

**SURVEY OF LEAFHOPPERS ON MEDICINAL AND AROMATIC PLANTS IN EGYPT (HEMIPTERA: AUCHENORRHYNCHA: CICADELLIDAE)**

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### **ABSTRACT**

Leafhoppers are common and abundant insects in worldwide. Numerous leafhopper species are considered serious plant pests, and those as vector plant diseases inflict untold economic losses in agricultural crops. the present work aims to survey leafhoppers species infesting medicinal and aromatic plants in Egypt. So leafhopper adults and nymphs were collected from these plants at different localities in Egypt using both sweeping net and aspirator throughout 2011 to 2015. Fifteen leafhopper species belonging into four subfamilies and fourteen genera were surveyed. Synonyms, diagnostic morphological characters and host plants were provided.

**Keywords:** Cicadellidae, Leafhoppers, Medicinal, Aromatic Plants, Hemiptera, Auchenorrhyncha, Egypt.

### **INTRODUCTION**

Medicinal and Aromatic plants (MAPs) play a valuable and important role in economic, social, cultural and ecological aspects of local communities all over the world . In one form or another, they benefit virtually everyone on the earth through nutrition, toiletry, bodily care, incense and ritual healing important tool for treating illness in most cultures (Marshall, 2011).

Medicinal and aromatic plants are infested with several insect pests including leafhoppers. They are herbivorous insects and many species are economically important pests of agricultural crops in and worldwide (Day and Fletcher, 1994). The family Cicadellidae is a globally-distributed group of sap-feeding insects that contains 20000 described species (Dietrich 2013). They feed by sucking plant sap from the xylem, phloem or mesophyll cells ( Knight 1983) and cause serious damage either directly through feeding or indirectly by transmitting plant pathogens including viruses and phytoplasmas (Weintraub and Beanland, 2006). Nielson (1979) listed 151 species and subspecies as vectors of plant pathogens such as plant viruses, phytoplasmas, spiroplasmas and bacteria.

### **MATERIALS AND METHODS**

Leafhoppers adult were collected from different medicinal and aromatic plants at different localities in Egypt during the period of 2011 to 2015 using sweeping vegetation with a heavy muslin sweep net as well as some species were collected using an aspirator. Then samples were kept in freezer for one

hour to keep them calm. Afterwards specimens were separated according to their appearance features and preserved in 70 % ethanol until preparing mounted microscopic slides for identification according to identification keys (Abul-Nasr *et al.*, 1968; Blocker, 1967; Christian, 1956; Ghauri, 1966; Herakly, 1970 and Ross, 1968).

## RESULTS AND DISCUSSION

Fifteen leafhopper species belonging into four subfamilies and fourteen genera were found on different medicinal and aromatic plants at different localities in Egypt throughout the period of 2011 to 2015. (Table1).

### **Subfamily: Agalliinae**

**Diagnostic Characters:** General colour of body brown to yellow brown. Pronotum finely granulose. Vertex and pronotum and scutellum with number of black spots different in shape. Appendix of forewing present. Hind wing with 4 apical cells.

This subfamily is represented in this work by only one genus and one species named *Austroagallia* sp.

### **Genus *Austroagallia* Evans, 1935**

**(Type-species: *Austroagallia torrida* Evans 1935)**

### ***Austroagallia* sp.**

No males were collected from this species during this work but only females. So some specimens were sent for identification to Prof. Dr. Christopher H. Dietrich of the Illinois Natural History Survey, USA.

**Diagnostic Characters:** head wider than pronotum. Vertex with 2 black spots. Pronotum with four black spots, two of them small placed near anterior margin while the other two spots are larger than the anterior ones and placed near posterior margin. Forewing much longer than abdomen.

During the present work, females of this species were collected from one plant species named Horse mint; *Mentha longifolia* from different localities at only El-Fayoum governorate during 2013 to 2015.

### **Subfamily: Deltocephalinae**

**Diagnostic Characters:** Ocelli present on vertex. Veins of fore wing veins distinct basally with cross veins, 1- 3 subapical cells. Appendix of forewing present.

This subfamily is represented in this work by three tribes, ten genera and eleven species as follows.

### **Tribe Euscelini**

**Diagnostic Characters:** Forewing with 3 subapical cells (2 or 3 closed) Connective not fused with aedeagus.

This tribe is represented here by five genera as follows:

### **Genus *Exitianus* Ball, 1929**

**(Type-species: *Jassus obscurinervis* Stål, 1859)**

This genus is represented in this work by only one species named; *E. pondus* Ross

***Exitianus pondus* Ross, 1968**

**Diagnostic Characters:** yellowish brown with black markings. Vertex bluntly angled, triangular, with black thick transverse bands between eyes. Male pygofer with two black apical spines, one of them elongate and slender while the other short and thick.

This species was collected from eleven plant species including Geranium, *Pelargonium graveolens* L., Marjoram, *Majorana hortensis*, Jasmine, *Jasminum grandiflorum* L., Evening primrose, *Oenothera biennis* and Bunchflower Daffodil, *Narcissus tazetta* from four localities at El-Sharqya, El-Fayoum, Qalyubya and Giza governorates during 2011 to 2015.

**Genus *Neolimnus* Linnavuori, 1953**

**Type-species: *Scaphoideus aegyptiacus* Matsumura, 1908)**

This genus is represented in this work by one species only named; *N. aegyptiacus*.

***Neolimnus aegyptiacus* (Mats., 1908)**

**Synonyms:**

*Scaphoideus aegyptiacus* Matsumura 1908

*Neolimnus aegyptiacus* Linnavuori 1953

This species is recorded in Egypt by Linnavuori (1953) on cultivated fields.

**Diagnostic Characters:** yellow-reddish brown with conspicuous colour markings on head and pronotum. Vertex triangular, fish scale-like with different markings. Forewing with brown shadows on cells. Genital plate sharp sclerified claw resembling stylus.

This species was collected from six plant species; Roselle, *Hibiscus Sabdariffa* L., Geranium, *Pelargonium graveolens* L., Rosemary, *Rosmarinus officinalis* L., Sweet basil, *Ocimum basilicum* var. *purpuascans* L., Spearmint, *Mentha viridis* L. and Wormseed, *Artemisia cina* from four localities at El-Sharqya, El-Fayoum, Qalyubya and Giza governorates during 2011 to 2015.

**Genus *Nephotettix* Matsumura, 1902**

**(Type-species: *Selinocephalus cincticeps* Uhler, 1896)**

This genus is represented in this work by one species only named; *N. modulates*.

***Nephotettix modulates* Melichar, 1912**

**Synonyms:**

*Nephotettix africanus* Emeljanov, 1968 (after Orosz, 2011)

No males were collected from this species during this work but only females. So some specimens were sent for identification to Prof. Dr. Christopher H. Dietrich of the Illinois Natural History Survey, USA.

**Diagnostic Characters:** Green with black markings. Vertex obtusely angled, triangular with black thin transverse band between eyes. Pronotum with three blotches surrounding by curved line. Meso-Scutellum with two small spots. Forewing light powdery green except the apex transparent with four apical cells, three sub-apical cells, 2 closed, appendix large and extending around apex.

During the present work, females of this species were collected from one plant species named Roselle; *Hibiscus Sabdariffa* L. at only Qalyubya governorate during 2013 to 2015.

**Genus *Orosius* Distant, 1918**

**(Type-species: *Orosius albicinctus* Dist., 1918)**

This genus is represented in this work by one species only named; *O. albicinctus*.

***Orosius albicinctus* Dist., 1918**

**Synonyms:**

*Thamnotettix filigranus* Haupt, 1927 (after Ghauri, 1966)

**Diagnostic Characters:** Creamy white with irregular transverse brown spots and markings on vertex, pronotum, meso-scutellum, forewing and legs. Connective U-shaped, short articulate with aedeagus. Aedeagus long, triangle with well diverging arms.

This species was collected from six plant species; Pot marigold, *Calendula officinalis* L. Geranium, *Pelargonium graveolens* L. Roselle, *Hibiscus Sabdariffa* L. Rosemary, *Rosmarinus officinalis* L. Jasmine, *Jasminum grandiflorum* L. and Ginger, *Zingiber officinale* Roscoe from three localities at El-Sharqya, El-Fayoum and Qalyubya governorates during 2011 to 2015.

**Genus *Psammotettix* Haupt, 1929**

**(Type-species : *Athysanus maritimus* Perris, 1857)**

This genus is represented in this work by one species named; *P. alienus*.

***Psammotettix alienus* Dhlb**

**Synonyms:**

*Cicada striata* Linnaeus, 1758( after Herakly, 1970)

*Thamnotettix aliena* Dahlbom, 1850 (after Nielson, 1968)

*Psammotettix alienus*, Vacke, 1962 (after Nielson, 1968)

This species is recorded in Egypt by Linnavuori (1964) on cultivated fields.

**Diagnostic Characters:** Pale yellowish brown or tawnyish brown. Vertex bluntly angled, triangular with 6 spots and 4 vertical bands. Forewing semi-leather tannish yellow. Male pygofer long and fused. Connective long closely appressed anteriorly. Aedeagus thick, short and curved backwards upon itself in the end ( like inverted triangle with two little arms).

This species was collected from three plant species; Evening primrose, *Oenothera biennis* Rosemary, *Rosmarinus officinalis* L. and Roselle, *Hibiscus Sabdariffa* L. from one locality at Qalyubya governorate during 2013 to 2015.

**Tribe Hecalini**

**Diagnostic Characters:** Hecalines are medium to large leafhoppers, all with some degree of dorsoventral flattening. The crown is often produced and flattened (Catanach, 2013).

This tribe is represented in Egypt by one genus; *Parabolocratalis*.

**Genus *Parabolocratialis* Evans, 1955**

**(Type-species : *Parabolocratialis viridis* Evans, 1955)**

***Parabolocratialis* sp.**

As far as the available literature of leafhoppers, this genus is considered as a new record in Egypt . During the present work, neither adult males nor females were collected, only few nymphs were found. So some specimens were sent to Prof. Dr. Christopher H. Dietrich of the Illinois Natural History Survey, USA. for identification.

**Diagnostic Characters:** green in colour can be easily recognized by the flatted body with striped lines. Vertex very long about twice as long as pronotum, rectangular and produced in obtuse angle in middle with small red eye in each side of posterior margin of vertex touching the posterior margin of pronotum .

During the present work, nymphs of this species were collected from one plant species named; Wormseed, *Artemisia cina* from only Qalyubya governorate during 2014.

**Tribe Macrostelini**

**Diagnostic Characters:** Forewing with 2 subapical cells (1 closed). Connective not fused with aedeagus.

**Genus: *Aconurella* Rib., 1948**

**(Type-species: *Thamnotettix prolixa* Lethierry, 1855)**

This genus is represented in this work by only one species named *A. prolixa*

***Aconurella prolixa* Leth.**

**Synonyms:**

*Thamnotettix prolixa* Lethierry 1885b

*Thamnotettix sanguisuga* Lindberg 1927; Metcalf 1967b, (after McKamey (2001).

This species is recorded in Egypt by Linnavuori (1964) on cultivated fields.

**Diagnostic Characters:** Head yellow and triangular. Vertex with two transverse depressions. Pronotum clear green, meso and meta- thorax black in the middle. Pronotum with one big blackish green arc in middle. stylus apophysis elongate claw-like, pre-apical angle distinct. Aedeagus Long, curved .

This species was collected from three plant species; *Mentha longifolia*, *Rosmarinus officinalis* L. and *Hibiscus Sabdariffa* L. from two localities at El-Fayoum and Qalyubya governorates during 2013 to 2015.

**Genus *Balclutha* Kirkaldy 1900**

**(Type-species: *Eugnathodus neglectus* DeLong&Davidson,1933)**

This genus is represented in this work by one species named; *B. hebe* (Kirkaldy).

***Balclutha hebe* (Kirkaldy, 1906)**

**Synonyms:**

*Nesosteles hebe* Kirkaldy, 1906 Synonymised by Knight 1987a.

*Eugnathodus bisinuatus* DeLong, in Wolcott, 1923 (after Zanol, 2006)

*Balclutha hortensis* Lindberg, 1948

*Balclutha hebe* (Kirkaldy); Linnavuori, 1959 (Zanol, 2006)

This species is recorded in Egypt by Linnavuori (1964) on cultivated fields.

**Diagnostic Characters :** General colour pale yellow with orange stripes or dim green with dark markings on pronotum . Pronotum very wide more than 3 time as long as vertex. Forewing much longer than abdomen. Pygofer rounded triangular, heavily setose with distinct heavily sclerotized tapered process on posterior-ventral margin .

This species was collected from seventeen plant species including Ginger, *Zingiber officinale* Roscoe, Evening primrose, *Oenothera biennis* and Red pepper, *Capsicum annuum* from four localities of El-Sharqyia, El-Fayoum, Qalyubya and Giza governorates during 2011 to 2015.

**Genus: *Cicadulina* China, 1926**

**(Type-species: *Cicadulina zae* China, 1926)**

This genus is represented in this work by two species named; *C. bipunctella zae* China and *C. chinai* Ghauri

***Cicadulina bipunctella zae* China**

**Synonyms:**

*Gnathodus bipunctata* (Melichar) 1904 (after Knight 2010) (Herakly 1970)

*Cicadula bipunctella* Matsumura 1908 (after McKamey 2010)

*Cicadulina bipunctella* (Matsumura) by Zachvatkin 1935 (after knight,2010)

*Cicadulina bipunctata* (Melichar) 1976 (after Knight 2010)

This species is recorded in Egypt by Linnavuori (1964) on maize and ground nuts.

**Diagnostic Characters :** General colour orange yellow, abdomen dorsally with black transverse bands. Vertex with two black spots on each side. Aedeagus with 2 ventral spines. Genital plate with 5 long posterior setae and 3 short anterior setae.

***Cicadulina chinai* Ghauri, 1964**

**Diagnostic Characters :** Vertex yellow obtusely angled with two black spots on each side. Male pygofer long, broad and triangular with curved long slender hook like process. Genital plate setae uniseriate with 6 long posterior setae and 4 short anterior setae. Aedeagus long, thick with 2 lateral spines.

These two species were collected from eleven plant species including Wormwood plants, *A Artemisia cin*, Ginger, *Zingiber officinale* and Rosemary, *Rosmarinus officinalis* L. from four localities at El-Sharqyia, El-Fayoum, Qalyubya and Giza governorates during 2011- 2015.

**Genus: *Macrosteles* Fieb., 1866**

**(Type-species : *Cicada sexnotata* Fallen,1806)**

This genus is represented in Egypt by one species *M. sexnotatus*.

***Macrosteles sexnotatus* (Fall.)**

**Synonyms:**

*Cicada sexnotata* Fallen 1806 (after Herakly 1970)

*Tettigonia sexnotata* (Fall.), Germar,1831

*Macrosteles sexnotatus*, Nielson, 1962

This species is recorded in Egypt by Linnavuori (1964) on cultivated fields.

**Diagnostic Characters:** General colour dim green with dark markings. Vertex rounded, yellow green with 6 spots; 2 rounded at apex, 2 oblong in

middle and 2 rounded at base. Pronotum with 3 pulled oval blotches reaching to meso-scutellum. Connective short and widely divergent.

This species was collected from two plant species named, Horse mint, *Mentha longifolia* and Spearmint, *Mentha viridis* at both Fayoum and Qalyubya governorates during 2014 to 2015.

**Subfamily: Typhlocybinae**

Small, slender leafhoppers. Forewing without cross-veins, veins indistinct basally, forewing without appendix, without closed sub-apical cells. This subfamily is represented in Egypt by one tribe, four genera and eight species.

**Tribe: Typhlocybini**

Fragile insect, stylus elongate and without pre-apical lobe and apical extension

During this work, this tribe is represented by two genera; *Empoasca* and *Eupteryx* each of them is represented by one species; *Empoasca decipiens* Paoli and *Eupteryx cypria* (Ribaut)

**Genus *Empoasca* Walsh, 1862**

**(Type-species: *Empoasca viridescens* Walsh, 1862)**

(= *E. fabae* Harris)

***Empoasca decipiens* Paoli**

**Synonyms:**

*E. decipiens minor* Zach, 1935

*E. decipiens bifurcata* Cerutti, 1939

*Typhlocyba solani-tuberosi* Kollar, 1852

*Empoasca decipiens* Paoli, 1930, 1932, 1933. (after Herakly 1970).

This species was recorded in Egypt on cotton plant by Willcocks, 1937.

**Diagnostic Characters :** General colour bluish green, light green, forewing thick, smooth with yellowish veins, four apical cells and without appendix. Male abdominal apodeme as long as two abdominal segment, diverging towards apex, 2<sup>nd</sup> sternum crescentic in shape. Anterior stylus curved as an arc across its length. Posterior stylus short, slightly curved, apex pointed and denticulate.

This species was collected from thirty one plant species including Pot marigold, *Calendula officinalis* L. Wormseed plant, *Artemisia cina*, Chamomile, *Matricaria chamomilla*, Horse mint, *Mentha longifolia*, Water mint, *Mentha aquatic*, Common sage, *Salvia officinalis* L., Liquorice, *Glycerrhiza globra* L, Indian Abutilon, or Indian Mallow, *Abutilon indicum*, Hollyhock or Marshmallow, *Althea officinalis*, Celery, *Apium graveolens*, Ginger, *Zingiber officinale* Roscoe, Red pepper, *Capsicum annum* *Solanum laciniatum*, Evening primrose, *Oenothera biennis* and Bunchflower Daffodil, *Narcissus tazetta* at four governorates, El-Sharqya, El-Fayoum, Qalyubya and Giza governorates. during 2011 to 2015.

**Genus *Eupteryx* Curtis, 1833**

**(Type-species: *Cicada picta* Fabricius, 1794)**

In this work, this genus is represented by one species only named; *E. cypria*

***Eupteryx cypria* (Ribaut, 1948)**

**Synonyms:**

***Cicadella cypria* Ribaut, 1948.**

The first record of this species in Egypt by Linnavuori, 1964. But since this time it hasn't been mentioned in literature except Herakly (1980).

**Diagnostic Characters :** General colour whitish yellow with fuscous brown markings. Head as wide as pronotum. Vertex fully rounded with five black spots. Two small at anterior of vertex, three at posterior margin. Pronotum with four dark brown spots and three blotches. Forewing with irregular spots and with greenish fuscous markings around apex of wing and edges of cells, male abdominal apodeme as long as 4<sup>th</sup> sternum abdominal segment and slightly diverging towards apex.

This species is very similar to *Eupteryx melissae* but has the dorsal branches of the aedeagal processes much shorter than the ventral branches. This species was collected from nine plant species Wild ment, *Mentha microphylla* C.Koch, Spearmint, *Mentha viridis*.L. Peppermint, *Mentha peperita* L., Horse mint, *Mentha longifolia*, Rosemary, *Rosmarinus officinalis* L., Common sage, *Salvia officinalis* L., Marjoram, *Majorana hortensis*, Sweet basil, *Ocimum basilicum* var. *purpuascants* L. and Roselle, *Hibiscus Sabdariffa* L. at four governorates, El-Sharqya, El-Fayoum, Qalyubya and Giza governorates during 2011- 2015.

**Subfamily: Ulopinae**

**Diagnostic characters:** Large leafhoppers, brown in colour covered with small distinct punctures. Forewing thick coriaceous or leathery and opaque. Ocelli absent.

This subfamily is represented in Egypt by one genus and one species named; *Megulopa sahlbergorum*

**Genus *Megulopa*, Lindberg, 1925**

**(Type-species: *Megulopa sahlbergorum* Evans, 1947a )  
(after Metcalf 1962)**

This genus is represented in this work by one species only named; *M. sahlbergorum* by Evans 1947.

***Megulopa sahlbergorum* Lindberg, 1925**

No males were collected from this species during this work but only females. So some specimens were sent for identification to Prof. Dr. Christopher H. Dietrich of the Illinois Natural History Survey, USA.

**Diagnostic Characters:** General brown colour. body with depressions and small pit. Vertex rectangular and outer margin not angulated. Forewings are stiff and coriaceous without appendix and cross veins. Presence of dorsal long black band on abdomen.

This species was collected from two plants; Geranium, *Pelargonium graveolens* L. and Ginger, *Zingiber officinale* Roscoe at only Qalyubya governorates during 2014 and 2015.

**Table 1: Leafhopper species recorded in Egypt, host plants, plant families and distribution in different governorates through 2011 to 2015.**

Leafhopper species	Number of		
	Plant species	Plant families	Governorates
<i>Austroagallia</i> sp.	1	1	1
<i>Exitianus pondus</i>	12	6	4
<i>Neolimnus aegyptiacus</i>	6	4	4
<i>Nephotettix modulatus</i>	1	1	1
<i>Orosius albicinctus</i>	6	6	3
<i>Psammotettix alienus</i>	3	3	1
<i>Parabolocralis</i> sp.	1	1	1
<i>Aconurella prolixa</i>	3	2	2
<i>Balclutha hebe</i>	17	9	4
<i>Cicadulina bipunctella zeae</i>	11	5	4
<i>C. chainai</i>	11	5	4
<i>Macrosteles sexnotatus</i>	2	1	2
<i>Empoasca decipiens</i>	31	10	4
<i>Eupteryx cypria</i>	9	3	4
<i>Megulopa sahlbergorum</i>	2	2	1

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**حصر لأنواع نطاطات الأوراق التي تصيب النباتات الطبية والعطرية في مصر**  
هبة عصام إبراهيم\* ، عزة كمال إمام\*\* ، أشرف حلمي\* و مجدى عبد العظيم أحمد\*  
\* معهد بحوث وقاية النبات - مركز البحوث الزراعية - الجيزة - مصر .  
\*\* قسم وقاية النبات - كلية الزراعة جامعة عين شمس - شبرا الخيمة - القاهرة - مصر.

تعد نطاطات الأوراق من الآفات الهامة، فهي آفة واسعة الانتشار في جميع أنحاء العالم، بالإضافة لأنها تنقل العديد من مسببات الأمراض النباتية، التي تسبب خسائر اقتصادية فادحة للعديد من المحاصيل الزراعية ومنها النباتات الطبية والعطرية. ويهدف هذا البحث إلى حصر أنواع نطاطات الأوراق التي تصيب النباتات الطبية والعطرية في مصر. حيث تم جمع كافة الحشرات الكاملة والحوريات من هذه النباتات في مختلف محافظات مصر وقد اعتمد في ذلك على استخدام وسيلتين للجمع وهما: شبكة الجمع، والشاغط الهوائي. وقد تحددت فترة الجمع ودراسة العينات خلال الفترة من ٢٠١١ إلى ٢٠١٥ . وتم حصر خمسة عشر نوعاً من نطاطات الأوراق تنتمي إلى أربعة تحت فصيلة وأربعة عشر جنس . كما تم ذكر الأسماء المرادفة والصفات المورفولوجية التشخيصية والعوائل النباتية.