IDENTIFICATION OF APTEROUS VIVIPAROUS OF CEREAL APHIDS IN EGYPT (HEMIPTERA: STERNORRHYNCHA: APHIDIDAE)

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ABSTRACT: Thirteen cereal aphid species represent five subfamilies from different cereal plants in different localities of Egypt were surveyed, described and illustrated. Usual hosts as well as diagnostic characters for both fresh and microscopic mounted materials of each species were provided. Dichotomous and pictorial keys for apterous viviparous females of these aphids were included to aid personnel charged with detetion, identification and control of aphids associated with cereals in Egypt.

KEY WORDS: Apterous, viviparous females, cereal aphids, Aphididae, taxonomic key, pictorial key, identification.

Cereal crops of the family Gramineae are the main source of the carbohydrates in the human diet and feed throughout the world. Grains are account for over half of the world's food energy, or even more counting grain consumed indirectly as animal feed. Global agricultural production outpaced the doubling of the world's population occurred between 1950 and 1990.

When aphids' populations are large, they can greatly diminish plant's vigor or even kills it through mechanical injury by removal of sap during feeding. Aphids also have the capability of transmitting persistent, semi-persistant and non persistent viruses among different plants that would not otherwise be considered hosts. Aphids also produce a sticky substance (honeydew) during feeding. This substance may be problematic when it fouls the corn tassel and interferes with pollination and encourages fungal growth (Chan et al., 1991 and Clifford et al., 2004). The previous key of aphids in Egypt was presented by Habib & El-Kady, 1961 was based on alate viviparous females only. There are no published keys that include apterous forms, althought these forms are the most settled on the plants and easy to collect, so the objectives of this study were to develop keys and main characters illustrations of apterous viviparous females of cereal aphids to aid personnel charged with detetion, identification and control of aphids associated with cereals in Egypt.

MATERIALS AND METHODS

Collecting and preservation:

Apterous viviparous females of different cereal aphid species were collected from different cereal host plants (crops and weeds) from different localities of Egypt throughout two successive years (2007 and 2008). Aphid samples were brought to the laboratory alive on a part of the host plant in paper bags. Aphid colonies often consist of mainly immature individuals, and the proportion of adults in the sample can be increased by keeping the aphids alive for a few days in a cool place before preserving them. Possible collection data were note down at the time of collection, including host plant, locality and date. Also some biological information were noted such as colour of alive aphid individuals, position of

colony on host plant, and any changes of the host plants that may be due to aphid infestation. Some aphid species were successfully reared on their host plant in the laboratory in Chimeny glass cages for maintenance and mounting. Aphid samples were preserved in tightly stoppered tubes fitted with two volume of 70% lacto-alcohol (ethyl alcohol added to one volume of 75% w/w lactic acid) and few drops of glycerin.

Samples mounting:

Aphid samples were washed in 5% glacial acetic acid then embedded in 10% sodium hydroxide over night at room temperature. The second day sodium hydroxide was decanted and add 1cm depth of glacial acetic acid for 5 minutes, then samples were dehydrated by gradually series of ethyl alcohol concentrations. Samples were cleared using chloral-phenol solution (1 vol. chloral hydrate: 1 vol. phenol) and left in this solution overnight at the room temperature. Samples then were ready to be mounted in the swan's gum chloral media on cleaned micro slides and carefully covered by a clean cover slip to avoid any air bubbles, and then the slides left horizontally in a hot plate at 50 ^{o}C for 5 days to dry.

Labeling and slide storage:

Square pieces of cardboard about 0.5 – 1.0 mm thick are glued to either end of the slide On the left side of the label the scientific name of the aphid, the form and the name of the person who identified the aphid are indicated. The label on the right hand side lists the host plant, locality, date, name of collector and the number of collection. Slides are stored in boxes or drawers in a horizontal position, and the genera are arranged in alphabetical sequence. The species are also arranged alphabetically within the genera.

Samples drafting:

Morphological diagnostic characters of apterous viviparous females of different cereal aphid species were drafted using the drawing eye-piece. Some measurements of these characters were made using micrometric slide and lens.

Aphids on Cereals in Egypt

I. Aphids on cereal roots:

Two aphids' species were found to infest cereal roots only during this work; *Anoecia corni* (Fabricius) and *Tetraneura africana* Van der Goot**.**

Subfamily Anoeciinae

Anoecia corni (Fabricius, 1775)

Dog Wood Aphid

The first record of this aphid species in Egypt by Theobald, 1922 on the cereal weed species *Cyperus longus*. It was recorded also on different cereal weed plants at Giza and Sharqiya governorates by Elnagar et al., 1978, Amin, 1979 and Megahed, 2000. Also, this aphid species was recorded by Habib & El-Kady, 1961 on wheat plants in El-Gezeirh region.

Diagnostic characters:

Fresh materials: Tortoise-looks like in shape. Pale greenish-grey with sclerotized parts black.

Mounted materials: Frontal tubercles not developed; unguis as twice as the basal part, apical rostral segment acute, cauda circular and siphunculi on hairy cones.

Materials: Twenty specimens of this species were collected during this work. Five of them on roots of barley at Sakha, Kafr El-Sheikh Governorate, November 2007 and five specimens on roots of wheat at Shalakan, Qalubiya Governorate, December 2008 and the rest ten specimens were recorded on wheat plants at Giza Governorate, March, 2008.

Subfamily Eriosomatinae

Tetraneura africana Van der Goot, 1912

This aphid species was recorded for the first time in Egypt on *Cynodon dactylon* roots by Theobald, 1922. It was recorded after that at Mansoura, Zagazig, Cairo, Giza and Fayoum

Governorate (Hassan, 1958). It was recorded also at Giza Governorate by other authors (Habib & El-Kady, 1961; Elnagar et al., 1978; Amin, 1979).

Diagnostic characters:

Fresh materials: Body globose large in size (3 mm), buff colored to pale brown with a dark brown head and prothorax. Dorsum with long spine-like hairs.

Mounted materials: Frontal tubercles not developed unguis too short less than the basal part, apical rostral segment acute, cauda broadly rounded and siphunculi ring-like.

Materials: Five specimens of this species were collected from roots of *Cynodon dactylon* at Giza Governorate, February, 2008.

II. Aphids on cereal aerial parts:

A- Infesting cereal weeds only:

Three aphids' species were found to infest aerial parts of cereal weeds only during this work; *Hyalapterus pruni* (Geoffroy) on *Arundo donax* only. While the other two species, *Saltusaphis scirpus* Theobald and *Schizaphis minuta* (Van der Goot) on Scirpus, *Cyperus rotundus* only.

Subfamily Aphidinae

***Hyalapterus pruni* (Geoffroy, 1762)**

Mealy Plum aphid

This aphid species was recorded for the first time in Egypt by Willcocks, 1916 on both *Arundo donax* and *Phragmites comnunis* and then recorded at Giza Governorate by Elnagar *et al.,* 1978 and Amin, 1979.

Diagnostic characters:

Fresh materials: Body elongate, green or pink, covered with white powdery wax**.**

Mounted materials: Frontal tubercles not well developed; unguis twice as long as the basal part, apical rostral segment acute, cauda elongate with five long hairs, siphunculi cylindrical and shorter than the cauda.

Materials: Fourty specimens of this species were collected all on *Arundo donax* from Qalyabiya, Giza, Sharqiya and Behaira Governorates during March and April, 2008.

***Schizaphis minuta* (Van der Goot, 1917)**

Cyperus Aphid

This species was recorded for the first time in Egypt by Habib and El-Kady, 1961 using a light trap. There wasn't any record about it until it was observed after thirty nine years on *Cyperus rotundus* by El-Fatih, 2000 and 2006.

Diagnostic characters:

Fresh materials: Very small in size (1.2mm: 1.5mm). Dark-olive in colour. Legs yellow with black distal parts**.**

Mounted materials: Frontal tubercles not well developed, unguis five times as long as the basal part, apical rostral segment acute, cauda elongate with about 6 long hairs, siphunculi cylindrical about twice as long as the cauda.

Materials: Six specimens were collected during this work all on Cyperus, *C. rotundus* from Giza and Qalyabiya Governorates in December, 2007 and January, 2008.

Subfamily Saltusaphidinae

***Saltusaphis scirpus* Theobald, 1915**

It was recorded for the first time in Egypt by Willcocks, 1910 on Sedge "*Scirpus* sp.". Also it was caught on light trap in 28 Dec. 1958 at Kobba Palace and four specimens were recorded on *Cyperus* sp. 7 Dec. 1944 at Dokki region by Habib and El-Kady, 1961. Then it was recoded at Zagazig, Sharkiea Governorate (Megahed, 2000) and at Giza Governorate on *Cyperus rotundus* by El-Fatih 2000 and 2006**.**

Diagnostic characters:

Fresh materials: Pale grey-brown with dark brown inter-segmental markings legs, peculiarly characterized by the Cat-like setting when rest. Considered the fastest cereal aphid species whereas it springs off the plant on the slightest alarm.

Mounted materials: Frontal tubercles not developed Antennae almost reaching body length, unigus as 1.5 long as the basal part, apical rostral segment short and blunt, cauda knobbed and anal plate bilobed and siphunculi short on hairy cones.
Materials: Five specimens were collected during this work all on Scirpus, *C. rotundus* from Qalyabiya in January, 2008 and from Giza, March, 2008.

B. Infesting cereal crops and weeds:

Eight cereal aphid species were found to infest both cereal crops and weeds during this work.

Subfamily Aphidinae
***Diuraphis noxia* (Mordvilko, 1914)**
Russian Wheat Aphid

It was mentioned that the first record of this aphid species in Egypt was recorded by Attia, 1988. But during this revision study it was noticed that *Diuraphis noxia* was the same species which was found on the leaves of wheat in March 1957 at Koubba Palace by (Habib and El-Kady, 1961) and they defined it as *Cuernavaca noxia* (Mordvilko. It was recorded after that by many authors on wheat and barley plants at both of Beni-Suef (El-Lathy, 1999); Ismailia (Noaman et al., 1992); Sinai (Abd El-Salam, 1999). Also it was recorded on *B. catharticus* and *A. fatua* cereal weed plants by El-Fatih, 2000.
Diagnostic characters:
Fresh materials: Small in size, spindle-shaped, pale yellow green or grey-green covered with white wax powder.
Mounted materials: Frontal tubercles not well developed, unigus twice as long as the basal part, apical rostral segment acute, supra-caudal process present on the eighth abdominal tergum, that about as long as the cauda, siphunculi short and cube shaped.
Materials: Fifteen specimens were collected during this work. Six of them were on wheat plants at Giza Governorate. Five of them were on *Bromus catharticus* and four were on *Avena fatua*.

***Metopolophium dirhodum* (Walker, 1849)**
Rose-grass aphid, Rose-grain aphid

This aphid species was recorded at the first time in Egypt on wheat plants at Beni-Suef Governorate (El-Lathy, 1999) and on barley and different cereal weed plants at Giza Governorate (El-Fatih, 2000, 2006).
Diagnostic characters:
Fresh materials: Body green to yellow green with dark green longitudinal stripe along the middle of the dorsum. Small to medium sized, body length 1.7-2.7 mm, elongate, antennae green with dark bands on apices of antennal segments 3, 4 and the base of 6**.** Cauda and siphunculi pale.
Mounted materials: Frontal tubercles well developed (Diverging); unigus 4 times as long as the basal part, apical rostral segment acute, Cauda elongate with about 5 pairs of long setae, siphunculi cylindrical about twice as long as the cauda
Materials: Thirty specimens were collected during this work. Ten of them were on barley plants at Giza Governorate in February, 2007. Five of them were on *Lolium temulentum* January, 2008. Six of them were on *Phalaris minor* January, 2008. Eight specimens were on *Avena fatua* April, 2008.

***Rhopalosiphum maidis* (Fitch, 1856)**
Corn-leaf aphid

The first record of this aphid species in Egypt was on the cereal weed plant, *Andropogon halepensis* (Willcocks, 1922). Then it was recorded on cereal weeds at both of Giza Governorate (Megahed et al., 1978, Elnagar et al., 1978, Amin, 1979, Abdel-Wahab, 1998, El-Fatih 2000 & 2006); Zagazig region, Sharkiea Governorate (Megahed, 2000) and Kharga and Dakhla Oases (Hassan, 1957).

It was recorded also on wheat plants at both of Kharga & Dakhla Oases (Hassan, 1957); Beni-Suef, Assiut & Sohag (Mohamed, 1992); Assiut (Slman, 1993 & 1997); Sinai (Abd El-Rahman, 1997) and Beni-Suef (Abd El-Salam, 1999 and El-Lathy, 1999).

It was recorded also on barley plants at Middle Egypt (El-Hariry, 1979); Giza (Ibrahim, 1990, Abd El-Salam, 1999 and El-Fatih, 2000 & 2006); Sohag (Slman & Ahmed, 2005); Ismailia (Noaman et al., 1992) and both of Nubaria, Borg El-Arab and Marsa Mattrouh (El-Sayed et al., 1995).

It was recorded also on maize plants (Willcocks, 1922 & Hall, 1926). Then it was recorded at Kharga & Dakhlia Oases (Hassan, 1957); Qalubia (Yossef, 1990); Giza (Abd El-Salam, 1999) and Gharbiah (El-Khouly et al., 1994).

Diagnostic characters:

Fresh materials: Body rather elongate (1.9-2.6 mm) with short antennae and siphunculi, color blue green to olive green with reddish-purple areas around siphunculi bases. Siphunculi and cauda dark.

Mounted materials: Frontal tubercles not well developed. Antenna 6 segmented; unigus twice as long as the basal part. Apical rostral segment acute. Cauda elongate with 2 pairs of lateral setae. Siphunculi slightly swollen, 4.5 times as long as the length of cauda.

Materials: Forty specimens were collected during this work. Ten of them were on barley plants at Giza Governorate in December, 2007. Ten of them were on *Avena fatua* during February, 2008. Seven of them were on *Lolium temulentum* in March, 2008. Thirteen specimens were on *Phalaris moinor* May, 2008 at Giza Governorate.

***Rhopalosiphum padi* (Linnaeus, 1758)**

Bird Cherry-Oat Aphid

The first record of this aphid species in Egypt was on the cereal weed plants, *Panicum colonum* and *Phalaris* sp. (Hassan, 1958). It was recorded also on another different cereal weed plants at Giza Governorate by many authors (Megahed et al., 1978, Elnagar et al., 1978, Amin, 1979, Abdel-Wahab, 1998, El-Fatih 2000 & 2006), while it was recorded at Zagazig region, Sharqiya Governorate (Megahed, 2000). The first record of this aphid species on wheat plants in Egypt was at Koubba palace (Habib & El-Kady, 1961). Then it was recorded at Beni-Suef, Assiut & Sohag (Mohamed, 1992); Assiut (Slman, 1993 & 1997); Sinai (Abd El-Rahman, 1997); Beni-Suef (Abd El-Salam, 1999 and El-Lathy, 1999).

It was recorded also on barley plants at Middle Egypt (El-Hariry, 1979); Giza (Ibrahim, 1990; El-Fatih, 2000); Abd El-Salam, 1999 and El-Fatih 2000 & 2006; Beni-Suef, Assiut and Sohag (Mohamed, 1992), Sohag (Slman & Ahmed, 2005); Ismailia (Noaman et al., 1992) and both of Nubaria, Borg El-Arab and Marsa Mattrouh (El-Sayed et al., 1995), Sinai (Abd El-Salam, 1999). It was recorded also on maize plants at Qalubia Governorate (Yossef, 1990) and at Sinai (Abd El-Salam, 1999).

Diagnostic characters:

Fresh materials: body broadly rounded, small to medium sized (2: 2.4 mm), colour yellowish to bluish green with orange patches around base of siphunculi. Siphunculi and cauda dark

Mounted materials: frontal tubercles not well developed. Antennae 6 segments; unigus four times as long as the basal part, apical rostral segment blunt. Cauda elongate with four lateral setae. Siphunculi cylindrical, twice as long as the length of cauda.

Materials: Forty specimens were collected during this work. Thirteen specimens on *Avena fatua* from Giza and Qalyabiya Governorates in January, 2007 and twenty specimens were on barley in March, 2008. Seven specimens were on wheat plants from Beni-Suif Governorate, April, 2008.

***Schizaphis graminum* (Rondani), 1852.**

Green Bug

The first record of this aphid species in Egypt was on the cereal weed plant, (Willcocks, 1922). After that it was recorded on other cereal weeds (Megahed et al., 1978, Elnagar et al., 1978, Amin, 1979, Abdel-Wahab, 1998, El-Fatih 2000 & 2006, while it was recorded at Zagazig region, Sharqiya Governorate by Megahed, 2000. Also, it was recorded on barley plants by El-Hariry, 1979, Ibrahim and Afifi, 1991, Abd El-Salam, 1999 and El-Fatih 2000 & 2006.

Diagnostic characters:

Fresh materials: Body elongate oval shaped; small in size (1.5 to 2 mm), yellowish to bluish green with a darker spinal stripe on the dorsum of abdomen, head and prothorax yellowish green. Siphunculi pale with slightly flared and darkened tips.

Mounted materials: Frontal tubercles not well developed. Antennae 6 segmented; unigus 3 times as long as the basal part. Apical rostral segment acute. Cauda elongate with 4 long lateral setae. Siphunculi cylindrical, about 1.6 as long as the length of cauda.
Materials: Thirty five specimens were collected during this work. Fourteen specimens were recorded on *Avena fatua* from Giza and Beni-Suef Governorates in February, 2007 and sixteen specimens were on *Cynodon dactylon* in January, 2008.

***Schizaphis rotundiventris* Signoret, 1860**

Oil pulm aphis

This aphid species was recorded as a first time in Egypt by Theobald, 1922 as a new species under the name *Aphis acori* on Sedge, *Cyperus longus*. Then it was recorded by Hall, 1926 under the name *Toxoptera acori*. After approximately seventy four years it was observed at Giza Governorate on different cereal weed plants by El-Fatih 2000, Abdel-Wahab, 2004 and El-Fatih 2006 under the name *Schizaphis cyperi*.

Borner and Heinze (1957) stated that *Schizaphis cyperi* (Van der Goot) (Ainslie) is a junior synonym of *S. rotundiventris* Borner and Heinze list (Ainslie) after Van der Goot as the describer, evidently synonymizing the two species.

Diagnostic characters:
Fresh materials: Body pear shaped; small in size (1.3 to 1.8 mm). Dark-red, antennae and legs yellow with black bases and tips. Mainly infesting cereal weeds while rarely on economic crops
Mounted materials: Frontal tubercles not well developed. Antennae 6 segmented; unigus 5 times as long as the basal part. Apical rostral segment blunt. Cauda elongate with 4 long lateral setae. Siphunculi cylindrical, about 1.6 as long as the length of cauda.
Materials: Twenty five specimens were collected during this work. Eight specimens on *Digitaria sanguinalis* from Giza Governorates in November, 2007 and five specimens were on *Cynodon dactylon* in March, 2008 from Giza Governorates. Seven specimens were on *Echinocloa colonum* plants and five of them were on *Sorghum virgatum* from Beni-Suif Governorate, April, 2008.

***Sitobion avenae* (Fabricius, 1775)**

English Grain Aphid

The first record of this aphid species in Egypt was recorded on barley plants by Willcocks, 1922. Then it was recorded also by Hall, 1926. After that it was recorded at Giza region by both of El-Hariry, 1979; Ibrahim & Afifi, 1991, El-Fatih 2000 and 2006. It was recorded at Sinai by Abd El-Salam, 1999.

It was recorded also on different cereal weed plants at Giza Governorate by many authers (Hall, 1926; Megahed et al., 1978; Elnagar et al., 1978, El-Fatih, 2000 and 2006, while it was recorded at both of Zagazig region, Sharqiya Governorate by Megahed, 2000.

The first record of this aphid species on wheat plants was at Koubba palace (Habib & El-Kady, 1961). Then it was recorded at Beni-Suef, Assiut & Sohag (Mohamed, 1992), Assiut (Slman, 1993 & 1997); Sinai (Abd El-Rahman, 1997); Beni-Suef (Abd El-Salam, 1999 and El-Lathy, 1999).

Diagnostic characters:
Fresh materials: Body broadly spindle-shaped about 2.2-3.5 mm in length; antennae, legs and siphunculi long. Dorsum bright green to red brown in colour, with ten faint inter-segmental markings. Leg segments black towards ends while antennae and siphunculi uniformly black. Mainly infesting economic cereal crops
Mounted materials: Frontal tubercles well developed (Diverging). Antennae 6 segmented; unigus 3 times as long as the basal part. Apical rostral segment acute. Cauda elongate with 6 of lateral setae and 1-2 pre-apical setae. Siphunculi cylindrical much longer than cauda and with a sub-apical polygonal reticulated apex.
Materials: Thirty two specimens were collected during this work. Fifteen of them were on barley plants at Giza and Qalyabiya Governorate in December, 2007. Six of them were on *Avena fatua* in March, 2007. Seven of them were on *Lolium temulentum* in March, 2008. Four specimens were on *S. virgatum* in May, 2008 at Giza Governorate.

Subfamily Chaitophorinae

***Sipha (Rungsia) maydis* Passerini, 1860**

It was recorded before as a first time in Egypt at Giza Governorate on *Aegilops* sp. (El-Hariry, 1991). Then it was recorded on other different cereal weed plants (El-Fatih 2000).

Diagnostic characters:

Fresh materials: Body pear-shaped, somewhat dorsoventrally flattened, rather small (1.3-1.6mm). Shining dark-brown to almost black on dorsum**;** which fully sclerotized and armored with long spine-like hairs**.** Live on upper sides of leaf blades near the bases.

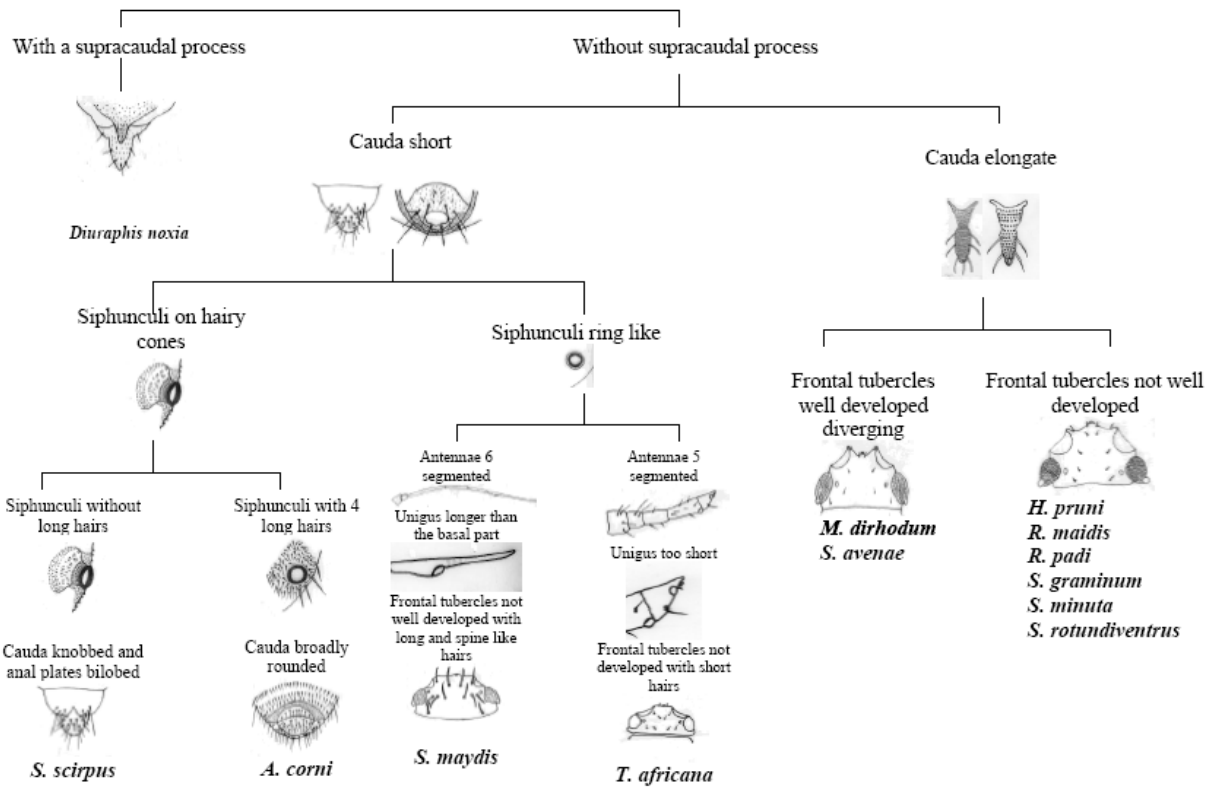
Mounted materials: Frontal tubercles not well developed. Antennae 6 segmented; unigus 5 times as long as the basal part. Apical rostral segment acute. Cauda broadly rounded with 5 long hairs. Siphunculi ring-like.

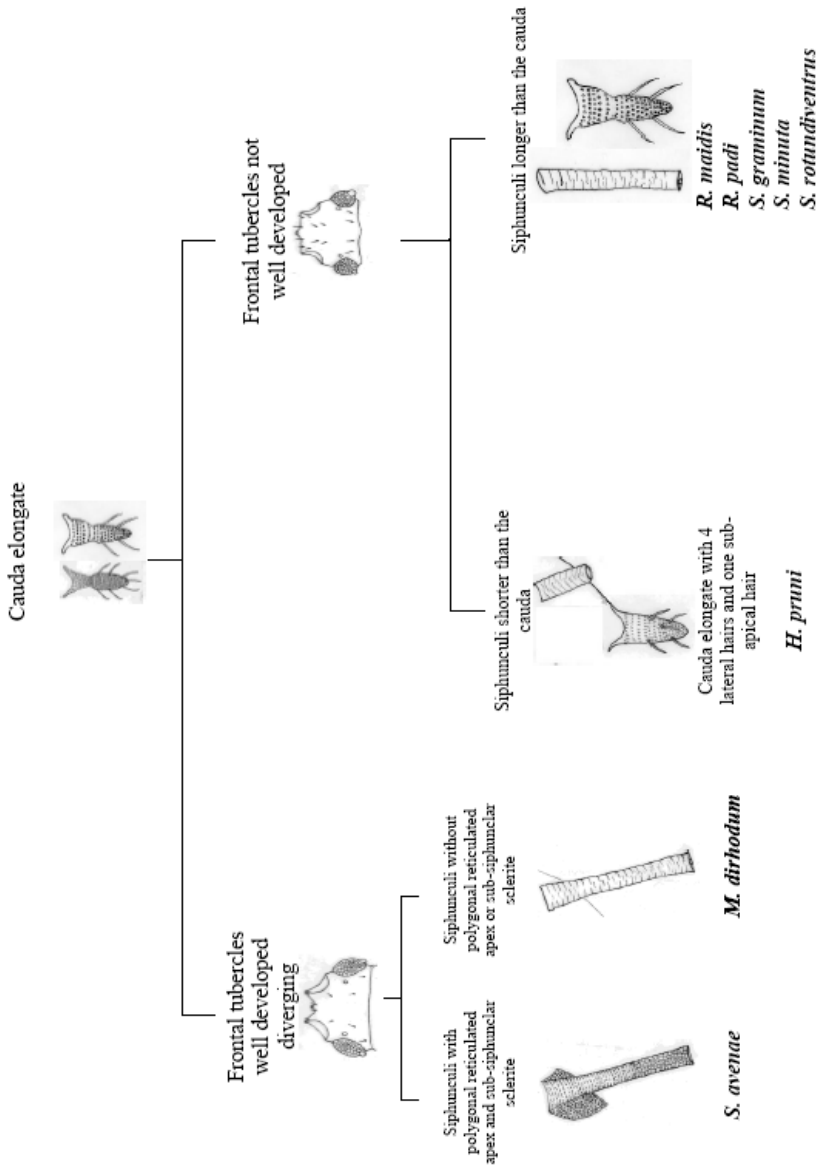
Materials: Eleven specimens were collected during this work. Four specimens on *Bromus catharticus* from Giza Governorates in April, 2007. Seven specimens were on *Sorghum virgatum* in February, 2008 from Qalyabiya Governorates.

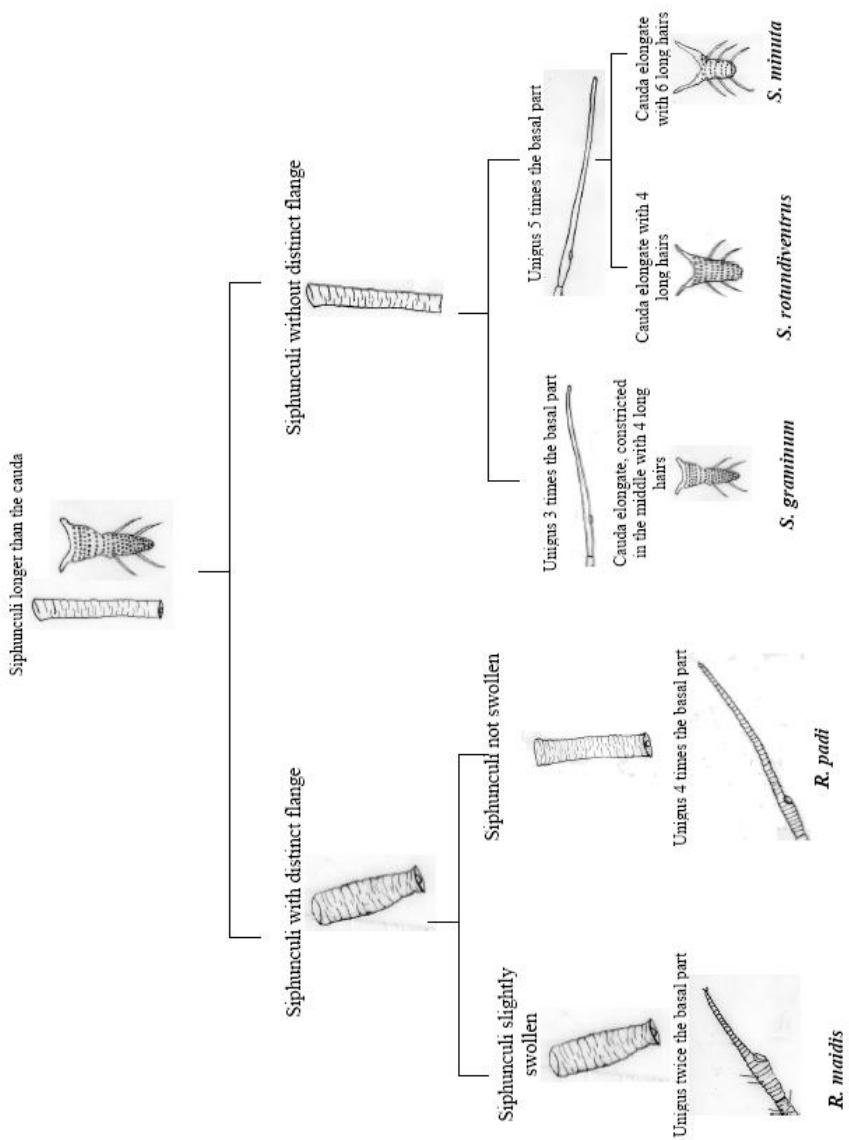
Key of cereal aphids in Egypt based on fresh materials:

1.	Infesting cereal roots only.....	2
-	Infesting aerial parts.....	3
2(1).	Tortoise-looks like in shape. Pale greenish-grey with sclerotized parts black. Dorsum hairs inconspicuous. Infesting cereal weeds and crops.....***A. corni***	
-	Globose in shape. Buff colored to pale brown with dark brown head and prothorax. Dorsum with long spine like hairs. Infesting cereal weeds and rarely on cereal crops.....***T. africana***	
3.	Infesting cereal weeds only.....	4
-	Infesting both cereal weeds and crops.....	6
4(3).	Body elongate, green or pink, covered with white powdery wax. Found infesting *Arundo donax* only.....***H. pruni***	
-	Body not covered with any wax. Found infesting *Cyperus rotundus* only.....	5
5(4).	Pale grey-brown with dark brown inter-segmental markings legs, peculiarly characterized by the Cat-like setting when rest. Considered the fastest cereal aphid species whereas it springs off the plant on the slightest alarm.....***S. scirpus***	
-	Dark-olive in colour. Legs yellow with black distal parts.....***S. minuta***	
6(3).	Tip of abdomen with double "tail" (supra caudal process).....***D. noxia***	
-	Tip of abdomen with cauda only.....	7
7(6).	Body fully sclerotized and armored with long spine like hairs.....***S. maydis***	
-	Body not sclerotized, dorsum hairs short and inconspicuous.....	8
8(7).	Mainly on plant ears and rarely on leaves.....	9
-	Infesting leaves only.....	10
9(8).	Bright-green, antennae and legs completely black. Mainly infesting economic cereal crops.....***S. avenae***	
-	Dark-red, antennae and legs yellow with black bases and tips. Mainly infesting cereal weeds while rarely on economic crops.....***S. rotundiventrus***	
10(9).	Dorsum with distinct longitudinal mid-dorsal stripe.....	11
-	Dorsum without any stripe.....	12
11(10).	Light green, antennae uniformly black.....***S. graminum***	
-	Yellow green, antenna green with dark bands on apices of antennal segments 3, 4 and the base of 6.....***M. dirhodum***	
12(10).	Olive-green, antennae and siphunculi with dark tips. Siphunculi base with reddish-orange spot.....***R. padi***	
-	Bright-green, antennae and siphunculi completely black. Siphunculi base without spots.....***R. maidis***	

Pictorial key to apterous viviparous females of aphid species that colonize cereals in Egypt based on mounted materials:




Cauda elongate
Frontal tubercles not well developed
Siphunculi longer than the cauda
R. maidis
R. padi
S. graminum
S. minuta
S. rotundiventrus
Siphunculi shorter than the cauda
Cauda elongate with 4 lateral hairs and one sub-apical hair
H. pruni
Frontal tubercles well developed diverging
Siphunculi without polygonal reticulated apex or sub-siphuncular sclerite
M. dirhodum
Siphunculi with polygonal reticulated apex and sub-siphuncular sclerite
S. avenae


Siphunculi longer than the cauda
Siphunculi with distinct flange
Siphunculi not swollen
Siphunculi slightly swollen
Unigus twice the basal part
R. maidis
Unigus 4 times the basal part
R. padi
Siphunculi without distinct flange
Unigus 3 times the basal part
Cauda elongate, constricted in the middle with 4 long hairs
S. graminum
Unigus 5 times the basal part
Cauda elongate with 4 long hairs
S. rotundiventrus
Cauda elongate with 6 long hairs
S. minuta

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