THE BIOLOGY OF THE STINK BUG *Apodiphus amygdali* (GERMAR) (HEMIPTERA: PENTATOMIDAE)

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ABSTRACT

In this investigation the biology of *Apodiphus amygdali* (Germar) were studied on the three kinds of fruit trees apricot, pear and apple in the field during the growth season of 2007 in Erbil governorate, Northeren Iraq. It was found that the mean of incubation period was 3.75 days and the egg hatching rates for the two generations were (89.29, 100.0), (96.94, 92.86) and (100.0, 100.0%) on apricot, pear and apple trees respectively. The nymph complete their development after five instars, the mean period of each were 4.0, 7.7, 7.8, 8.7 and 9.3 days for 1st, 2nd, 3rd, 4th and 5th instar, respectively. The mean natural mortality among the nymphal stage was 73.49%, and the majority of which occurred among the fifth instar nymph. The pre-oviposition period usually ranged between 3-6 days for the first generation, but the overwintered females of the second generation have a long preoviposition period began to lay their eggs after hibernation. The stink bug *A. amygdali* had two generations throughout the year, the first one began in the fourth week of June while the second began in the second week of August which the emerged adult enter hibernation from mid October and the fourth week of May of the next year. The general sex ratio was 1:1.

INTRODUCTION

The fruit trees stink bug *A. amygdali* is one of the pentatomid plant feeding stink bugs, which attacks many of the fruit trees especially plum, apricot, apple, olive, and pear. Furthermore non-fruit trees viz. poplar, pine, planetree, willow bark may also be infested (Muhammed, 1994). Both nymphs and adults feed by sucking plant sap. They are believed to inject toxic substance into the plant when feeding to break down plant tissues (PennState, 2006). It's also noted that sucking juice from the stems, leaves and immature fruits giving rise to host weakness then encouraging to attack by other insects. Severe infestation leads to fruit degradation (Schuh and Slater, 1995).

Reviewing the literature, the informations available about *A. amygdali* in Iraq and other parts of the world considered as records of this insect on the hosts (Anonymous, 2000). Yousif (1995) gave some information about the biology and host plants of this insect in Baghdad but no work has been done on this species of stink bug in Kurdistan region, thus it was deemed necessary to undertake studies on this insect. The goal of this investigation is to study the biology of this insect on apricot, pear and apple trees under field conditions.

MATERIALS AND METHODS

The biology of *A. amygdali* were performed in the field in Erbil city center location by rearing the insect from egg to adult on three types of fruit trees (apricot, pear

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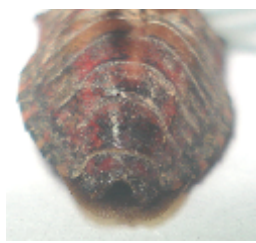
and apple) by using special cage made from muslin and tides to branches. The biological aspects included the following:

1- Egg stage: A colony of *A. amygdali* had been initiated from adults collected from the field. The colony was maintained in order to estimate the egg laying period. paired of adults (male & female) of *A. amygdali* were placed in special muslin cages (30 x 30 cm) threaded from three sides and the fourth side leaved open for entering the insects then tied to branches of apricot, pear and apple trees. One hundred replicate (♀+♂) were used. Each cages observed twice daily (before and afternoon) to estimate the incubation period, viability of eggs, egg laying and egg hatching.

2- Nymph rearing: After eggs hatching from the previous step, newly hatched first instar nymphs were transferred to another cages (1m x 1m) also made from muslin by using of smoothed brush in order to rearing nymphal stages. Cages were tied to the branches of same fruit trees. Ten nymphs were placed in each cage and ten cages were used for each type of tree as replicates. The cages were inspected twice daily till first instar nymph complete their development. First nymphal instar period was recorded.

Following ecdysis, second instar nymphs were separated from siblings and transferred to another cages and reared individually, the three rest instars can differs from their body size and development of the wings. Daily notation was conducted till the nymphs completed their development to the adult stage. The number of nymphal instar and the duration of each of them and also the total period of the nymphal stage were determined.

3- Sex ratio: The sex ratio was determined in adult stage according to the size of the stink bug, the male be smaller than female, in addition to the shape of the abdominal end of the insect. In male, external genitalia not developed eighth and ninth abdominal segments ring-like, while in female the eight abdominal sternum with a central groove (Figure 1).



A

B

Figure (1): External morphological differences between male (A) and female (B) *A. amygdali*

4- Overwintering: To find sites that are used by the insect as habitat for hibernation in winter season, a survey have been done in many places including, Permam and the villages around it, Shaqlawa and Safeen Mountain. Many visiting has been done at different times to these places. The visiting were done during the period from November 2006 till April 2007, these processes includes observing all the parts of fruit and non-fruit trees and wild plants and shrubs exists in this area.

The soils around the trees and under big rocks which were scattered in this area were also exam.

RESULTS AND DISCUSSION

1- Egg stage:

1-1 Incubation period: The data in table (1) revealed that the mean of incubation period of *A. amygdali* during the first generation on the apricot trees was 3.5 days and was 4.0 days during the second generation. On the other hand, the mean incubation period during the first generation on the pear trees was 3.0, whereas it was 4.00 days during the second generation. Also the data showed that the mean of incubation period during the first generation on the apple trees was 3.5 days while it was 4.5 days during the second generation. The general mean of incubation period of the eggs on the three fruit trees was 4.15 days.

That the shortest mean incubation period as table (1) indicated was 3.0 days occurred on the pear trees during the first generation of the insect, while the longest mean period was 4.5 days obtained on apple trees during the second generation.

Table (1): Incubation period of the eggs of *A. amygdali* on Apricot, Pear and Apple trees under field conditions

Kind of Tree	Gen. No.	No. of eggs observed	Period of Observations	Duration in days	
				Range	Mean
Apricot	1	56	29/5 – 2/7	3-4	3.5
	2	42	17/8 – 20/8	3-5	4.0
Pear	1	98	26/6 - 25/7	2-4	3.0
	2	56	13/8 – 24/8	4-4	4.0
Apple	1	84	30/5 – 03/7	3-4	3.5
	2	42	12/8 – 21/8	4-5	4.5
General Mean		63		2-5	3.75

Gen.= Generation

In general, the incubation period of *A. amygdali* ranged between 2-5 days with an average of 3.75 days in all generations on the three hosts undertaken in this study. According to Yousif (1995) the incubation period for *A. amygdali* eggs in the laboratory was four days under the temperature and relative humidity of 28-29°C and 45.00%, respectively and was 7 days at 25°C.

1-2 Viability of eggs: The data presented in table (2) showed that the mean percentage of egg hatching during the first generation on the apricot trees was 89.29%, while it was 100% during the second. Also the data indicated that the percentage of egg hatching during the first generation on the pear trees was 96.94%, while it was 92.86% during the second generation.

Otherwise, the hatching percentage of the eggs hatching during the first generation on the apple trees was 100%, whereas it was 100% during the second generation. Results indicated that the general mean hatching percentage of the eggs on the three hosts for both the generations was 96.52%. Yousif (1995) in her study found that the hatching percentage in the field was 84.9% at an average of 31.2°C and 97.6% at 28.7°C.

Table (2): Egg viability of *A. amygdali* on Apricot, Pear and Apple trees under field conditions.

Kind of Tree	Gen. No.	No. of eggs Observed	Period of observations	No. of eggs Hatched	Hatching %
Apricot	1	56	01/6 – 06/7	50	89.29
	2	42	20/8 – 26/8	42	100.0
Pear	1	98	26/6 - 25/7	95	96.94
	2	56	13/8 – 24/8	52	92.86
Apple	1	84	30/5 – 03/7	84	100.0
	2	42	12/8 – 21/8	42	100.0
General Mean		63		60.83	96.52

1-3 Egg laying: Eggs are laid in clusters usually 14 eggs, sometimes fewer, closely packed in 4 regular rows (two rows with four eggs and the rest with three eggs). Eggs are laid on various parts of the host, particularly on leaves, and firmly glued together and adhere to the host by a black sticky secretion they are usually abandoned after oviposition, maternal care of the eggs being uncommon. The eggs are laid either on the above or undersurfaces of leaves according to type of host**,** for example, the eggs laid on the above surface of fig and grape leaves while it's laid on the undersurface leaves of the trees under study. In Baghdad it has been found that the female of *A. amygdali* laid its eggs in masses (11-15) eggs per each mass (Yousif, 1995). Stink bug eggs are deposited on host plants in polygonal clusters. Each cluster may contain several to greater than 70 barrel-shaped eggs that are tightly packed in rows (Bundy *et al*., 2000). Gyeltshen, *et al*., (2005) reported that in Pennsylvania, females were observed laying eggs from June to September, since females continue to lay new egg masses throughout the season, different nymphal stages were often observed on the same host plant.

1-4 Egg hatching: The hatched nymph bites the chorion at the distal end and through the caused foramen pushes its head, after widening the perforation by using the legs crawls gradually to get rid of egg shell leaving it as an empty sac. Hatching process lasts about 15 to 45 minutes.

The newly emerged nymphs remain several hours aggregate around or beside their empty egg shells each in a crooked position without feeding; they rove about a little before dissipating for feeding directly after that. If the aggregating nymphs are dispersed, they begin to aggregate in different places and settle down within a period of time.

2- Nymphal stage: Nymphs of *A. amygdali* hatch from the eggs and has found pass through five instars before becoming adults. It is deemed preferable to deal with each instar alone before dealing with them collectively.

2-1 First nymphal instar: The data in table (3) showed the duration and natural mortality of the 1st nymphal instar of *A. amygdali* on apricot, pear and apple trees under natural field conditions throughout the year 2007. A study revealed that the mean duration for the 1st nymphal instar during both generations on the apricot trees were 4.0 days. The data also showed that the mean duration for this instar during the first generation on the pear trees was 3.5 days, while it was 4.0 days during the

second generation, on the other hand, the mean duration during the first generation on the apple trees was 4.0 days, while it was 4.5 days during the second generation.

Reviewing the obtained data showed that the 1st nymphal instar of *A. amygdali* take in general from 2-5 days with a mean value of 4.0 days on all three kinds of trees conducted in this study. The shortest average duration (3.5 days) occurred during the first generation on the pear trees, whereas the longest duration (4.5 days) occurred on the apple trees during the second generation.

Table (3): Duration and natural mortality of the 1st nymphal instar of *A. amygdali* on Apricot, Pear and Apple trees under field conditions.

Kind of Tree	Gen. No.	No. of Nymphs observed	Period of Observations	Duration in days		Mortality %
				Range	Mean	
Apricot	1	50	02/6 – 06/7	4-4	4.0	20.00
	2	42	20/8 – 25/8	3-5	4.0	11.90
Pear	1	95	29/6 – 29/7	2-5	3.5	11.58
	2	52	16/8 – 28/8	4-4	4.0	13.46
Apple	1	84	03/6 – 08/7	4-4	4.0	08.33
	2	42	16/8 – 26/8	4-5	4.5	07.14
General Mean		60.83		2-5	4.0	12.07

The natural mortality among the 1st instar nymphs was varied greatly. The lowest mortality percentage was 07.14%, occurred during the second generation on the apple trees and the highest mortality percentage was 20.00%, occurred during the first generation on the apricot trees. The general mean of mortality percentage during this instar was 12.07%. Buchner (1965) has been suggested that they acquire symbiosis by sucking secretions covering the shells of their hatched eggs. First instars are gregarious and remain clustered atop or near the egg shells, the nymphs begin to disperse slightly and feed after the first molt, Ishiwatari (1976) reported that many kinds of stink bugs lay eggs in a batch, and the newly hatched nymphs have a strong tendency to aggregate, he added, if the aggregating nymphs are dispersed they begin to aggregate in different places and settle down within one hour, although it is reported they do not feed (McPherson, 1982).

2-2: Second nymphal instar: The data presented in table (4) showed that the mean duration for the 2nd nymphal instar during the 1st generation on the apricot trees was 7.0 days, whereas it was 8.0.days during the second one. Results also showed that the mean duration for the same instar during the first generation on the pear trees was 5.5 days, while it was 9.0 days during the second. The mean duration for the 2nd nymphal instar during the first generation on the apple trees was 8.5 days, whereas it was 8.0 days during the second generation.

In general the mean duration for the 2nd nymphal instar on the three kinds of the trees conducted in the study was 7.7 days with a range of 5-10 days. The shortest average duration was 5.5 days occurred during the first generation on the pear trees, whereas the longest was 9.0 days occurred on the same trees during the second one. The lowest mortality percentage (10.39%) was observed during the first

generation on the apple trees, whereas the highest percentage (25.00%) was shown during the first generation on the apricot trees. The general mean of percent mortality was 17.55%.

Table (4): Duration and natural mortality of the 2nd nymphal instar of *A. amygdali* on Apricot, Pear and Apple trees under field conditions.

Kind of Tree	Gen. No.	No. of Nymphs observed	Period of observations	Duration in days		Mortality %
				Range	Mean	
Apricot	1	40	05/6 – 10/7	6-8	7.0	25.00
	2	37	24/8 – 28/8	7-9	8.0	21.62
Pear	1	84	02/7 – 02/8	5-6	5.5	11.90
	2	45	20/8 – 01/9	8-10	9.0	13.33
Apple	1	77	06/6 – 11/7	7-10	8.5	10.39
	2	39	19/8 – 29/8	7-9	8.0	23.08
General Mean		53.67		5-10	7.7	17.55

2-3: Third nymphal instar: The data in table (5) indicated that the mean duration for the 3rd nymphal instar during the first generation on the apricot trees was 8.3 days, whereas it was 7.3 days during the second one. The general mean duration was 7.8 days.

Table (5): Duration and natural mortality of the 3rd nymphal instar of *A. amygdali* on Apricot, Pear and Apple trees under field conditions.

Kind of Tree	Gen. No.	No. of Nymphs observed	Period of observations	Duration in days		Mortality %
				Range	Mean	
Apricot	1	30	13/6 – 04/8	7-11	8.3	30.00
	2	29	26/8- 08/9	7-8	7.3	31.03
Pear	1	74	15/7-11/8	6-7	6.7	18.92
	2	39	01/9-18/9	7-8	7.3	28.21
Apple	1	69	14/6 – 01/8	7-11	8.4	20.29
	2	30	27/8 – 08/9	7-9	8.5	30.00
General Mean		45.17		6-11	7.8	26.41

From the data it's noted that the mean duration for the 3rd nymphal instar during the first generation on the pear trees was 6.7 days, while it was 7.3 days during the second generation. The 3rd nymphal instar lasted a mean period of 8.4 days during the first generation on the apple trees, while it lasted 8.5 days during the second generation.

Generally, the results indicated that the duration of the 3rd nymphal instar ranged between 6-11 days with a mean of 7.8 days. On the other hand, the shortest average duration of this instar, 6.7 days took place during the first generation on pear trees, whereas the longest period 8.5 days occurred during the second generation on the apple trees.

The natural mortality among the 3rd instar nymphs showed a distinct variation. The lowest mortality was 18.92% as observed during the first generation on the pear trees, whereas the highest was 31.03% as found during the second generation on the apricot trees. The general mean mortality percentage was 26.41%.

2-4: Fourth nymphal instar: The data presented in table (6) revealed that the 4th nymphal instar takes a mean period of 7.5 days during the first generation on the pear trees, and takes also 7.5 days during the second generation. The mean duration for the 4th nymphal instar during the first generation on the apple trees was 11.0 days, while it was 9.5 days during the second one.

Generally, the mean duration for the 4th nymphal instar on the three kinds of the trees was 8.7 days with a range of 6-12 days. The 4th nymphal instar took the shortest period of 7.5 days during the first and second generation on the pear trees, whereas it took the longest period of 11.0 days during the first generation on the apple trees.

The result in table (6) showed that the natural mortality among the 4th instar nymphs varied greatly where the lowest mortality (25.00%) was occurred during the first generation on the pear trees, whereas the highest (55.00%) was occurred during the second generation on the apricot trees.

Table (6): Duration and natural mortality of the 4th nymphal instar of *A. amygdali* on Apricot, Pear and Apple trees under field conditions.

Kind of Tree	Gen. No.	No. of Nymphs Observed	Period of observations	Duration in days		Mortality %
				Range	Mean	
Apricot	1	21	22/6 – 24/7	8-9	8.5	52.38
	2	20	07/9 – 14/9	7-9	8.0	55.00
Pear	1	60	15/7 -11/8	6-9	7.5	25.00
	2	28	01/9 - 17/9	7-8	7.5	28.57
Apple	1	55	21/6 – 30/7	10-12	11.0	27.27
	2	21	03/9 -15/9	9-10	9.5	47.62
General Mean		34.17		6-12	8.7	39.31

2-5: Fifth nymphal instar: The data presented in table (7) appeared that the mean duration for the 5th nymphal instar during the first generation on the apricot trees was 11.00 days, whereas it was 8.5 days during the second generation. On the other hand the mean duration for the 5th nymphal instar during the first generation on the pear trees was 8.0 days, while it was 9.0 days during the second generation.

The data also showed that the mean duration for the 5th nymphal instar during the first generation on the apple trees was 10.5 days, and it was 8.5 days during the second generation. Finally, the general mean duration of the 5th nymphal instar on the three kinds of the trees ranged between 7-12 days with an average of 9.3 days. On the other side the shortest average duration (8.0 days) occurred during the first generation on the pear trees, whereas the longest 11.0 days occurred on the apricot during the first generation. The lowest mortality percentage of this instar was 66.67% as found during the second generation on the apricot trees, whereas the highest one was 80.00% observed during the first generation on the apple trees.

Table (7): Duration and natural mortality of the 5th nymphal instar of *A. amygdali* on Apricot, Pear and Apple trees under field conditions.

Kind of Tree	Gen. No.	No. of Nymphs Observed	Period of observations	Duration in days		Mortality %
				Range	Mean	
Apricot	1	10	01/7-01/8	10-12	11.0	70.00
	2	9	14/9-21/9	8-9	8.5	66.67
Pear	1	45	22/7-18/8	7-9	8.0	73.33
	2	20	08/9-25/9	8-10	9.0	70.00
Apple	1	40	01/7-12/8	10-11	10.5	80.00
	2	11	12/9-26/9	8-9	8.5	72.73
General Mean		22.5		7-12	9.3	72.12

Considering the nymphal period as a whole it was found (Table 8) that the nymphal stage lasted a general mean period of 37.5 days. The data indicated that the mean duration for the nymphal period during the first generation on the apricot trees was 39.5 days, whereas it was 36.0 days during the second one, and the mean duration for the nymphal period during the first generation on the pear trees was 31.0 days, while it was 37.0 days during the second. The nymphal period lasted a mean period of 43.0 days during the first generation on the apple trees, while it lasted 38.5 days during the second generation.

Table (8): Duration of the nymphal period and natural mortality of *A. amygdali* on Apricot, Pear and Apple trees under field conditions.

Kind of Tree	Gen. No.	No. of Nymphs observed	Period of observations	Duration in days		Mortality %
				Range	Mean	
Apricot	1	151	02/6-01/8	35-44	39.5	39.48
	2	137	20/8-21/9	32-40	36.0	37.24
Pear	1	358	29/6-18/8	36-34	31.0	28.15
	2	184	16/8-25/9	34-40	37.0	30.71
Apple	1	325	3/6-12/8	38-48	43.0	29.26
	2	143	16/8-26/9	35-42	38.5	36.11
General Mean		216.3		32-48	37.5	32.66

Generally, the results indicated that the nymphal duration ranged between 32-48 days with a mean of 37.5 days. On the other side, the shortest period (31.0 days) occurred during the first generation on pear trees. The longest nymphal period (43.0 days) occurred during the first generation on apple trees. The lowest mortality percentage (28.15%) was observed during the first generation on the pear trees, whereas the highest percentage (39.48%) was shown during the first generation on the apricot trees. The general mean of percent mortality was 73.49%.

During summer, development from eggs to adults takes 35 to 37 days, depending on temperature (Todd 1989). Yousif (1995) showed that the period of the five nymphal instar lasted an a mean periods of 4, 12.43, 19.59, 24.89 and 47.5 days for the 1st, 2nd, 3rd, 4th and 5th nymphal instars, respectively, and the period of the

nymphal stage was 108.41 days at a temperature of 28-29°C and relative humidity of 45%. Brown Marmorated Stink Bug, *H. halys* has five nymphal instars, and each stage lasts approximately one week, depending upon temperature (Gyeltshen *et al*., 2005).

3- Number and duration of generations throughout the year: Length of a generation may be determined by considering the life cycle as the sum total of the developmental period (the incubation, the nymphal periods) and the pre-oviposition period. Under field conditions, the stink bug *A. amygdali* under went two overlapping generations throughout the year 2007-2008. The first generation started in May, and the second in August. The insects of the second generation passed the winter in adult stage and started to lay eggs in the following spring. The duration of generations of *A. amygdali* on Apricot, Pear and Apple trees under field conditions is represented in table (9).

The mean duration of the first generation on the three trees apricot, pear and apple were (38.67, 39.71 and 48.29 days) respectively, the insects of which commenced to be reared on the fourth week of May 2007. While the mean duration of the second generation on the same trees were (282.33, 284.80 and 286.67 days) respectively, the insects of which commenced to be reared on the second week of August.

It is clear that the shortest duration (38.67 days) was that of the first generation on the apricot trees, and the long duration (286.67 days) was that of the second generation on the apple trees too. The second generation life cycle which started in August has a long period due to adult's hibernation.

Yousif (1995) founded that *A. amygdali* have two generation through their life cycle in Baghdad. Day and Kuhart (2003) reported that there were one to two generations of stink bugs (*Euschislus servus* and *Acrosternum hilare*) each year. They typically overwinter as adults and begin to lay eggs on leaves of plants in late spring or early summer. Nymphs feed throughout the summer and molt to adults in late summer.

4- Hibernation: The stink bug *A. amygdali* overwinters as adults and aggregates sometimes in large numbers in hibernation sites in the winter. Adults overwinter in protected areas, mainly beneath leaf litter, rocks, wild plants and other ground debris and usually remain inactive during this period. A result of survey which has done to find out the place which is used by *A. amygdali* to spend the winter season has showed that, Safeen Mountain especially the south side is a suitable place for it to spend this adverse period season, this may be is due to existing many fruit trees such as wild pear, wild almond, *Pistachia atlantica*, *Crxpis parviflora* which may be used by the stink bug as a host during this time of his life stage.

Examining the area it was found that, in addition to adult of *A. amygdali* there were also other species of insects belong to the order Hemiptera use this place for hibernate such as *Dolycorus* sp. (Pentaomidae) and *Eurygaster integriceps* (Scutelleridae). The stink bug stay at hibernation site for seven months from Mid October 2006 till mid of May 2007.

Todd (1989) found that adults (and sometimes nymphs) overwinter beneath leaf litter and other ground debris and usually remain inactive during this period in most parts of South Carolina. Yousif (1995) indicated that the stink bug *A.*

amygdali spend the winter at adult stage from the 4th week of November 1993 till the end of April 1994, which mean that the insect stayed in fruit orchards for 5 months. Also she mentioned that the stink bug hibernates inside the fruit orchards without leaving, using cracks or pits in the stems of the olive trees or between the fallen leaves for hiding. Ehler (2000) reported that the adults overwintered in aboveground locations, especially under bark of snag trees in riparian habitats.

5- Migration*:* The study indicated that the *A. amygdali* have two migrations per growth season. The downward migration (spring migration) from the overwintering areas to orchards started at the second week of May when the average temperature and relative humidity were 20.50°C, 37.00% respectively. This migration was done by the insect in order to find the food and mating then laying the eggs. The insect stayed in the orchards feeding and mating till second week of September in which there were decrease in population, which is mean starting the upward migration (fall migration) towards the hibernate region when the average temperature and relative humidity were 29.04°C, 35.00 % respectively. This migration was done by the insect to protect itself from the adverse conditions in the winter.

6- Sex ratio: In this study, totals of 582 adults taken during the growth season from the field were examined. Sex determination (Table 10) gave the percentage of 50.52 and 49.48 for males and females, respectively, presenting a general sex ratio 1:1.

Table (10): Sex ratio of *A. amygdali* reared under field conditions.

Generation No.	No. of adults examined	No. of		sex %		Ratio M/F
		Males	Females	Males	Females	
1	244	119	125	48.77	51.23	0.95:1.1
2	338	175	163	51.78	48.22	1.07:0.93
Total	582	294	288	50.52	49.48	1.02:0.98
Mean	291	147	144	50.52	49.48	1.02:0.98

دراسة حياتية البق النتن *Apodiphus amygdali* (Germar) (Hemiptera: Pentatomidae)

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الخلاصة

اشتمل البحث الحالي على دراسة حياتية البق النتن *Apodiphus amygdali* (Germar) على ٣ انواع من الاشجار المثمرة وهي المشمش، الكمثرى والتفاح خلال موسم النمو ٢٠٠٧ وتحت الظروف الحقلية في محافظة اربيل شمال العراق. تراوحت مدة ما قبل وضع البيض بين ٣-٦ يوما لافراد الجيل الاول ، بينما تميزت هذه المدة لافراد الجيل الثاني بطولها وذلك لدخول الافراد في مرحلة التشتية. وجد ان متوسط مدة حضانة البيض ٣.٧٥ يوما ومتوسط نسبة فقس البيوض للجيلين (٨٩.٢٩، ١٠٠.٠) ، (٩٦.٩٤ ، ٩٢.٨٦) و (١٠٠.٠، ١٠٠.٠) على كل من اشجار المشمش والكمثرى والتفاح ، على التوالي. تمر الحورية بخمسة اعمار ، بلغ متوسط مدتها ٤.٠ ، ٧.٧ ، ٧.٨ ، ٨.٧ و ٩.٣ يوما لكل من العمر الحوري الاول ، الثاني ، الثالث ، الرابع والخامس على التوالي. وبلغ متوسط نسبة الموت الطبيعي خلال الطور الحوري ٧٣.٤٩% و ان النسبة الاكبر كانت في العمر الحوري الخامس. للحشرة جيلين متداخلين في السنة ، تدخل البقة في سبات شتوي في الطور الكامل بلغ امده بين ٧-٨ اشهروذلك ما بين الاسبوع الثاني من شهر تشرين الاول لغاية الاسبوع الرابع من شهر مايس للسنة القادمة، ولوحظ ان السبات تم في قمة جبل سفين والنسبة الجنسية ١:١.

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