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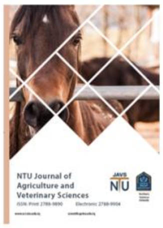

Effect of biological control factors acting on population dynamics parameters insect of *Sesamia cretica* Led. (Noctuidae:Lepidoptera) Tow varities on corn *Zea mays L* in Ninavah providence

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A B S T R A C T

The study was conducted under field conditions during the autumn season of the year 2023. A detailed account was given of the population dynamics of the corn stalk borer *Sesamia cretica* Led. (Noctuidae:Lepidoptera) infested two Varieties of corn Zia mays (Zwan and Samoray) in three regions belong to Ninavah provedence: Mosul city, Rabiaa and Nimrod districts. To investigate major mortality factors that are responsible for the change of S. cretica on corn were identified as density-dependent factors including predation and unknown factors which are independent. Predation by Anthocoris spp., green lacewings (Chrysopela spp.), and ladybugs (*Coccinella semptempunctat* and *C. undecimpunctata*) are a significant contributor to death. Birds also played a major role in predation of larvae and pupae that fed on tissue. Results showed that photoperiod and normal female mortality rate played an important role in reducing the pest level. Results revealed that *S. cretica* population were subjected to great biotic and abiotic mortality factors which played a major role in the destruction of their mature and immature stages. The trend index of the second generations was always below 1% , while for the first generations were above 1% .

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Introduction

Sesamia cretica, an oligophagous insect that feeds on a narrow range of Poaceae. It native to Europe, and has moved to North America[1]. It is considered a major pest of corn, sorghum and sugarcane plants in North-East Africa[(2], the Middle East [3], and Mediterranean Europe [4]. In sub-Saharan Africa it has been recorded from Sudan [5], Somalia [6], Kenya [7] and more recently from Cameroon [8]. In the field, the gravid moths oviposit up to 300 eggs on suitable young leaves, and eggs are thrust within the leaf sheath surrounding the upper internodes and hatch in 7-10 days [9] [10]. Larvae first feed within the leaf sheath's tissues, then enter the stem through a horizontal hole and move downward, sometimes through several internodes. Plant injury is caused by early instars of *S. cretica* feeding in the plant's whorl and later burrowing into the stem through the growing point or directly through the stalk. Larvae cause foliar damage, dead hearts, stem tunnelling, stem lodging, and breakage, all of which may contribute to the final loss in yield. Infested plants exhibit poor growth as translocation of nutrients is affected when the stem tissue is damaged. Infestation also results in reduced yield and plants more susceptible to lodging and secondary infections [11]. Life tables are one of the most successful methods for estimating the causes and rates of death affecting population movement. Field life-tables and key mortality factors may be analyzed to determine what stage in the life cycle contributes the most to the population trend when series of life tables are available [12][13][14][15]. The use of life tables by entomologists is a fairly recent approach in population dynamic studies with insects. The value of life tables in actuarial work long has been recognized. With the recent emphasis on population dynamic studies of insects, the usefulness of life tables in this area is becoming more recognized. Field life tables have been made recently to study the natural population of insect pests. When the environmental parameters are related to several causes of mortality, the field life tables form a budget for the successive process operating in a given population. Field life-table Study of the life tables of Sesamia cretica Lederer in three different areas in Nineveh Governorate studies indicate which age interval and independent variable should be studied in detail to control the pest effectively. It is also essential to grasp the actual seasonal prevalence of an insect pest in order to plan its successful control [14][16][17][18]. A life table is a tabular device that describes the occurrence of certain life history events for every or a particular age interval of life. For animals with a shorter life expectancy, such as insects, the age interval may represent a particular life cycle stage (e.g., egg, larva or pupa), an instar, or one day. Life table were studied animals for the first time by [19] when they published life tables for *Drosophila melanogaster* (Meig.). Population dynamics of corn stem borer, *Chilo partellus* (Swinhoe)and its natural enemies were conducted. They showed that the incidence of the pest begins in the third week of July and continues up to the third week of September, with a peak activity in August. Parasitoid *Cotesia flavipes* showed a significant positive correlation with larval population during both years. The abiotic factors, rainfall, had a significantly negative association with *C. partellus* in corn crops. The damaged plants caused by *C. partellus* were significantly negatively correlated with the highest and lowest temperature in 2007 and 2008 [20]. The life tables of the European corn borer, *Ostrinia nubilalis* (Hübner), were conducted from 1983 to 1985 to identify the factors affecting mortality at each life cycle stage. The results showed that the greatest mortality occurred during the first and second larval instars (62.2%) when mature larvae are in diapause (69.5%) and from moth migration and loss of reproductive potential (70.3%). The egg stage (11.7%), non-diapausing third- to fifth-instar larvae (2%), and pupae (10.4%) were the stages with the lowest mortality[21]. A study was conducted on the life tables of the European corn stem borer *Ostriniae nubilalis* (Hiibner) on the release and non-release of the egg parasitoid *Trichogramma ostriniae*. The key factor for the population of the European corn stem borer, as mortality rates in the egg stage ranged between 61-92% in the event of the parasitoid being released. [22].

Materials and Methods

Life table parameters of insect *Sesamia cretica*

This study was conducted in three areas of Nimrod, Rabia'a district and Mosul city Centre in Nineveh province during the growing season of 2023. In each district, a corn field was chosen with an area of one acre except in Mosul, where the cultivated area was 400 sq m. (Mosul city. The corn cultivars were Samurai and Zwan in all fields, and the plant density was more than 8,000 acres. No insecticides were applied during the study. The population density and dynamics of *S. cretica* were determined in all fields of selective areas during the growing season of 2023. In this study, the sampling unit was considered a whole corn plant, which was selected randomly, and five samples were taken every four meter in both diameters of the field. The samples were taken weekly from 7th July to 30th October 2023.

Preparing a particular life table of corn stem borer (*S. cretica*) on corn *Zea mays* per the program results, taking a random sample of the abovementioned varieties every ten days from July until November (2023). Counting the number of hatched and non-hatched eggs, each insect stage and pupa stage individuals identified death factors (parasitism, predation). At the same time, the stages of the insect are found dead without knowing the reason for death (unknown factors), where extreme weather conditions play a crucial role.

The current life tables were constructed using the equations suggested by [23]and developed by Harcourt (1969), which include the following columns:

X = pivotal age

L× = the number of individuals in the beginning.

D×F = factor responsible for the death in the age group.

Dx = number of individuals died.

100q× = "Based on these observations", apparent mortality.

S× = survival rate.

With adding the K-factor (the key factor) column to life tables, which represents the sum of the logarithm of the total mortality at each age group [24] according to the following equation :

K=Iog (Lx)- Iog (Lx+I)……………(1)

K=log (Lx\Lx+1)........................(2)

K=-log (Sx) …………………………..(3)

K= (log 1\Sx)............................(4)

As:

K = relative participation of each death factors.

Log (Lx) = logarithm the number of individuals live.

Log (Lx-1) = logarithm the number of live individuals age group that follows the age group.

Equation No. (2) was chosen to find the values of K. K represent the total deaths through Generation mortality was calculated from the sum of the values of K for all age groups this means that: K = K1+K2+K3...+KN (Smith,1973).

[14] developed the expected number of eggs, the Trend index of the population (TI) and the rate of survival of the generation (SG)according to the equations :

Expected Eggs (EE) = (Normal females ×2)/2×Maximum number of eggs /female/generation

As:

Expected eggs = the expected number of eggs.

Normal female = natural female.

Max. No. of eggs/female = highest number of eggs laid by the female.

Trend Index Population (TI)= (N2/N1)x100

As:

N1 = Number of actual eggs laid by females at the beginning of the first generation.

N2 = Number of eggs recorded at the beginning of the second generation.

Generation Survival Rate (SG)= N3/N1

As:

N3 = Number of females produced by the current generation.

The number of eggs damaged due to the effect of the photoperiod and which remain inside the female was calculated according to the following equations:

Number of damaged eggs = The highest number of eggs laid by the female - Average number of eggs

Number of dead females (each female represents a damaged egg) = Number of females (N3 × Number of damaged eggs inside a single female\Highest number of eggs laid by the female

Results and discussion

Pathogen Isolation and diagnosis

Life table parameters of *Sesamia cretica*

In order to understand the population dynamics from generation to next one and to identify the factors influencing changes in the population density of the corn stalk borer *Sesamia cretica*, life tables of the pest were constructed on corn plants. These factors could be keeping the pest density at a particular level, or releasing it to high levels. Life tables were constructed on a generation basis according to the sampling program that lasted from the beginning of July until mid-November for the autumn season of 2023.

The life tables of the first generation of *S. cretica* on the two corn cultivars Zwan and Samurai for the autumn season of 2023 in the city of Mosul (Tables 1 and 2) showed that the percentage of mortality in the egg stage was limited and did not exceed 8.69 and 10.00% for the two mentioned varieties, respectively. Infertility played an important role in reducing the hatching rate. It is also pointed out that the role of natural enemies of predators in reducing the population density of the pest stages, especially the first instar, was noted, as the percentage of predation of the pest that infested Zwan and Samourai cultivars reached 9.52 and 22.22%, respectively. As for the factors of death for unknown factors, they ranked first, amounting to 23.81 and 33.33% for both cultivars, respectively, and thus the total death rates for this stage were 33.33 and 55.55%, respectively. Predation were no longer noticed on the later stages, with the pest population continuing to decline for unknown factors to reach 7.14, 7.69 and 8.33% for the second and fourth larval instars and the pupal stage on Zwan cultivar respectively, while on the Samourai cultivar it reached 50.00 and 100.00 for the second instar and the pupal stage, respectively. The absolute death of the pest stages for this generation on the Samourai cultivar (Table 2) means, from a theoretical point of view, that it has reached the point of extinction in the region, but the reality indicates its continued existence and completion for another generation, as we will notice in the generation that will overwintering. Such an existence may come from the migration of adults from the corn cultivars present in the field. As for the Zwan cultivar (Table 1), the mortality of normal female adults ranked first for the same generation, reaching 42.62%, and the cumulative mortality rate, which totaled 80.30%, affected the insect stages, while the population tendency index reached 2.04.

[14] stated that the potential energy for laying eggs in insects depends on the photoperiod and considered it one of its most important functions. In the current study, the effect of this factor on adult

female is evident, as it caused a decrease in the number of eggs by 13.64 in Zwan cultivar in Mosul(Table 1).

The difference between the expected number of eggs (411) and the actual number (47) of the first generation of *S.cretica* on corn (Zwan cultivar) in 2023 shows the occurrence of adult mortality, which may be attributed to several reasons, including the death of adults before laying eggs due to weather conditions, exposure to predation, lack of nutritional requirements, or failure to mate or migrate. It is not easy to separate such factors in the current study, and there is no conclusive evidence about the role of each of them, but the extreme weather in Iraq likely played an important role in the extinction of the adults, as well as its incomplete stages, as the percentages of mortality for this factor reached 42.62 and 100% in the Mosul city, for both cultivars Zwan and Samourai, respectively (Tables 1 and 2).

The trend index population of the first generation of *S. cretica* in Mosul city, for Zwan cultivar showed a minor rise of 2.04 even though the pest's stages from egg to adult were considerably influenced by the combined mortality factors, resulting in death rates of 80.30 %. Tables 1 and 2 showed that normal females of *S cretica* infested Zwan cultivar ranked first in terms of proportionate contribution to mortality (K value), with a value of 0.244. Meanwhile, the first instar that infested the Samourali cultivar had the highest K value of the pest, measuring 0.356.

The life table of the first generation of *S. cretica* in Zwan cultivar in the Rabiaa district (Table 3) clearly shows the effect of biotic and abiotic mortality factors on pupae, which was 25.64% for the autumn season of 2023, which exceeds the rest of the death factors for incomplete stages. While the normal adult females ranked first in terms of mortality, as its percentage reached 44.24%. The aforementioned extermination factors negatively affected the lifespan of *S. cretica*, as the population tendency index did not exceed 1.31.

The impact of death factors on normal adult females outweighed that of the other pest stages, with a mortality rate of 56.83%, according to the results of the life table for the first generation of *S. cretica* that infested Samourai cultivar in the Rabiaa district (table 4) for the autumn season of 2023. This was followed by death factors for the first instar larvae, with a mortality rate of 37.10%. The impact of the combined mortality variables on the pest's population density is also included in the table, as the population tendency index remained below 1.22. The life table (5) displayed the variation in the effects of the mortality factors for the first generation in the pest stages on the Zwan cultivar in the Nimrod district for the autumn season, 2023. The effects of the photoperiod on females were (26.22%), while the death factors in normal females had the highest percentage of mortality rates (42.08%), followed by the first larval instar (31.03%). With a combined mortality rate of 23.04%, the biotic and abiotic death factors during the third larval instar came in fourth place in terms of effect. This generation's population tendency index indicated a little rise of 1.82.

The impact of both biotic and abiotic death factors on normal females was the most significant factor, as evidenced by the life table (6) for the second generation of *S. cretica* that infested Samourai cultivar for the autumn season of 2023 in the Nimrod district. The total death rates for these individuals were 76.5%, with the first larval instar coming in second (37.04%), and the percentage of mortality for unknown factors was 33.33%, which was followed by the effect of the photoperiod on females (21.87). Despite the fact that 93.93% of the pest stages died overall, they were unable to bring the density down to acceptable levels; the population tendency index indicated a 1.68 rise in population, which might be attributed to internal migration.

Table 1. Life table parameters of the first generation of *Sesamia cretica* reared on corn *Zea mays* (Zwan cultivar) in Mosul.

X	Lx	dxf	dx	100qx	Sx	k-value
Egg) N1(	23	Infertility	2	8.69	0.91	0.041
1st Instar	21	Predation	2	9.52	90.00	0.180
		Unknown factors	5	23.81	0.76	
			7	33.33	0.66	
2nd Instar	14	Predation	0	0	0	0.036
		Unknown factors	1	7.14	0.92	
			1	7.14	0.92	
3rd Instar	13	Predation	0	0	0	0
		Unknown factors	0	0	0	
			0	0	0	
4th Instar	13	Predation	0	0	0	
		Unknown factors	1	7.69	0.92	
			1	7.69	0.92	0.036
5th Instar	12	Predation	0	0	0	0
		Unknown factors	0	0	0	
			0	0	0	

Pupa	12	Predation	0	0	0	
		Unknown factors	1	8.33	0.91	0.041
			1	8.33	0.91	
Adult	11	Sex♀59 ♀	1.98	10	0.90	0.046
) N3(FemaleX2	9.02	Photoperiod	1.23	13.64	0.86	0.065
Normal FemaleX2	7.79	Adult mortality	3.32	42.62	0.57	0.244
Total Generation			18.53	80.30	0.1943	0.689

Expected number of eggs) E.E =(81 Population Tendency Index) TI =(2.04
Actual eggs) N2 =(47 generation survival rate) GS=(0.39

Table 2. Life table parameters of the first generation of *Sesamia cretica* reared on corn *Zea mays* (Samorai cultivar) in Mosul.

X	Lx	dxf	dx	100qx	Sx	k-value
Egg) N1(	10	Infertility	1	10.00	0.90	0.046
1st Instar	9	Predation	2	22.22	0.77	
		Unknown factors	3	33.33	0.66	
			5	55.55	0.44	0.356
2nd Instar	4	Predation	0	0	0	
		Unknown factors	2	50.00	0.50	0.301
			2	50.00	0.50	
3rd Instar	2	Predation	0	0	0	
		Unknown factors	0	0	0	0
			0	0	0	
4th Instar	2	Predation	0	0	0	
		Unknown factors	0	0	0	0
			0	0	0	
5th Instar	2	Predation	0	0	0	
		Unknown factors	0	0	0	0
			0	0	0	
Pupa	2	Predation	0	0	0	
		Unknown factors	2	100.00	0.00	0
			2	100.00	0.00	
Adult	0	Sex♀55 ♀	-	-	-	-
)N3(FemaleX2	0	Photoperiod	-	-	-	-
Normal FemaleX2	0	Adult mortality	-	-	-	-
Total Generation			10	100%	0.00	0.703

Table 3. Life table parameters of the first generation of Sesamia cretica reared on corn Zea mays (Zwan cultivar) in Rabiaa district

X	Lx	Dxf	dx	100qx	Sx	k-value
Egg) N1(	97	Infertility	8	8.25	0.91	0.041
		Predation	5	5.62	0.94	
1st Instar	89	Unknown factors	7	7.86	0.91	0.065
			12	13.48	0.86	
		Predation	2	2.60	0.97	
2nd Instar	77	Unknown factors	6	7.79	0.92	0.051
			8	10.39	0.89	
		Predation	3	4.35	0.95	
3rd Instar	69	Unknown factors	7	10.14	0.89	0.070
			10	14.49	0.85	
		Predation	3	5.08	0.94	
4th Instar	59	Unknown factors	10	16.95	0.83	0.113
			13	22.03	0.77	
		Predation	1	2.17	0.97	
5th Instar	46	Unknown factors	6	13.04	0.86	0.075
			7	15.22	0.84	
		Predation	5	12.82	0.87	
Pupa	39	Unknown factors	5	12.82	0.87	0.131
			10	25.64	0.74	
Adult	29	Sex♀ 59 ♀	5.22	18.00	0.82	0.086
) N3(FemaleX2	23.78	Photoperiod	7.62	32.04	0.67	0.174
Normal FemaleX2	16.16	Adult mortality	7.15	44.24	0.55	0.260
Total Generation			87.99	90.71	0.0929	1.066

1.31=(T1) Population Tendency Index
229=(E.E) Expected number of eggs
0.24=(GS) generation survival rate
128=(N2) Real number of eggs

Table 4. Life table parameters of the first generation of *Sesamia cretica* reared on corn *Zea mays* (Samorai cultivar) in Rabiaa district.

X	Lx	Dxf	dx	100qx	Sx	k-value
Egg) N1(	67	Infertility	5	7.46	0.92	0.036
		Predation	7	11.29	0.88	
1st Instar	62	Unknown factors	16	25.81	0.74	0.208
			23	37.10	0.62	
		Predation	4	10.26	0.89	
2nd Instar	39	Unknown factors	9	23.08	0.76	0.180
			13	33.33	0.66	
		Predation	0	0	0	
3rd Instar	26	Unknown factors	4	15.38	0.84	0.076
			4	15.38	0.84	
		Predation	1	4.54	0.95	
4th Instar	22	Unknown factors	3	13.64	0.86	0.091
			4	18.18	0.81	
		Predation	0	0	0	
5th Instar	18	Unknown factors	1	5.55	0.94	0.027
			1	5.55	0.94	
		Predation	0	0	0	
Pupa	17	Unknown factors	1	5.88	0.94	0.027
			1	5.88	0.94	
Adult	16	Sex♀59 ♀	2.88	18.00	0.82	0.086
) N3(FemaleX	13.12	Photoperiod	2.21	16.84	0.83	0.081
Normal FemaleX2	10.91	Adult mortality	6.20	56.83	0.43	0.366
Total Generation			62.29	92.97	0.0703	1.178

1.22=(T1) Population Tendency Index
189=(E.E) Expected number of eggs
0.19=(GS) generation survival rate
82=(N2) Real number of eggs

Table 5. Life table parameters of the first generation of *Sesamia cretica* reared on corn *Zea mays* (Zwan cultivar) in Nimrod district.

X	Lx	Dxf	dx	100qx	Sx	k-value
		Infertility	7	6.86	0.93	
Egg) N1(	102	Predation	8	7.84	0.92	0.070
			15	14.70	0.85	
		Predation	8	9.19	0.90	
1st Instar	87	Unknown factors	19	21.84	0.78	
			27	31.03	0.68	0.167
		Predation	3	5.00	0.95	
2nd Instar	60	Unknown factors	10	16.66	0.83	0.108
			13	21.66	0.78	
		Predation	0	0	0	
3rd Instar	47	Unknown factors	11	23.04	0.76	0.119
			11	23.04	0.76	
		Predation	0	0	0	
4th Instar	36	Unknown factors	8	22.22	0.77	0.113
			8	22.22	0.77	
		Predation	0	0	0	
5th Instar	28	Unknown factors	1	3.57	0.96	0.018
			1	3.57	0.96	
		Predation	0	0	0	
Pupa	27	Unknown factors	3	11.11	0.88	0.055
			3	11.11	0.88	
Adult	24	Sex♀59 ♀	4.24	17.66	0.82	0.086
) N3(FemaleX2	19.68	Photoperiod	5.16	26.22	0.73	0.137
Normal FemaleX2	14.52	Adult mortality	6.11	42.08	0.57	0.244
Total Generation			93.51	91.75	0.0824	1.117

1.82=(T1) Population Tendency Index
321=(E.E) Expected number of eggs
0.19=(GS) generation survival rate
186=(N2) Real number of eggs

Table 6. Life table parameters of the first generation of *Sesamia cretica* reared on corn *Zea mays* (Samorai cultivar) in Nimrod district.

X	Lx	Dxf	dx	100qx	Sx	k-value
Egg) N1(	61	Infertility	3	4.92	0.95	0.055
		Predation	4	6.56	0.93	
			7	11.47	0.88	
1st Instar	54	Predation	2	3.70	0.96	0.208
		Unknown factors	18	33.33	0.66	
			20	37.04	0.62	
2nd Instar	34	Predation	1	2.94	0.97	0.070
		Unknown factors	4	11.76	0.88	
			5	14.70	0.85	
3rd Instar	29	Predation	0	0	0	0.102
		Unknown factors	6	20.69	0.79	
			6	20.69	0.79	
4th Instar	23	Predation	1	4.35	0.95	0.041
		Unknown factors	1	4.35	0.95	
			2	8.69	0.91	
5th Instar	21	Predation	0	0	0	0
		Unknown factors	0	0	0	
			0	0	0	
Pupa	21	Predation	0	0	0	0.022
		Unknown factors	1	4.76	0.95	
			1	4.76	0.95	
Adult	20	Sex♀60 ♀	4.00	20.00	0.80	0.097
) N3(FemaleX2	16.00	Photoperiod	3.50	21.87	0.78	0.108
Normal FemaleX2	12.50	Adult mortality	8.80	70.40	0.29	0.538
Total Generation			57.30	93.93	0.0606	1.241

1.68=(T1) Population Tendency Index
192=(E.E) Expected number of eggs
0.26=(GS) generation survival rate
103=(N2) Real number of eggs

Regarding the pest lifespan and the survival rates of the second generation of *S. cretica* on infested the Zwan corn cultivar for the autumn season of 2023, Table 7 indicates that the third, fourth and fifth larval stars, as well as the pupae, were not exposed to biotic or abiotic factors of mortality for several reasons, including the fact that corn is not grown in vast areas and continuously in Mosul city and the lack of natural enemies. As for the effect of weather factors on the pest stages for this generation, it is also limited. It is clear from the table the effect of biotic and abiotic factors on the other pest stages, especially the normal females, as they ranked first in the mortality rates, reaching 43.26%, followed by the first larval instar, 23.68%. Although the total death rates for the pest stages reached 80.11%, they were unable to increase the density of the pest to higher levels, as the population tendency index showed an increase in the population of 0.89, which may be due to the low temperatures at the beginning of November.

Table (8) shows the effect of biotic and abiotic factors on the first instar of the second generation of *S. cretica* on Samourai cultivar in Mosul city, as the percentage of mortality reached 42.10%, which exceeds the rest of the death factors for other incomplete stages. The mortality of normal females achieved 41.50%, and the population tendency index indicated an increase of 0.90, although the total mortality rate for the pest stages was 87.38%. The reason may be due to the low number of eggs laid for the next generation due to the low temperatures at the beginning of November, as well as the pest preference for Zwan cultivar compared to the Samourai, which is consistent with what Al-Asibi (2023) stated.

As for the second generation of *S. cretica* on the Zwan cultivar in the Rabiaa district for the 2023 autumn season, mortality factors were noticed on the first and second instar larvae, as their percentage reached 20.05 and 20.34%, respectively, while for the fourth larval instar, it reached 30.78% and the pupal stage 33.33%. The extermination of normal adult females ranked first for the same generation, which was 52.47%, and the combined mortality factors totalled 96.16%, and the population tendency index did not exceed 0.41 (Table 9).

The life table of the second generation of *S. cretica* in Rabiaa district for the autumn season of 2023 indicates the importance of unknown mortality factors on all incomplete stages, especially weather factors, as the rise in temperatures during August (44.29° C) led to the death of larval ages, especially the first and second larval instars, which reached 33.85 and 23.53% respectively, while it reached 15.79% for the pupae, meanwhile the mortality of normal female adults ranked first (60.55%). The total mortality factor for the pest stages was 94.62%, which negatively affected the insect population tendency index, which did not exceed 0.86% (Table 10).

Table 11 illustrates the variation in the impact of the mortality factors on the stages of the second generation of *S. cretica* that infested Zwan cultivar in Nimrod district. The mortality factors in the normal females had the highest death percentage, amounting to 54.54%, followed by the egg stage and the first larval instar, which reached 45.70 and 34.65% respectively. The mortality factors for the females affected by the photoperiod, amounting to 31.10%, and the population tendency index indicated a slight increase in the insect population, amounting to 0.39.

The life table of the second generation of *S. cretica* on the Samourai cultivar for the autumn season of 2023 (Table 12) showed that the percentage of mortality of the egg stage was 45.63% and infertility played an important role in reducing the hatching percentage, which reached 42.72%. It was found that the natural enemies of predators played a clear role in reducing the population density of the pest stages, especially the first larval instar, as the percentage of predation reached 10.71%. This factor, in addition to the mortality for unknown factors, increased the mortality to 48.21%. The effect of the death factors is also clearly evident in the second larval instar and the pupae, as the mortality percentages reached 24.14 and 10.00%, respectively. In addition, the photoperiod, measured by the effect on the maximum and minimum egg rates, played an important role in influencing normal females, as this factor caused a decrease in the number of eggs laid by 23.36%. The combined mortality factors greatly affected the pest's stages from egg to adult, achieving a total death rate of 95.22%, which negatively affected the population tendency index, which indicates a slight increase of 0.54. Table 12 point out that the relative contribution of mortality (k value) ranked first for normal adult females at 0.398, followed by the first larval instar at 0.292 and eggs at 0.268.

Regarding the lifespan of the first generation of *S. cretica* on the two vcultivars of corn, Zwan and Samourai, for Mosul's autumn season in 2023, the findings indicated that the pest's presence was restricted because there was essentially no corn cultivation in the city, which prevented there from being a sufficient and stable population of the pest. In order to survive the winter, it was also discovered that during the second generation, which occurred in late August till October on corn plants, the insect's population clearly increased.

Table 7. Life table parameters of the second generation of *Sesamia cretica* reared on corn *Zea mays* (Zwan cultivar) in Mosul.

X	Lx	Dxf	dx	100qx	Sx	k-value
Egg) N1(	47	Infertility	2	4.25	0.95	0.097
		Predation	7	14.89	0.85	
			9	19.15	0.80	
1st Instar	38	Predation	7	18.42	0.97	0.091
		Unknown factors	2	5,25	0.94	
			9	23.68	0.81	
2nd Instar	29	Predation	0	0	0	0.051
		Unknown factors	3	10.34	0.89	
			3	10.34	0.89	
3rd Instar	26	Predation	0	0	0	0.018
		Unknown factors	1	3.85	0.96	
			1	3.85	0.96	
4th Instar	25	Predation	0	0	0	0
		Unknown factors	0	0	0	
			0	0	0	
5th Instar	25	Predation	0	0	0	0
		Unknown factors	0	0	0	
			0	0	0	
Pupa	25	Predation	0	0	0	0.036
		Unknown factors	2	8	0.92	
			2	8	0.92	
Adult	23	Sex♀55 ♀	2.3	10	0.91	0.041
) N3(FemaleX2	20.7	Photoperiod	4.22	20.39	0.79	0.102
Normal FemaleX2	16.48	Adult mortality	7.13	43.26	0.56	0.253
Total Generation			32.65	80.11	0.199	0.689

0.89=(T1) Population Tendency Index
74=(E.E) Expected number of eggs
0.44=(GS) generation survival rate
42=(N2) Real number of eggs

Table 8. Life table parameters of the second generation of *Sesamia cretica* reared on corn *Zea mays* (Samorai cultivar) in Mosul.

X	Lx	Dxf	dx	100qx	Sx	k-value
Egg) N1(	21	Infertility	2	9.52	0.90	0.046
1st Instar	19	Predation	5	26.31	0.73	0.244
		Unknown factors	3	15.79	0.84	
			8	42.10	0.57	
2nd Instar	11	Predation	0	0	0	0.143
		Unknown factors	3	27.27	0.72	
			3	27.27	0.72	
3rd Instar	8	Predation	0	0	0	0.060
		Unknown factors	1	12.50	0.87	
			1	12.50	0.87	
4th Instar	7	Predation	0	0	0	0
		Unknown factors	0	0	0	
			0	0	0	
5th Instar	7	Predation	0	0	0	0
		Unknown factors	0	0	0	
			0	0	0	
Pupa	7	Predation	0	0	0	0.070
		Unknown factors	1	14.82	0.85	
			1	14.82	0.85	
Adult	6	Sex♀55 ♀	0.60	10.00	0.90	0.046
) N3(FemaleX2	5.40	Photoperiod	0.87	16.11	0.83	0.081
Normal FemaleX2	4.53	Adult mortality	1.88	41.50	0.58	0.236
Total Generation			18.35	87.38	0.0126	0.926

0.90=(T1) Population Tendency Index
32 =(E.E) Expected number of eggs
0.26=(GS) generation survival rate
19 =(N2) Real number of eggs

Table 9. Life table parameters of the second generation of *Sesamia cretica* reared on corn *Zea mays* (Zwan cultivar) in Rabiaa district.

X	Lx	Dxf	dx	100qx	Sx	k-value
Egg) N1(	128	Infertility	9	7.03	0.92	0.194
		Predation	37	28.91	0.71	
			46	35.94	0.64	
1st Instar	82	Predation	7	8.54	0.91	0.149
		Unknown factors	16	19.51	0.80	
			23	20.05	0.71	
2nd Instar	59	Predation	3	5.08	0.94	0.102
		Unknown factors	9	15.25	0.84	
			12	20.34	0.79	
3rd Instar	47	Predation	3	6.38	0.93	0.086
		Unknown factors	5	10.64	0.89	
			8	17.02	0.82	
4th Instar	39	Predation	1	2.56	0.97	0.161
		Unknown factors	11	28.20	0.71	
			12	30.78	0.69	
5th Instar	27	Predation	0	0	0	0.113
		Unknown factors	6	22.22	0.77	
			6	22.22	0.77	
Pupa	21	Predation	2	9.52	0.90	0.180
		Unknown factors	5	23.81	0.76	
			7	33.33	0.66	
Adult	14	Sex♀55 ♀	1.40	10.00	0.90	0.046
)N3(FemaleX2	12.60	Photoperiod	2.27	18.01	0.81	0.091
Normal FemaleX2	10.33	Adult mortality	5.42	52.47	0.47	0.328
Total Generation			123.09	96.16	0.0383	1.450

0.41=(T1) Population Tendency Index
111 =(E.E) Expected number of eggs
0.09=(GS) generation survival rate
53 =(N2) Real number of eggs

Table 10. Life table parameters of the second generation of *Sesamia cretica* reared on corn *Zea mays* (Samorai cultivar) in Rabiaa district.

X	Lx	Dxf	dx	100qx	Sx	k-value
Egg) N1(	82	Infertility	4	4.88	0.95	0.102
		Predation	13	15.85	0.86	
			17	20.73	0.79	
1st Instar	65	Predation	9	13.85	0.86	0.284
		Unknown factors	22	33.85	0.66	
			31	47.69	0.52	
2nd Instar	34	Predation	1	2.94	0.97	0.137
		Unknown factors	8	23.53	0.76	
			9	26.47	0.73	
3rd Instar	25	Predation	0	0	0	0.055
		Unknown factors	3	12.00	0.88	
			3	12.00	0.88	
4th Instar	22	Predation	0	0	0	0.046
		Unknown factors	2	9.09	0.90	
			2	9.09	0.90	
5th Instar	20	Predation	0	0	0	0.022
		Unknown factors	1	5.00	0.95	
			1	5.00	0.95	
Pupa	19	Predation	0	0	0	0.060
		Unknown factors	3	15.79	0.84	
			3	15.79	0.84	
Adult	16	Sex♀56 ♀	1.92	12.00	0.88	0.055
) N3(FemaleX2	14.08	Photoperiod	2.90	20.60	0.79	0.102
Normal FemaleX2	11.18	Adult mortality	6.77	60.55	0.39	0.409
Total Generation			77.59	94.62	0.0539	1.272

0.86=(T1) Population Tendency Index
180=(E.E) Expected number of eggs
0.17=(GS) generation survival rate
71 =(N2) Real number of eggs

Table 12. Life table parameters of the second generation of *Sesamia cretica* reared on corn *Zea mays* (Zwan cultivar) in Nimrod district.

X	Lx	Dxf	dx	100qx	Sx	k-value
Egg) N1(	186	Infertility	18	9.68	0.90	0.278
		Predation	67	36.02	0.63	
			85	45.70	0.54	
1st Instar	101	Predation	16	15.84	0.84	0.187
		Unknown factors	19	18.81	0.81	
			35	34.65	0.65	
2nd Instar	66	Predation	4	6.06	0.93	0.065
		Unknown factors	5	7.57	0.92	
			9	13.64	0.86	
3rd Instar	57	Predation	1	1.75	0.98	0.060
		Unknown factors	6	10.53	0.89	
			7	12.28	0.87	
4th Instar	50	Predation	0	0	0	0.018
		Unknown factors	2	4.00	0.96	
			2	4.00	0.96	
5th Instar	48	Predation	0	0	0	0
		Unknown factors	0	0	0	
			0	0	0	
Pupa	48	Predation	4	8.33	0.91	0.051
		Unknown factors	1	2.08	0.97	
			5	10.42	0.89	
Adult	43	Sex♀56 ♀	5.16	12.00	0.88	0.055
) N3(FemaleX2	37.84	Photoperiod	11.77	31.10	0.68	0.167
Normal FemaleX2	26.07	Adult mortality	14.22	54.54	0.45	0.347
Total Generation			174.15	93.63	0.0637	1.228

0.39=(T1) Population Tendency Index
160=(E.E) Expected number of eggs
0.20=(GS) generation survival rate
73=(N2) Real number of eggs

Table 13. Life table parameters of the second generation of *Sesamia cretica* reared on corn *Zea mays* (Samorai cultivar) in Nimrod district.

X	Lx	Dxf	dx	100qx	Sx	k-value
Egg) N1(	103	Infertility	3	2.91	0.97	0.268
		Predation	44	42.72	0.57	
			47	45.63	0.54	
1st Instar	56	Predation	6	10.71	0.89	0.292
		Unknown factors	21	37.50	0.62	
			27	48.21	0.51	
2nd Instar	29	Predation	2	6.90	0.93	0.125
		Unknown factors	5	17.24	0.82	
			7	24.14	0.75	
3rd Instar	22	Predation	0	0	0	0.046
		Unknown factors	2	9.09	0.90	
			2	9.09	0.90	
4th Instar	20	Predation	0	0	0	0
		Unknown factors	0	0	0	
			0	0	0	
5th Instar	20	Predation	0	0	0	0
		Unknown factors	0	0	0	
			0	0	0	
Pupa	20	Predation	0	0	0	0.046
		Unknown factors	2	10.00	0.90	
			2	10.00	0.90	
Adult	18	Sex♀56 ♀	2.16	12.00	0.88	0.055
) N3(FemaleX2	15.84	Photoperiod	3.70	23.36	0.76	0.119
Normal FemaleX2	12.14	Adult mortality	7.22	59.47	0.40	0.398
Total Generation			98.08	95.22	0.0467	1. 349

0.54=(T1) Population Tendency Index
138=(E.E) Expected number of eggs
0.15=(GS) generation survival rate
56 =(N2) Real number of eggs

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