

Survey of ladybird beetles (Coccinellidae: Coleoptera) from different host plants, of agricultural system in Basrah province, south of Iraq

Shurooq Abdullah Najim^{(1)*}, Hussain Ali Mahdi⁽²⁾, and Dawod Salman Hamid⁽²⁾

(1) Department of Ecology, College of Science, University of Basrah, Iraq.

(2) Plant protection department, College of Agriculture, University of Basrah, Iraq.

(*corresponding author: Dr. shurooq Najim, E-mail: shurooq.najim@uobasrah.edu.iq)

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Abstract:

The ladybirds which belonging to a family Coccinellidae are important predators that feed on insects, especially some agricultural pests. In view of the importance of these types of predators, the current research was conducted as a comprehensive survey for different regions of Basra province, the samples were collected using sweeping nets and hand collection from the wetland environment (East Hammar Marsh), desert lands (Safwan and Zubair) and agricultural areas (Shatt Al-Arab and Abu Al-Khasib), during the period from 1st. January to 1st. June, 2021. During the study period, 6 species of ladybirds were recorded, belonging to 6 genera and from different plant families, the frequency rate of the species was as follows: *Coccinella septempunctata*,; *Coccinella novemnotata*,; *Coccinella undecimpunctata*,; *Hippodamia tredecimpunctata*,; *Stethorus* spp.; *Harmonia* spp. The host plant of each species of insects; main preys and environmental conditions (temperature; relative humidity) for each station of study were recorded.

Keywords: Ladybird, predators, *Coccinella*, *Stethorus*, *Harmonia*, Basrah, Iraq.

Introduction:

The ladybirds beetles belong to family Coccinellidae have great economic and ecological important, it has 375 genera and about 6000 species distributed worldwide, 4000 species of them are predators (Nedvèd, 2020; Fleming, 2000; Vandenberg, 2002).

Most of these species are predators on aphids, scale insects, whiteflies and mite, so they are widely used in biological control, and for the same reason the ladybirds offer an important services to agricultural ecosystem and silviculture (Amexia *et al.* 2018).

There are six subfamilies occur within family Coccinellidae: Chilocorinae, Coccinellinae, Scymninae, Sticholotidinae, Coccidulinae and Epilachninae (Hodek and Honek, 1996).

The subfamily Coccinellinae comprises 21 genera and 90 described species (Arnett, 2002).

The genus *Coccinella*, *Harmonia* and *Hippodamia* are belong to subfamily Coccinellinae, which their members are characterized by their medium to large body, glabrous dorsal surface, Antenna 11 segmented with well-developed club; slightly shorter than head width; emarginated between mandibular bases and eyes. Mandibles with basal tooth, apex bidenticulate.

In Iraq Ali and others (1990) recorded sixty-one species and subspecies of coccinellid beetles belonging to twenty two genera and six tribes in three subfamilies of Epilachinae, Lithophilinae, Coccinellinae.

Materials and methods:

The specimens of coccinellid beetles were collected by sweeping nets and hand collecting method from different regions of Basrah province. Map (1), wetland environment (East Hammar Marsh), desert lands (Safwan and Zubair) and agricultural areas (Shatt Al-Arab and Abu Al-Khasib), the collection of specimens was done weekly, divided on three sites during the period from 1st. January to 1st. June, 2021, the specimens were collected from different host plants(*Phragmites communis*; *Beta vulgaris*; *Medicago sativa* ; *Typha domengensis*; *Nerium oleander* ; *Raphanus sativus*; *Eruca vesicaria*; *Solanum melongena*; *Cucumis sativus*; *Abelmoschus esculentus*).

The specimens were killed by freezing for 2 hours, examined and photographed using digital camera (Am Scoop MD200) installed on bionocular dissecting microscope (Am Scope), different accurate taxonomic keys were used to identify coccinellid beetles (Bieńkowski, 2018)(Biranvand et al., 2021)(Jouveau et al., 2018).

Some of specimens were preserved in 70% alcohol, another were hardening and kept in insect boxes provided with naphthalene granules.

The environment factors (temperature and relative humidity) were recorded in all sites during the period of study .

The statistical analysis for correlation was done by spss statistic program , pearson test.

Results :

A total of 228 specimens of coccinellid beetles were collected from different agricultural regions of Basrah province, the study showed 4 genus: *Coccinella*, in 3 species, *Coccinella septempunctata*; *Coccinella novemnotata*; *Coccinella undecimpunctata*. Genus *Hippodamia* in one species; *Hippodamia tredecimpunctata*. Genus *Stethorus* . Genus *Harmonia* spp. Figure (1) ; among them the highest numbers 93 specimens were found for *Coccinella septempunctata*, and the lowest numbers for *Stethorus* spp. 7 specimens only, the remaining specimens were in *Coccinella novemnotata* 54 specimens, 32 specimens for *Coccinella undecimpunctata*, 24 specimens for *Hippodamia tredecimpunctata*, 18 specimens for *Harmonia* spp, and 7 specimens for *Stethorus* spp. Table(1,2,3,4,5,6).

The relative abundance for every species according to regions and for every months of study period were collected by Odum(1971). Table(7,8)

The species *Coccinella septempunctata* was showed a wide variety of host plants; it has been recorded on (*Typha domengensis*, *Phragmites communis*, *Nerium oleander*, *Beta vulgaris*, *Raphanus sativus*, *Eruca vesicaria*, *Solanum melongena*, *Cucumis sativus*, *Abelmoschus esculentus* and *Medicago sativa*).

While the another two species of *Coccinella*, were recorded on *Phragmites communis*, *Beta vulgaris* *Solanum melongena*, and *Medicago sativa*, the species *Hippodamia tredecimpunctata* was collected from *Phragmites communis*, *Raphanus sativus*, *Beta vulgaris*, the genus *Stethorus* was recorded on *Solanum melongena*, *Cucumis sativus*, *Abelmoschus esculentus* ,and the genus *Harmonia* spp. was recorded on *Beta vulgaris* and *Raphanus sativus*.

In current study, the main preys of species belong to genus *Coccinella* and *Hippodamia tredecimpunctata* were aphid, mealybug, larvae of *Colaphellus apicalis* ,larvae of Lepidoptera.

The genus *Stethorus* preys were Two Spotted Spider Mite, while *Harmonia* spp was noticed preyed on aphids and larvae of *Colaphellus apicalis* .

The highest relative abundance was recorded for the species *Coccinella novemnotata* on *Medicago sativa* plant , reached 0.18; while the lowest value of relative abundance was 0.004 for *Stethorus* spp on *Cucumis sativus*, table(2,6).

The high relative abundance was recorded in April, in agricultural region for species *Coccinella septempunctata* and reached 0.07. Table 8

The prevailing environmental conditions were recorded for each region during the study period, with average temperatures ranging from 11° to 39°, lowest rate was 11° in agricultural region for the month of January, and the highest rate was in desert 39° in May. Figur(2).

As for the relative humidity, it ranged between 18-53%, where the lowest relative humidity was recorded in the Safwan site at 18% for the month of January, and the highest relative humidity recorded at the Abu Alkhasib site was 53% in the month of May. Figure(3)

The statistical analysis results showed a positive correlation between relative abundance and temperature degrees($r=0.124$, $p=0.417$), as well as positive correlation between relative abundance and relative humidity($r=0.3$, $p=0.45$).

Table (1): number of individuals and relative abundance of *Coccinella septempunctata* in all study regions .

Genus	species	locality	Host plant	Ind.	Relative abundance
Coccinella	<i>Coccinella septempunctata</i>	Agricultural region	<i>Beta vulgaris</i>	5	0.02
			<i>Raphanus sativus</i>	6	0.03
			<i>Eruca vesicaria</i>	10	0.04
			<i>Cucumis sativus</i>	10	0.04
			<i>Solanum melongena</i>	7	0.03
			<i>Abelmoschus esculentus</i>	5	0.02
			<i>Medicago sativa</i>	12	0.05
		Wetland region	<i>Phragmites communis</i>	14	0.06
			<i>Typha domengensis</i>	13	0.06
		Desert region	<i>Nerium oleander</i>	3	0.01
			<i>Solanum melongena</i>	10	0.04
			Total	93	

Table 2: number of individuals and relative abundance of *Coccinella novemnotata* in all study regions

Genus	species	locality	Host plant	Ind.	Relative abundance
Coccinella	<i>Coccinella novemnotata</i>	Agricultural region	<i>Medicago sativa</i>	40	0.18
		Wetland region	<i>Phragmites communis</i>	3	0.01
			<i>Typha domengensis</i>	4	0.02
		Desert region	<i>Solanum melongena</i>	7	0.03
			Total	54	

Table 3: number of individuals and relative abundance of *Coccinella undecimpunctata* in all study regions

Genus	species	locality	Host plant	Ind.	Relative abundance
Coccinella	<i>Coccinella undecimpunctata</i>	Agricultural region	<i>Medicago sativa</i>	20	0.09
		Wetland region	<i>Phragmites communis</i>	4	0.02
			<i>Typha domengensis</i>	3	0.01
		Desert region	<i>Solanum melongena</i>	5	0.02
			Total	32	

Table 4: number of individuals and relative abundance of *Hippodamia tredecimpunctata* all study regions.

Genus	species	locality	Host plant	Ind.	Relative abundance
Hippodamia	<i>Hippodamia tredecimpunctata</i>	Agricultural region	<i>Beta vulgaris</i>	9	0.04
			<i>Raphanus sativus</i>	5	0.02
		Wetland region	<i>Phragmites communis</i>	10	0.04
		Desert region	/	0	0.00
			Total	24	

Table 5: number of individuals and relative abundance of *Harmonia* Spp all study regions.

Genus	species	locality	Host plant	Ind.	Relative abundance
Harmonia Spp.	-	Agricultural region	<i>Beta vulgaris</i>	10	0.04
			<i>Raphanus sativus</i>	5	0.02
		Wetland region	/	0	0.00
		Desert region	<i>Beta vulgaris</i>	2	0.01
			<i>Raphanus sativus</i>	1	0.00
			Total	18	

Table 6: number of individuals and relative abundance of *Stethorus* spp Spp all study regions.

Genus	species	locality	Host plant	Ind.	Relative abundance
Stethorus spp			<i>Cucumis sativus</i>	1	0.004
			<i>Solanum melongena</i>	2	0.009
			<i>Abelmoschus esculentus</i>	1	0.004
		Wetland region	/	0	0.000
		Desert region	<i>Cucumis sativus</i>	1	0.004
			<i>Solanum melongena</i>	2	0.009
			Total	7	

Table 7: variation in number of individuals during the months of study period.

No.	Genus	locality	Jan.	Feb.	Mar.	Apr.	May	Total
	species							
1.	<i>Coccinella septempunctata</i>	Site 1	3	10	16	21	4	54
		Site 2	2	3	8	12	1	26
		Site 3	0	0	5	7	1	13
2.	<i>Coccinella novemnotata</i>	Site 1	2	6	6	17	9	40
		Site 2	0	0	3	4	0	7
		Site 3	0	1	2	3	1	7
3.	<i>Coccinella undecimpunctata</i>	Site 1	2	2	8	8	0	20
		Site 2	0	0	3	4	0	7
		Site 3	0	0	1	3	1	5
4.	<i>Hippodamia tredecimpunctata</i>	Site 1	0	2	6	5	1	14
		Site 2	0	0	3	5	2	10
		Site 3	0	0	0	0	0	0
5.	<i>Harmonia spp</i>	Site 1	0	2	4	7	2	15
		Site 2	0	0	0	0	0	0
		Site 3	0	0	0	3	0	3
6.	<i>Stethorus spp</i>	Site 1	0	0	2	2	0	4
		Site 2	0	0	0	0	0	0
		Site 3	0	1	1	1	0	3

Table 8: Relative abundance of species for every months of study period.

No.	Genus	locality	Jan.	Feb.	Mar.	Apr.	May
	species						
1.	<i>Coccinella septempunctata</i>	Site 1	0.01	0.03	0.06	0.07	0.01
		Site 2	0.01	0.01	0.03	0.04	0.00
		Site 3	0.00	0.00	0.02	0.02	0.00
2.	<i>Coccinella novemnotata</i>	Site 1	0.01	0.02	0.02	0.06	0.03
		Site 2	0.00	0.00	0.01	0.01	0.00
		Site 3	0.00	0.00	0.01	0.01	0.00
3.	<i>Coccinella undecimpunctata</i>	Site 1	0.01	0.01	0.03	0.03	0.00
		Site 2	0.00	0.00	0.01	0.01	0.00
		Site 3	0.00	0.00	0.00	0.01	0.00
4.	<i>Hippodamia tredecimpunctata</i>	Site 1	0.00	0.01	0.02	0.02	0.00
		Site 2	0.00	0.00	0.01	0.02	0.01
		Site 3	0.00	0.00	0.00	0.00	0.00
5.	<i>Harmonia spp</i>	Site 1	0.00	0.01	0.01	0.02	0.01
		Site 2	0.00	0.00	0.00	0.00	0.00

		Site 3	0.00	0.00	0.00	0.01	0.00
6.	<i>Stethorus</i> spp	Site 1	0.00	0.00	0.01	0.01	0.00
		Site 2	0.00	0.00	0.00	0.00	0.00
		Site 3	0.00	0.00	0.00	0.00	0.00

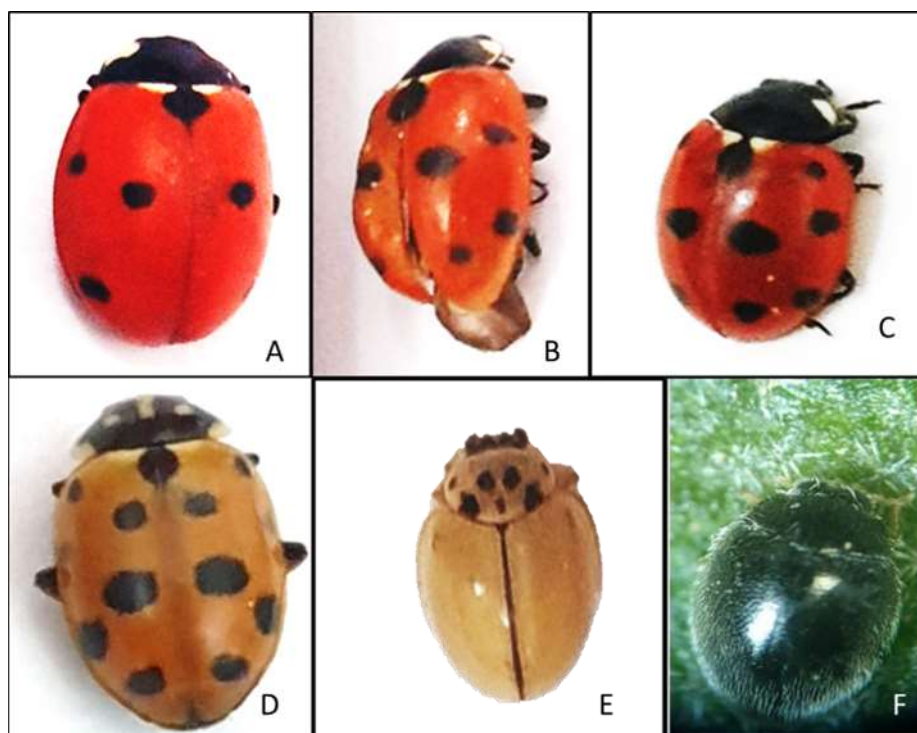


Figure (1): A: *Coccinella septempunctata*; B: *Coccinella novemnotata*; C: *Coccinella undecimpunctata*; D: *Hippodamia tredecimpunctata*; E: *Harmonia* Spp. ; F: *Stethorus* Spp

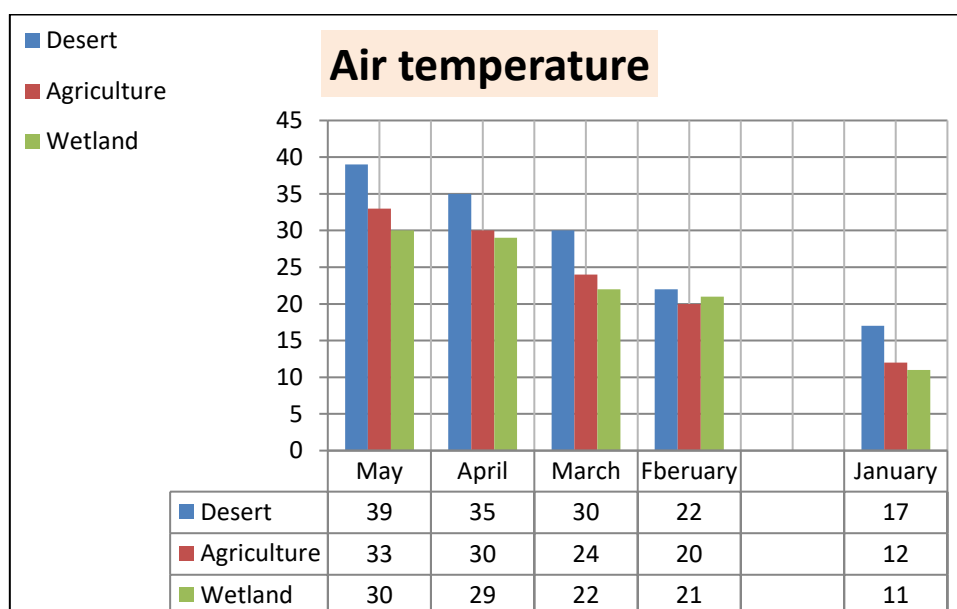


Figure 2: Temperature degrees in three habitat during study months.

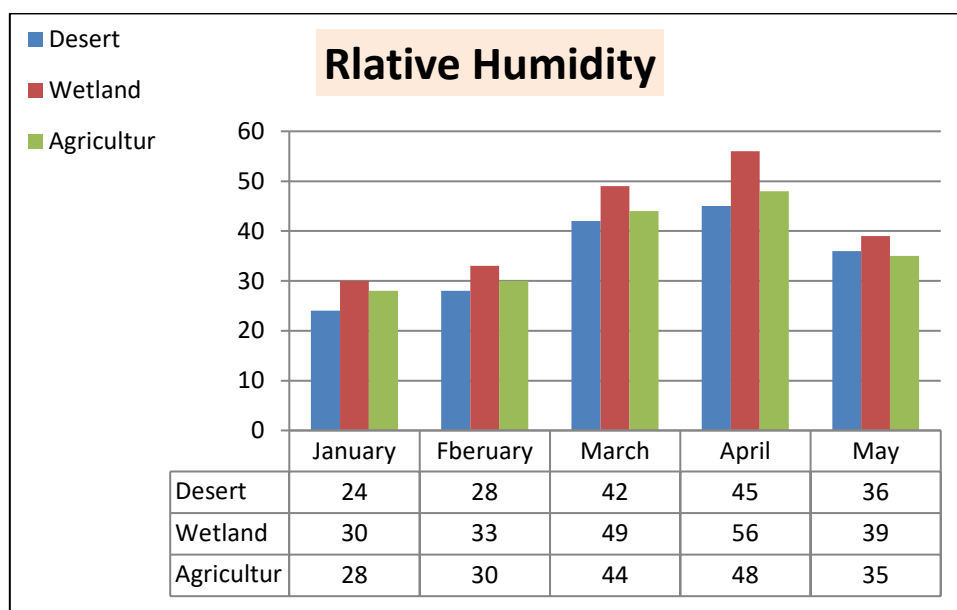
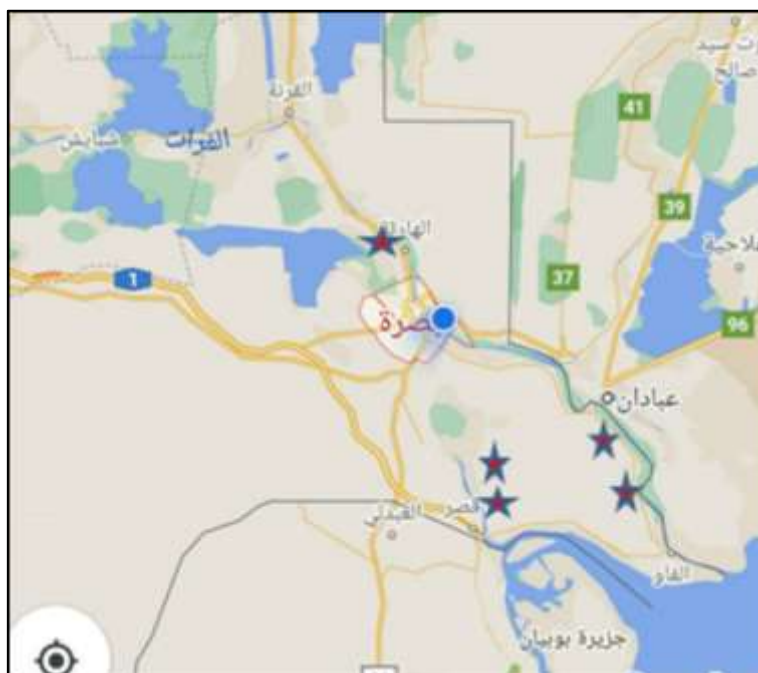


Figure 3: Relative humidity degress in three habitats during study months.



Map(1): Map of Basrah province with regions of collection pointed by red stars.

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مسح الدعاسيق التابعة لعائلة *Coccinellidae* ضمن النظام البيئي الزراعي لمحافظة البصرة جنوب العراق

شروق عبدالله نجم^{(1)*} وحسين علي مهدي⁽²⁾ وداود سلمان حامد⁽²⁾

(1) قسم علم البيئة، كلية العلوم، جامعة البصرة، العراق.

(2) قسم وقاية النبات، كلية الزراعة، جامعة البصرة، العراق.

(3) قسم وقاية النبات، كلية الزراعة، جامعة البصرة، العراق.

* للمراسلة: د. شروق نجم، البريد الإلكتروني: shurooq.najim@uobasrah.edu.iq

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الملخص:

تضمنت الدراسة الحالية مسح للدعاسيق المختلفة التابعة لفصيلة *Coccinellidae* و التي جمعت من عدة عوائل نباتية مصابة بحشرات اقتصادية مهمة. و نظرا لأهمية هذا النوع من المفترسات فقد تم اجراء الدراسة الحالية كمسح شامل لمناطق زراعية مختلفة في محافظة البصرة جنوب العراق, حيث جمعت العينات باستخدام الشباك الكانسة والجمع اليدوي من بيئات زراعية مختلفة شملت الاراضي الرطبة (هور شرق الحمار)، الاراضي الصحراوية (سفوان والزبير)، الاراضي الزراعية (شط العرب وأبو الخصيب)، خلال الفترة من الاول من كانون الثاني الى الاول من حزيران 2021. و قد سجلت خلال هذه الفترة ستة انواع من الدعاسيق تعود لثلاثة اجناس. كما سجلت الظروف البيئية (درجة الحرارة، الرطوبة النسبية) لكل محطة خلال فترة الدراسة .
الكلمات المفتاحية: الدعاسيق، *Coccinellidae*، البصرة.