

Short Communication: Morphological characterizations of *Aphis passeriniana* (Del Guercio) (Hemiptera: Aphididae) living on common sage in Turkey

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Manuscript received: 11 May 2018. Revision accepted: 18 June 2018.

Abstract. Zarkani A, Turanlı F. 2018. Short Communication: Morphological characterizations of *Aphis passeriniana* (Del Guercio) (Hemiptera: Aphididae) living on common sage in Turkey. *Biodiversitas* 19: 1319-1325. *Aphis passeriniana* (Del Guercio) (Hemiptera: Aphididae) living on sage plant in Turkey is already recorded, but some morphological characterizations are still needed to extend. Here, morphometrics data of *A. passeriniana* is described from apterous viviparous females (fundatrigeniae and fundatrices) attacking *Salvia officinalis* Linnaeus (Lamiaceae) in Turkey. Seventy specimens were collected in Izmir province between January 2015 and December 2017. The study revealed that apterous viviparous females of *A. passeriniana* turkish species have body length of 0.715-1.407 mm, rostral segment IV+V of 1.80-2.49 × hind tibia II, antennae processus terminalis/base of 1.4-1.8, siphunculus of 0.56-1.56 × cauda length and cauda of 3-6 setae. Biometric data of alate viviparous and intermediate individual between apterous and oviparous, and also a revision of identification key for the species within aphid species in *Salvia* are consisted. □

Keywords: *Aphis passeriniana*, insect pest, *Salvia officinalis*, taxonomy, Turkey

Abbreviations: ABD TERG: abdominal tergite, ANT: antenna, ANT I-V and VIb: antennal segments I-V and the base of antennal segment VI, ANT III BD: basal diameter of antennal segment III, BL: body length, HFem: hind femur, HTib: hind tibia, HTro: hind trochanter, HT II: second segment of hind tarsus, HW: head width across the compound eyes, MTu: marginal tubercles, PT: processus terminalis, R: rostral segment, SIPH: siphunculus, and URS: ultimate rostral segment

INTRODUCTION

Aphis Linnaeus, 1758, with 580 described species, is the largest aphid genus within the subfamily Aphidinae and tribe Aphidini (Remaudiere and Remaudiere 1997; Favret 2017). This genus is easily found on shrubs and herbs, never on sedges (Cyperaceae), very rarely on grasses (Poaceae) and less on trees (Blackman and Eastop 2006). About 221 species from *Aphis* are reported in Europe (Nieto Nafria et al. 2017), and 69 species are in Turkey (Görür et al. 2012). In addition, this genus is mostly found in the northern hemisphere, and some native species also found in South America, New Zealand and Australia (Blackman and Eastop 2006; 2018). □

Salvia spp. (Lamiaceae) are hosts to 41 aphid species, but only nine species associated with *Salvia officinalis* Linnaeus, i.e., *Aphis craccivora* Koch, *A. fabae* Scopoli, *A. passeriniana* (Del Guercio), *A. salviae* Walker, *Aulacorthum solani* (Kaltenbach), *Brachycaudus cardui* (Linnaeus), *B. helichrysi* (Kaltenbach) *Eucarazzia elegans* (Ferrari), and *Myzus ornatus* Laing (Holman 2009). Almost all the aphid species are oligo- or polyphagous and just *A. passeriniana* is constantly found on *Salvia* spp. (Blackman and Eastop 2006). This *Aphis* species does not host alternate; however, it can also survive on *Salvia fruticosa* Miller, *S. splendens* Sello and *S. verticillata* Linnaeus

(CABI 2005).

The sage aphid, *A. passeriniana*, generally lives up growing shoots, in curled leaves and among the flowers (Blackman and Eastop 2006). Even though the aphid's potential vector of plant viral diseases has not been reported, the aphid attacks show virus-like symptoms; distortion of leaves and young shoots; dwarf plant; flowers and seeds undeveloped (Nieto Nafria et al. 2005). It is assumed to overwinter as eggs on sage of which sexual forms have not been described (Blackman and Eastop 2018). This is mainly a southern European species with records from Germany, Italy, Spain, Switzerland, Bulgaria, Croatia, Hungary, and Greece, as well as Iraq and Israel (Stroyan 1984). □

The aphid fauna of Turkey has been surveyed extensively starting in the first part of the 20th century (Trotter 1903). However, the aphid species and host plants in some regions have not been fully established, and as result, it is likely that new and invasive species will be found in Turkey (Görür et al. 2012; Şenol et al. 2014; 2015). In this study, the morphological characterizations of *A. passeriniana* as an aphid of *S. officinalis* in Turkey were reported. We extended the data of the first record of *Aphis passeriniana* (Del Guercio) (Hemiptera: Aphididae) in the Asia Minor peninsula reported by Barjadze (2017).

MATERIALS AND METHODS

The samples were collected between January 2015 and December 2017. Aphid specimens were handpicked from sage planted in experimental fields of Field Crops Department, Faculty of Agriculture, Ege University (38° 27' 16" N and 27° 13' 33" E; 29 m a.s.l) and Aegean Agricultural Research Institute, Menemen (38° 33' 56" N and 27° 3' 20" E; 11 m a.s.l), Izmir, Turkey.

Slide mounted specimens were prepared using the methods of Borrer et al. (1981), and the aphid species were studied using a Leica microscope with MShoot 1.0 version software installed for taking the measurements. Seventy quantitative characteristics of specimens were used for species description. Material examined were apterous viviparous females (45 fundatrigeniae (9.vii.2015, 10.vii.2017 and 22.vii.2017) and six fundatrices (20.ii.2015, 9.ii.2016)), 15 alatae viviparous females (9.vii.2015, 30.vii.2016, 10.vii.2017 and 22.vii.2017) and four intermediate individual between apterous and oviparous (20.xi.2016, 11.xi.2017) with the same host plant and locality; collection of the Ege University, Izmir, Turkey. Measurements of morphological characters, ratios, and chaetotaxy given in this paper are those used by Nieto Nafria and Mier Durante (1998), Nieto Nafria et al. (2017) and Blackman and Eastop (2018).

RESULTS AND DISCUSSION

Here, a diagnosis of the *Aphis passeriniana* (Del Guercio) species and illustration of some structures to facilitate the identification of the Turkish specimens are presented. □

Apterous viviparous female

Based on 45 specimens. Color in life mottled was dull green to yellowish and greenish, dark green head, brown to black siphunculi and brownish cauda (Figure 1.A). Very small aphids, 0.72 to 1.41 mm long. ANT III-IV was brown and others were dark, rostrum was slightly dusky. In mounted specimens (Figure 2.A), head, prothorax, siphunculi and cauda were less pigmented; dorsal pigmentation on other thoracic and abdominal segments were practically absent, only transversal bars sometimes present on abdominal segments I, III and V. Head: smooth dorsally and ventrally, with three pairs of acuminate setae on dorsum, occasionally one setae added on anterior pair, longest setae was almost longer than ANT III BD; front sinuosa shaped, median tubercles of frons undeveloped; acuminate setae on frons and vertex were longer than dorsal setae. Antennae consisted of five or six antennal segments (Figure 6), 0.41 to 1.04 mm long, 0.5 to 0.8 times body length, without secondary sensoria. Processus terminalis was 1.4 to 2.4 times the base of last antennal article V or VI. Rostrum (0.25 to 0.44 mm) was reaching the hind coxae. URS was 0.09 to 0.14 mm, 2.0 to 4.2 times its basal width and 1.7 to 2.5 times HT II, with two to four complementary short setae. Thorax: pronotum smooth with one spinal setae and one marginal setae close to marginal

tubercles on each side. Hind coxa was smooth with about six acuminate setae; posterior setae on hind trochanter was 0.5 to 1.0 times as long as width of trochanter-femoral joint; hind femur was smooth, bearing anterior setae and posterior setae were similar in size, longest setae of the later was 0.2 to 0.6 times as long as middle width of segment; longest setae on tibiae was 0.6 to 1.2 times as long as middle width; tarsal formula was 2.2.2; second segment of hind tarsus imbricate consisted of three pairs of setae. Abdomen: dorsum was smooth, membranous with eight setae on each segment of terga I-VI; terga I, VII with small marginal tubercles; small and oval marginal papillae on prothorax (0.008 to 0.020 mm diameter), and the abdominal segment I and VII (0.007 to 0.013 mm diameter). Abdominal segments I-VI consisted marginal sclerites; II-V sclerites bear two hairs. Genital plate was less pigmented on its distal zone, bearing two to five distal setae and eight to 12 marginal-posterior setae. Cauda (Figure 3.E) was triangular to fingerlike (somewhat narrowed in its basal half), 1.0 to 2.1 times its basal width, bearing a lot of strong black spinules and three to six long, robust and curved setae of 0.035 to 0.069 mm. Siphunculi (Figure 3.F) were short (0.08 to 0.21 mm, 0.08 to 0.16 times body length and 0.6 to 1.6 times cauda length) and curved inside; its apical flange was inconspicuous or lacking. Other characteristics are summarized in Table 1.

Fundatrix

From six specimens. Similar to the fundatrigeniae when both alive and mounted. Antennae with six segments; antennal length was close to alate, but the ratio of ANT PT/VIIb was close to fundatrigeniae. Cauda was wider and longer than fundatrigeniae and alatae (Figure 3.A). In mounted specimens, siphunculus and spiracle were darker and larger than fundatrigeniae (Figure 3.B). Marginal papillae were similar in distribution and size to the fundatrigeniae. Other characteristics are summarized in Table 1.

Alatae viviparous female

From 15 specimens. Color in life: thorax and head were dark or black, antennae and femora were more extensively and evenly pigmented, abdomen was similar in appearance to apterous specimens (Figure 1.B). Median tubercle of frons was well developed. Marginal tubercle was similar to the apterous females; present on abdominal segments I and VII. Antennal article III with three to seven (sometimes different on each pair) was irregular secondary sensoria (Figure 2.E), rounded and almost in line on side; no secondary sensorium on antennal IV. Forewing broad was 2.4 to 2.9 times as long as its maximum width and very scaly; sub close to radius costa. Genital plate was less pigmented on its distal zone, bearing two to five distal setae and six to 12 marginal-posterior setae. Cauda was less robust and more triangular than others with five to six setae (Figure 3.C). Siphunculus and its basal width were less than those of apterous females (Figure 3.D). Other characteristics are summarized in Table 1.

Intermediate individual between *apterous* and *oviparous* female

Based on four specimens. Color in life was as in apterous viviparous female. The mounted specimen was of similar pigmentation to apterous viviparous females and also with genital plate pale in the middle. Antennae consisted of six articles. Median tubercle on frons was developed. Marginal tubercles was smaller (0.0076 to 0.0136 mm diameter) than apterous viviparous females.

Hind tibia was swollen with 12 to 18 scent plates of different size and shape (Figure 2.B). Genital plate comprised of 13 to 15 distal and 18 to 20 poster setae. Cauda consisted of five setae (Figure 3.G), was similar in size and shape to the apterous viviparous setae. Siphunculi was identical to those of apterous viviparous females but darker in color (Figure 3.H). Other characteristics are summarized in Table 1.

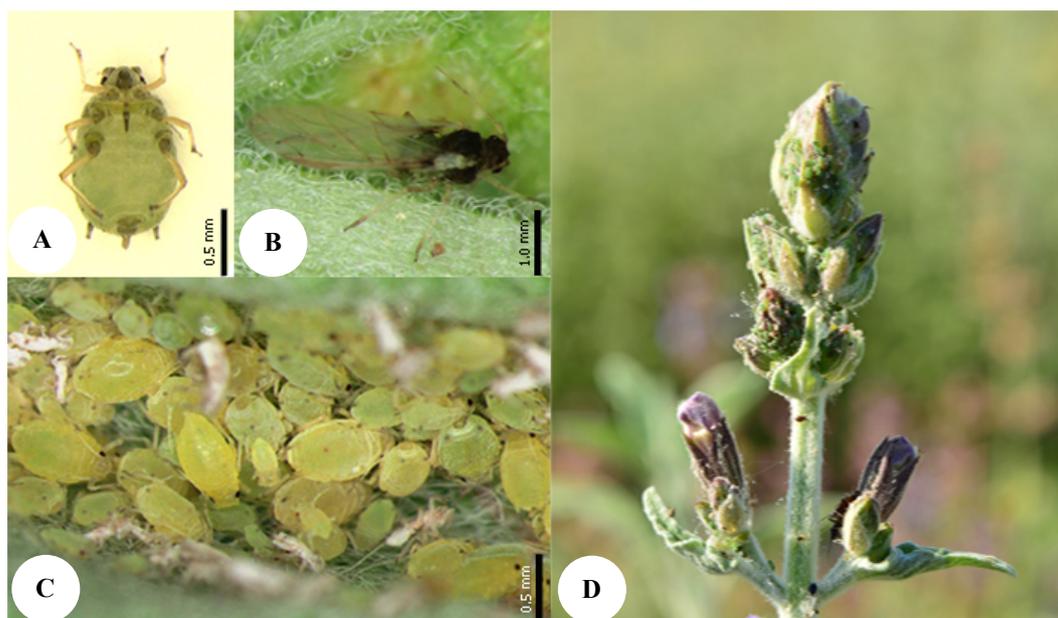


Figure 1. Apterous and alatae of *Aphis passeriniana* (Del Guercio). A. Apterous viviparous female fundatrigeniae, B. Alatae viviparous female, C. Aphid colonies, D. Aphid attacks on plant



Figure 2. *Aphis passeriniana* (Del Guercio): A. Apterous viviparous female, B. Hind tibia of intermediate individual between apterous and oviparous female, C. Alatae viviparous female, D. Six-segmented antenna of apterous viviparous female, E. Six-segmented antenna of alatae vivipara

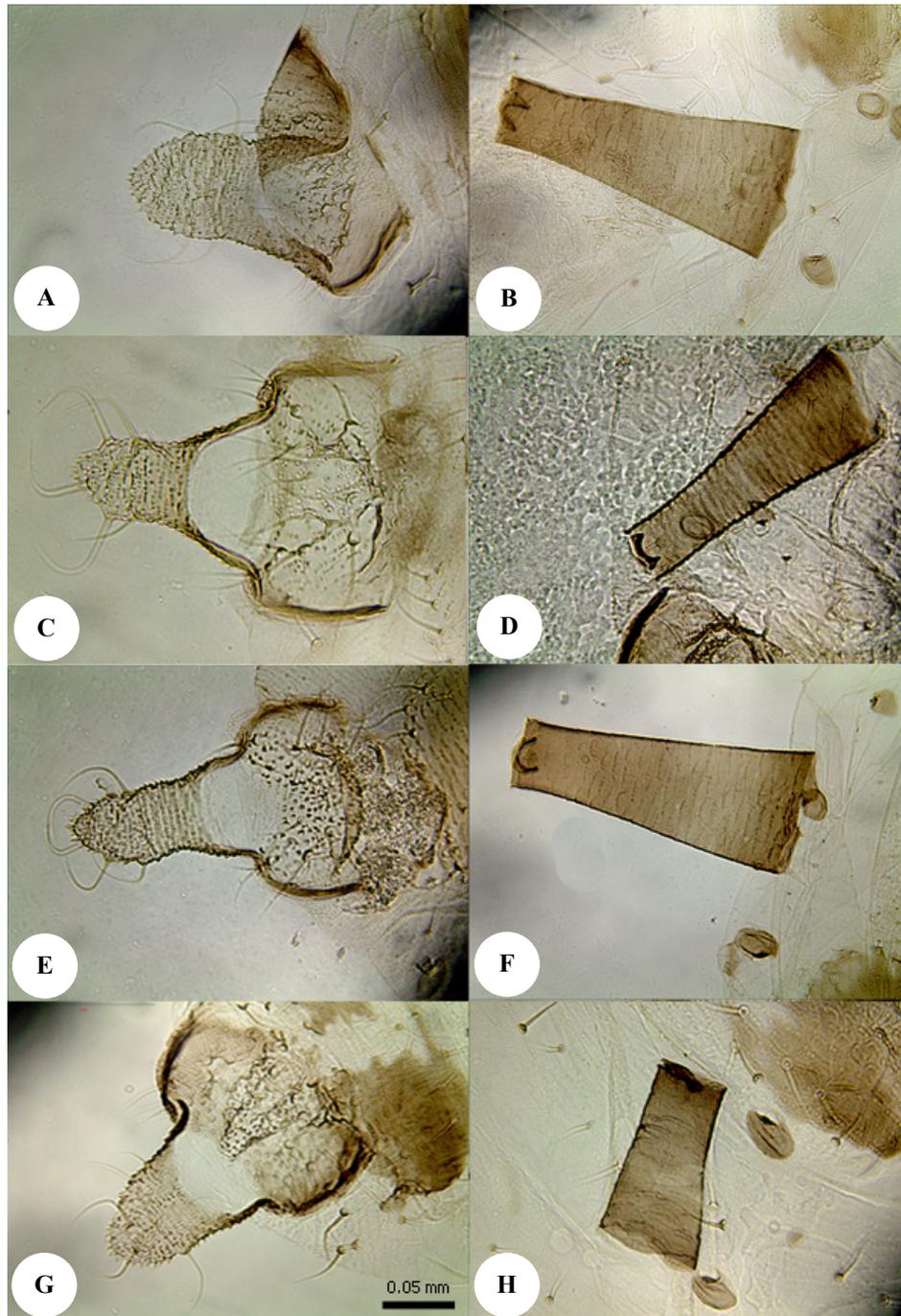


Figure 3. Siphunculi and cauda of *Aphis passeriniana* (Del Guercio). A-B. Fundatrix; C-D. Alatae viviparous female; E-F: Apterous viviparous female; and G-H. Intermediate individual between apterous and oviparous female

Table 1. Biometric data of *Aphis passeriniana* (Del Guercio), abbreviations are explained in the article note

Parameter	Fundatrigeniae (n=45)		Fundatrices (n=6)		Alatae female (n=15)		Intermediate individual (n=4)	
	Range	Mean	Range	Mean	Range	Mean	Range	Mean
Body (mm)	0.715-1.308	1.043	1.315-1.407	1.366	0.959-1.455	1.148	1.164-1.186	1.172
HW (mm)	0.244-0.365	0.297	0.329-0.392	0.358	0.269-0.342	0.289	0.316-0.326	0.323
Head frons setae (mm)	0.036-0.036	0.023	0.017-0.034	0.025	0.008-0.032	0.019	0.023-0.024	0.024
Head dorsal setae (mm)	0.024-0.024	0.017	0.017-0.030	0.023	0.011-0.021	0.017	0.018-0.021	0.019
ANT I (mm)	0.030-0.048	0.040	0.041-0.057	0.050	0.037-0.053	0.042	0.037-0.039	0.039
ANT II (mm)	0.027-0.049	0.039	0.051-0.058	0.054	0.040-0.066	0.046	0.039-0.041	0.040
ANT III (mm) for specimens with 5 segments	0.126-0.258	0.189	-	-	-	-	-	-

ANT III (mm)	0.100-0.188	0.143	0.225-0.292	0.251	0.147-0.309	0.193	0.110-0.111	0.111
BD III (mm)	0.013-0.023	0.018	0.020-0.031	0.026	0.012-0.021	0.015	0.018-0.019	0.019
Longest hair ANT III (mm)	0.007-0.015	0.011	0.010-0.015	0.012	0.009-0.015	0.012	0.011-0.012	0.012
ANT IV (mm)	0.052-0.111	0.080	0.146-0.190	0.159	0.076-0.184	0.111	0.094-0.095	0.094
ANT V (mm) for specimens with 6 segments	0.061-0.110	0.082	0.128-0.152	0.139	-	-	-	-
ANT V (mm) for specimens with 5 segments	0.050-0.083	0.072	-	-	0.081-0.175	0.102	0.092-0.093	0.093
ANT V PT (mm) for specimens with 5 segments	0.095-0.151	0.123	-	-	-	-	-	-
ANT VI (mm)	0.062-0.094	0.075	0.090-0.113	0.100	0.055-0.109	0.085	0.088-0.089	0.088
ANT VI PT (mm)	0.108-0.162	0.138	0.143-0.203	0.171	0.126-0.200	0.156	0.137-0.138	0.138
ANT length (mm)	0.406-0.722	0.582	0.882-1.044	0.925	0.596-1.084	0.734	0.604-0.612	0.609
ANT segment	5-6	6	6	6	6	6	6	6
Rostrum (mm)	0.253-0.435	0.347	0.434-0.441	0.437	0.295-0.460	0.343	0.350-0.353	0.352
URS its basal width (mm)	0.026-0.048	0.036	0.035-0.042	0.039	0.026-0.043	0.033	0.041-0.042	0.041
URS (mm)	0.090-0.129	0.109	0.122-0.142	0.130	0.098-0.139	0.110	0.103-0.104	0.103
URS setae num.	1-4	2	2-3	2	2-3	2	2	2
HTib III (mm)	0.255-0.525	0.420	0.621-0.638	0.628	0.423-0.724	0.525	0.339-0.340	0.340
HT II (mm)	0.041-0.066	0.051	0.062-0.078	0.068	0.047-0.072	0.053	0.060-0.061	0.060
HFem (mm)	0.163-0.285	0.232	0.336-0.360	0.351	0.234-0.417	0.276	0.184-0.186	0.185
HTro hair length (mm)	0.019-0.040	0.028	0.029-0.039	0.037	0.014-0.028	0.022	0.032-0.033	0.033
HTro-Fem diameter (mm)	0.031-0.059	0.040	0.046-0.066	0.055	0.024-0.051	0.033	0.046-0.048	0.047
Siphunculus (mm)	0.083-0.172	0.122	0.172-0.210	0.190	0.091-0.200	0.109	0.101-0.105	0.103
Siphunculus its basal width (mm)	0.033-0.080	0.061	0.074-0.099	0.088	0.025-0.073	0.045	0.062-0.066	0.064
Siphunculus its middle width (mm)	0.028-0.056	0.041	0.045-0.071	0.058	0.023-0.053	0.034	0.044-0.046	0.045
Siphunculus its distal width (mm)	0.025-0.041	0.031	0.034-0.049	0.041	0.025-0.042	0.031	0.038-0.039	0.038
Caudal its basal width (mm)	0.054-0.124	0.085	0.086-0.131	0.109	0.061-0.140	0.099	0.106-0.108	0.107
Caudal (mm)	0.088-0.197	0.124	0.145-0.216	0.168	0.091-0.202	0.135	0.111-0.118	0.115
Caudal hair num.	3-6	5	3-5	5	5-6	5	5	5
Caudal setae length (mm)	0.035-0.069	0.055	0.051-0.063	0.056	0.037-0.060	0.049	0.050-0.052	0.051
Genital distal setae length (mm)	0.014-0.041	0.030	0.024-0.048	0.032	0.017-0.038	0.026	0.024-0.027	0.026
Genital marginal poster setae length (mm)	0.023-0.053	0.035	0.030-0.057	0.039	0.020-0.041	0.032	0.041-0.042	0.041
Genital distal setae num.	2-5	2	2-4	3	3-4	4	13-15	13
Genital poster setae num.	5-11	8	7-12	9	7-9	8	18	18
Mar papillae prothorax (mm)	0.008-0.020	0.012	0.008-0.026	0.016	0.008-0.013	0.011	0.013-0.014	0.013
Mar papillae prothorax length (mm)	0.006-0.017	0.011	0.015-0.022	0.019	0.007-0.014	0.011	0.012-0.013	0.012
Mar papillae ABD I (mm)	0.007-0.013	0.009	0.013-0.030	0.018	0.011-0.018	0.013	0.008-0.012	0.010
Mar papillae ABD I hair (mm)	0.011-0.021	0.016	0.000-0.000	0.000	0.008-0.023	0.016	0.014-0.018	0.016
Mar papillae ABD VII (mm)	0.007-0.012	0.010	0.008-0.017	0.013	0.009-0.020	0.013	0.009-0.010	0.009
Mar papillae ABD VII hair (mm)	0.010-0.026	0.017	0.000-0.000	0.000	0.010-0.017	0.015	0.021-0.024	0.022
HFem longest setae (mm)	0.030-0.030	0.020	0.021-0.029	0.026	0.011-0.017	0.014	0.024-0.025	0.025
HFem diametre (mm)	0.046-0.075	0.059	0.064-0.087	0.077	0.046-0.071	0.057	0.071-0.072	0.072
HTib setae (mm)	0.018-0.038	0.027	0.027-0.400	0.033	0.016-0.029	0.023	0.037-0.038	0.037
HTib diameter (mm)	0.027-0.045	0.034	0.035-0.052	0.044	0.027-0.042	0.031	0.048-0.051	0.049
Forewing broad (mm)	-	-	-	-	1.323-1.922	1.588	-	-
Forewing width (mm)	-	-	-	-	0.475-0.748	0.599	-	-
ANT/Body (times)	0.46-0.79	0.57	0.64-0.76	0.69	0.54-0.75	0.62	0.52-0.53	0.052
ANT VI PT/ANT VIb (times)	1.41-2.44	1.81	1.52-2.14	1.71	0.43-0.65	0.54	1.56-1.57	1.56
ANT III/ANT VI PT (times)	0.79-1.36	1.04	1.30-1.75	1.48	0.97-1.79	1.24	0.80-0.81	0.80
ANT VI PT/ANT III (times)	0.49-1.27	0.89	0.63-0.69	0.68	0.56-1.03	0.83	1.25	1.25
Cauda/Its basal width (times)	1.04-2.15	1.49	1.39-1.69	1.55	1.03-1.70	1.37	1.04-1.10	1.07
Head setae/BD III (times)	0.63-1.90	1.32	1-1.58	1	0.49-2.02	1.27	1.26-1.28	1.27
Rostrum/Body (times)	0.25-0.40	0.34	0.31-0.34	0.32	0.24-0.41	0.29	0.30-0.31	0.30
Setae ANT III/BD III (times)	0.20-0.90	0.59	0.38-0.56	0.47	0.45-1.18	0.80	0.59-0.63	0.62
Setae HTro/Diameter HTro (times)	0.48-1.05	0.72	0.54-0.84	0.67	0.51-0.90	0.66	0.68-0.72	0.69
Setae HFem/Diameter HFem (times)	0.22-0.58	0.37	0.24-0.46	0.35	0.18-0.31	0.25	0.35	0.35
Setae HTib/Diameter HTib (times)	0.56-1.18	0.81	0.57-0.92	0.76	0.39-0.92	0.73	0.73-0.77	0.76
Siphunculus/Its width in the middle (times)	1.92-4.24	3.04	2.43-4.54	3.36	2.75-3.93	3.21	2.20-2.31	2.27
Siphunculus/Cauda (times)	0.56-1.56	1.00	0.95-1.40	1.15	0.59-1.43	0.83	0.88-0.92	0.90
Siphunculus/Body (times)	0.08-0.16	0.12	0.12-0.15	0.14	0.08-0.12	0.09	0.09	0.09
Siphunculus/HT II (times)	1.85-3.23	2.37	2.50-3.04	2.75	1.65-2.76	2.02	1.65-1.76	1.71
Siphunculus/ANT III (times)	0.58-1.13	0.86	0.71-0.82	0.76	0.33-0.74	0.57	0.92-0.95	0.93
Siphunculus/ANT III (5 seg.) (times)	0.54-0.78	0.64	-	-	-	-	-	-
Siphunculus/HFem (times)	0.43-0.68	0.52	0.49-0.62	0.54	0.34-0.52	0.40	0.54-0.57	0.55
HTibIII/Body (times)	0.22-0.56	0.40	0.44-0.46	0.45	0.39-0.54	0.45	0.29	0.29
URS/Its basal width (times)	2.06-4.26	3.07	2.97-3.94	3.34	2.53-4.35	3.36	2.48-2.51	2.49
URS/HT II (times)	1.80-2.48	2.13	1.74-2.12	1.93	1.86-2.26	2.06	1.69-1.73	1.72
URS/ANT VIb (times)	0.68-0.96	0.80	0.67-0.88	0.77	0.62-0.91	0.71	0.75	0.75
URS/Siphunculus (times)	0.71-1.11	0.91	0.61-0.75	0.69	0.69-1.20	1.03	0.99-1.02	1.01

Discussion

Aphis passeriniana is mainly a southern European species with records from Germany, Italy, Spain, Switzerland, Bulgaria, Croatia, Hungary and Greece, as well as Palestine (Blackman and Eastop 2018), Iraq (Ali et al. 2012) and Turkey (Bardjadze 2017). The species is widespread but limited on host plants *Salvia* spp. (Blackman and Eastop 2006; 2018). How *A. passeriniana* entered Turkey is not clearly stated. However, it is known in Greece, Iraq, and Bulgaria. The species was probably brought not only on winds and storms (Barjadze 2017) but also on transportations from Bulgaria, Iraq and/or Greece to Turkey since Izmir is known as one of the most attractive touristic places in Turkey. We recorded the aphid population in two sage fields in Bornova and Menemen Districts where the species has been a most injurious pest in growing season 2015 and 2017, but less in 2016. At the time, the incidence rate of the aphid species was ranging from 30 to 80% (Zarkani 2018). It firstly emerges on shoots in the early spring and then spreads to all aerial parts of the plants *S. officinalis*. In some outbreaks, *A. passeriniana* colonies are found in mixed populations with *E. elegans*. The signs and symptoms of aphid attack are the distortion of young shoots and leaves with no wilting, curling and turning yellow; honeydew on leaves and bud flowers with black sooty mold; stunted plants; undeveloped flowers and hollow seeds (Figure 1d). Symptoms of virus disease on the plant are still unknown (Blackman and Eastop 2018).

The aphid species is also found hosting on *S. fruticosa* (greek sage), *S. splendens* (scarlet-flowered sage) and *S. verticillata* (lilac sage) in Izmir. Ants (Formicidae: Formicinae) often attend the aphid colonies. Apterous forms display thanatosis when disturbed. This study, furthermore, restated that six aphid species: *Aphis craccivora* Koch, *A. fabae* Scopoli, *A. passeriniana* (Del Guercio), *Aulacorthum solani* (Kaltenbach), *Eucarazzia elegans* (Ferrari) and *Myzus ornatus* Laing; out of nine aphid species recorded on *S. officinalis* in the world are now in Turkey.

Apterous viviparous females of *A. passeriniana* Turkish species have comparatively longer URS and SIPH/cauda, and shorter antennae PT/BASE than the same aphid species reported by Stroyan (1984) and Blackman et al. (2006). It was evident that the Turkish species has BL 0.715-1.407 mm, R IV+V 1.80-2.49 × HT II, ANT PT/BASE 1.4-1.8, SIPH 0.56-1.56 × cauda length and cauda with 3-6 setae whilst the general morphology of *A. passeriniana* described in outside Turkey has BL 1.2-1.8 mm, R IV+V 1.54-2.02 × HT II, ANT PT/BASE 1.7-2.5, SIPH 1.38-2.23 × cauda length and cauda with 4-7 setae. These morphological diversities may probably be explicable as the environmental/geographical variation which the phenomena have been resulted polymorphism studies in many insect species (e.g., Dobzhansky 1933; Rohacek 2012; Kawakami et al. 2013).

Aphis passeriniana morphological forms can easily be separated from some species living on common sage, *S. officinalis*, using the following key (after Blackman and Eastop 2018):

1. Dorsal abdomen with extensive dark sclerotization on ABD TERG 1-6, with pale polygonal reticulation 2
- BD TERG 1-6 pale or with only small scattered dark sclerites 3
2. R IV+V 0.87-1.18 × HT II (rarely more than 1.1×) *Aphis craccivora*
- R IV+V 1.1-1.42 × HT II (usually at least 1.13×) *Aphis salviae*
3. R IV+V 0.19-0.23 mm, 2.0-2.2 × HT II. Marginal abdominal hairs 78-103 μm long, 3-4 × ANT BD III. MTu present on ABD TERG 1 but often absent from ABD TERG 7 *Aphis raji*
- Without that combination of characters 4
4. R IV+V with 5-7 accessory hairs. ANT PT/BASE 1.5-1.8. SIPH pale, or dark only at apices..... *Aphis ramona*
- R IV+V with 2 (-3) accessory hairs, and other characters not in that combination..... 5
5. R IV+V 1.50-2.49 × HT II. ANT PT/BASE 1.4-2.5. SIPH 0.56-2.23 × cauda length. Longest hair on ANT III 0.2-0.9 × BD III. Marginal hair on ABD TERG 1 is at least 1.2 × height of MTu on same segment. Cauda with 3-7 setae *Aphis passeriniana*
6. R IV+V less than 1.5 × HT II. ANT PT/BASE 1.7-3.5. SIPH 0.70-1.81 × cauda length. Longest hair on ANT III 0.8-3.4 × BD III. The marginal hair on ABD TERG 1 is at least 1.2 × height of MTu on same segment. Cauda with 11-24 setae *Aphis fabae*

In short, there are some different morphological forms in *A. passeriniana* (Del Guercio) Turkish species compared with same species recorded outside Turkey which the specimens have longer URS and SIPH/cauda, shorter BL and antennae PT/BASE and less of caudal setae. It consequently extends the identification keys of the species. These features show a morphological diversity in some aphid species.

ACKNOWLEDGEMENTS

We are grateful to the Head of Biology Department, Faculty of Natural Science, Ege University, Turkey for providing laboratory equipment used to measure the specimens in this study. Many thanks to Prof. Dr. Colin Favret, Department of Biological Sciences, University of Montreal, Canada, for useful comments. We also thank Prof. Dr. J. M. Nieto Nafria, Departamento de Biodiversidad y Gestión Ambiental, Universidad de León, Leon, Spain for critical reading of the manuscript. This is a part of Ph.D. research funded by *Lembaga Pengelola Dana Pendidikan* (LPDP) contract no. PRJ-4599/LPDP.3/2016, Ministry of Finance of Indonesia.

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