	Pinaceae
Eulachnus nigricola Pasek +	
Pinus halepensis	Pinaceae
Aphididae, Lachninae, Lachnini	
Pterochlorides persicae Cholodkovsky &	
Prunus domestica, Prunus persica, Prunus amygdalus, Prunus armeniaca	Rosaceae
Aphididae, Pemphiginae, Eriosomatini	
Tetraneura nigriabdominalis Sasaki &	
Cynodon dactylon	Gramineae
Eriosoma lanigerum Hausmann *&	
Pyrus malus	Rosaceae
Aphididae, Pemphiginae, Fordini	
Aploneura lentisci Passerini *&	
Pistacia terebinthus	Anacardiaceae
Forda formicaria von Heyden &	
Cynodon dactylon	Gramineae
Aphididae, Calaphidinae, Panaphidini	
Therioaphis trifolii Monell *	
Melilotus indica *Cyperus rotundus*	Fabaceae Cyperaceae
Aphididae, Chaitophorinae, Chaitophorini	
*Chaitophorus sp. *&*	
Populus nigra, Populus hybrides	Salicaceae
Chaitophorus populialba Boyer de Fonscolombe &	
Populus nigra, Populus hybrides	Salicaceae
Aphididae, Chaitophorinae, Siphini	
Sipha elegans del Guercio &	
Ampelodesma mauritanica	*Gramineae*
Sipha maydis Passerini *&	
Arundo donax,Hordeum vulgare, Lolium rigidum	*Gramineae*
Aphididae, Drepanosiphinae , Phyllaphidini	
Siculaphis vittoriensis Quednau Barbagallo +	
Quercus ilex	*Fagaceae*
Myzocallis sp +	
Quercus ilex	*Fagaceae*
Aphididae , Greenideinae, Greenideini	
Greenidea ficicola Takahachi +	
Ficus nitida, Ficus benjamina, Ficus carica	*Moraceae*

It is worth noticing that regardless of the improvements in the knowledge of aphidofauna made in Tunisia during the last decade. These suggest that with further research the recorded aphid fauna will be substantially increased. Conclusively, the ten-year survey enriched our knowledge on the Tunisia aphidofauna. However, the survey should be continued, especially in non investigated areas and in relation with the aphid host plants or trees.

Many studies conducted so far showed that Tunisia aphid fauna consists of more than 136 species [2, 4, 5, 7, 11, 29, 36]. This number can be considered similar to aphid fauna records in Morocco (200) [18] or in Algeria (120) [19], [20]. Despite that there are general consensuses

that due to geographical, agricultural, floristic and climatic variability and richness of Tunisia, this number does not reflect sufficiently Tunisian aphid fauna. The organization similar local survey is going to play an important role in faunistic and applied entomological studies. It must focus on the useful fauna which constitutes a tool to control aphids in cultivated plant and natural flora against aphids [37]. Therefore, knowing preserve natural in auxiliary input the spontaneous plant without a source of contamination for crops. It is in this sense a host, aphid, and auxiliary plant associations study will be presented in the future.

Hosts plants-aphids have relations a valuable agronomic interest because they provide additional information and the significant difference between the number of associations and identified aphids reveal the ability of aphid's species to grow on a large number of plants. Among the aphid fauna recorded about 48% of the species may infest cultivated crops and ornamental plants. However, fewer species could be considered perhaps as tentative or important pests. For example, various Aphidinae species cause severe damages in herbaceous crops (e.g. *M. persicae*, *A. gossypii*, *A. fabae*) or trees (*H. pruni*) and very few belong to other subfamilies such as the giant brown aphid *P. persicae* (Lachninae).

Aphids newly recorded

Sixteen species were added to Tunisian aphid fauna witch they were *Aulacorthum circumflexus* Buckton, *Aphis hederae* Kaltenbach, *Aphis illinoisensis* Shimer, *Aphis eugenia* Van Der Goot, *Aphis maculata* (Aphidinae), *Cinara ferresi* Swain, *Cinara palestinensis* Hille Ris Lambers, *Eulachnus agilis* Kaltenbach, *Eulachnus nigricola* Pasek, *Cinara pinea* Mordivilko, *Cinara tujafilina* Del Guercio, *Cinara magrebicha* Mimeur, *Cinara maritima* Dufour (Lachninae), *Myzocallis sp*., *Siculaphis vittoriensis* Quednau Barbagallo **(**Drepanosiphinae) and *Greenidea ficicola* Takahachi (Greenideinae) (Table 1).

Aphid diversity under different subfamilies

Aphidinae comprises about 73% of aphid species followed by Pemphiginae, Lachninae, Chaitophorinae, Drepanosiphinae, Calaphidinae and Greenideinae (Table 2). Members of the genera like *Greineidae*, *Eulachnus* have been recorded for the first time in this area. Thus, 76 species in 36 genera of aphids are known from as many as 134 species of host plants from this area to date.

Table 2: Number of genera and species of aphids in different subfamilies and their host plant genera and species

Subfamily	Aphid		Host plant	
	Genus	Species	Genus	Species
Aphidinae	23	54	93	107
Pemphiginae	4	4	3	3
Greenidinae	1	1	1	3
Lachninae	3	10	7	8
Calaphidinae	1	1	2	2
Chaitophorinae	2	4	5	6
Drepanosiphinae	2	2	1	1

Host association

During this survey 76 species were identified among 46 botanical families, with 155 host plant association The most abundant aphid host family in the sites of study is Rosaceae followed by Gramineae, Composeae, Malvaceae, Fabaceae, and Solanaceae. Fourten host families are found with only one aphid species in each (Table 3).

Table 3: Association of aphids with major host families

Host family	Aphid		Host family	Aphid	
	Genus	Species		Genus	Species
Acanthaceae	1	1	*Labieae*	1	1
Alliaeae	1	1	*Legumineuseae*	3	3
Amaranthaceae	2	4	*Liliaceae*	3	3
Anacardiaceae	1	1	*Lythraceae*	1	2
Apiaceae	1	1	*Malvaceae*	4	6
Apocynaceae	1	1	*Meliaceae*	1	1
Araliaceae	1	3	*Moraceae*	2	2
Asteraceae	4	4	*Myrtaceae*	1	2
Bignoniaceae	1	3	*Nyctaginaceae*	2	2
Buddejaceae	1	1	*Ombelliferae*	3	6
Chenopodiaceae	4	5	*Papaveraceae*	1	1
Composeae	7	14	*Pinaceae*	3	2
Convolvulaceae	2	2	*Pittosporaceae*	2	4
Crassulaceae	1	1	*Plumbaginaceae*	1	1
Cruciferae	2	2	*Polygonaceae*	1	1
Cucurbitaceae	1	2	*Punicaceae*	1	2
Cupressaceae	1	1	*Rosaceae*	12	16
Cyperaceae	3	3	*Rutaceae*	4	8
Ephedraceae	1	1	*Salicaceae*	3	5
Euphorbiaceae	1	1	*Solanaceae*	3	5
Fabaceae	3	6	*Urticaceae*	2	3
Fagaceae	4	4	*Vitaceae*	1	3
Gramineae	11	12			

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