Beitr. Ent., Berlin 36 (1986) 2, S. 233–235

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Effect of intraspecific competition between larvae of *Calliphora erythrocephala* (MEIG.) (Calliphoridae, Diptera)

1. Introduction

The concept of an all-pervading struggle for existance among organisms in nature holds a prominent place in the tentes of biological science. The form and intensity of struggle varies from time to time and from place to place with the relevant environmental factors and with the kind of organisms concerned. One of its most striking evidence is in the form of competition for a common food supply between numbers of the same insect population.

Larval competition due to increasing population levels have been studied by many authors such as ULLYETT (1950); BHALLA (1964) and ANDERSEN (1965).

The objective of the present study is to evaluate intraspecific competition between the first larval instar of *Calliphora erythrocephala* (MEIG.) to study the following factors:

(1) The effect of starvation on the larval mortality during competition.
(2) The effect of competition on the pupal weight and percentage of adult emergence.
(3) The effect of competition on the ovarioles number of the next generation females.

2. Materials and methods

The *C. erythrocephala* (MEIG.) cultures used in the present investigation were collected from Giza region. The mature adults were kept in Cages (34 × 18 × 25 cm) under room conditions (16 hr light, 28 ± 2 °C and 50% R. H.). The cages were provided with sugar, water and pieces of meat. The meat was changed daily. Shallow pans with meat were placed inside the cages during the morning. They were examined every 30 minutes untile the eggs were deposited. The eggs were transfered to petridishes which contain 2 mm of 0.5% NaOH solution to stimulate egg hatching.

Six different densities of the first larval instar (10, 20, 40, 60, 80 and 100 larvae) were applied. Three replicates were considered for every density. One piece of meat (50 g) was used for each replicate. The meat was placed over 2 cm layer of sieved sand, in the bottom of a plastic boxes (10 × 10 × 8 cm). After pupation the pupae were weighed. The percentage of adult emergence was recorded.

Five newly emerged females were used from every density. Females were isolated in plastic boxes for five days with water; sugar and newly changed piece of meat every day. Dissication have been done at 5 days age using two fine needles. Ovarioles were counted according to (HARLOW, 1956).

3. Results and discussion

The effect of different densities of first larval instars on pupal weight, percentage of pupation, percentage of emergence, sex ratio, and number of ovarioles is presented in table 1–2.

DOI: 10.21248/contrib.entomol.36.2.233-235

3.1. Pupal weight and pupation

It is evident from the results dealing with pupal weight presented in table (1) that an inverse relationship between number of used larvae and weight of pupae was found. This relationship is more clear through high densities 80 and 100 larvae; where the recorded weights were very low in comparison to other applied densities. The reduction in pupal weight was 16% in comparison to pupae weight produced through the least densities. Also an inverse relationship was recorded between percentage of pupation and larval density.

It can be concluded from pupal weight data that as the density increase the pupal weight was decreased with high larval mortality. ULLVETT (1950) found that in the case of *Lucilia sericata* (MEIG.), the regression of total mortality with larval density is almost linear, with decreasing in the pupal weight, this is due to the restriction of meat amount per larvae especially with high densities, in which many larvae was pupated with little weight.

3.2. Percentage of adult emergence

The data of adult emergence were evaluated in two ways:

a) emergence related to those larvae which pupated normally and b) emergence as the index for total survival relative to density.

a) As shown in table (1) emergence based on the number of larvae that pupated shows relatively normal emergence rate till the density of 60 larvae where a sharp reduction was recorded. This may show that a great number of pupae were very weak that they couldn't emerge.

Table 1
Effect of intraspecific competition on pupal weight, rate of pupation and adult emergence in *C. erythrocephala* (MEIG.)

Density of larvae/replicate	Pupal weight in mg	Pupation %	Emergence %	
			per larvae	per pupae
10	0.0795	92	62	68
20	0.0756	96	71	74
40	0.0701	80	48	68
60	0.0697	80	53	66
80	0.0675	77	40	51
100	0.0669	79	33	42

b) On the other hand, presented data in table (1) also show that the total survival rate was very low. It can be postulated from the previously mentioned data that the effect of intraspecific competition on adult emergence shows a normaly effect at densities 20, 40 and 60 larvae, while it shows strongly effect with higher densities. MILLER (1964) stated that with the increase in the numbers of Dorsophila larval density their was additional increase in the numbers of pupae but the viability of these pupae was so drastically reduced that the total numbers of produced adults was less than in the case of lower densities. KLOMP (1964) had a similar results with different species of flies such as *Musca domestica* and *Phormia regina*.

3.3. Sex ratio

It is evident from table (2) that the density levels didn't show any remarkable effect on the sex ratio. SULLIVAN (1963) and KLOMP (1964) didn'nt find any effect for larval competition on the sex ratio of *M. domestica* (1) and *Lucilia sericata* (MEIG.).

3.4. Number of ovarioles

Data presented in table (2) shows that as the number of larvae was increased the number of ovarioles was reduced. This reduction was 25% with the highest density (100 larvae). This can be attributed to the shortage in the amount of food required to the building of

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Table 2
Effect of intraspecific competition between larvae of *C. erythrocephala* (MEIG.) on sex ratio and number of ovarioles

Density of larvae/replicate	Sex ratio		Number of ovarioles
	♀	♂	
10	1	1.3	490
20	1,3	1	450
40	1,3	1	398
60	1	1.01	392
80	1,1	1	380
100	1.05	1	368

ovarioles. The previously mentioned results are in great agreement with the finding of WEBBER (1955).

Zusammenfassung

Die Nahrungskonkurrenz innerhalb der Larven-Population von *C. erythrocephala* (MEIG.) bildet einen wichtigen Faktor, der die allgemeine Fliegenpopulation in der Natur begrenzt. Das gilt, weil der primäre Faktor, der das Anwachsen jeder Insektenpopulation begrenzt, in der Nahrungsmenge besteht, die ihr in ihrem gegebenen Lebensraum zur Verfügung steht. Untersuchungen des Einflusses der Konkurrenz innerhalb der Art während des Larvenwachstums wurden vorgenommen, um die folgenden Kriterien zu ermitteln: Durchschnittsgewicht der Puppen; Prozentsatz der Verpuppung; Sterblichkeitsprozentsatz der Larven; Prozentsatz des Schlüpfens; Geschlechterverhältnis und Zahl der Eiröhren.

Summary

Competition for food among larval population of *C. erythrocephala* (MEIG.) constitutes an important factor limiting the general fly population in nature. This factor is true since the primary factor which limits the abundance of any insect population is the quantity of food which is available to it within its given universe.

Investigations about the influence of intraspecific competition of this species during the larval growth were carried out to asses the following criteria: average weight of pupae, % of pupation; % of mortality among the larvae; % of emergence; sex ratio and number of ovarioles.

Резюме

Борьба за корм между личинками *C. erythrocephala* (MEIG.) является важным фактором, ограничивающим общую популяцию мух в природе, так как основным фактором, который ограничивает численность любой популяции насекомых, является количество корма, имеющееся в ее ареале.

Изучено влияние внутривидовой конкурренции этого вида в личиночный период с целью оценки следующих критериев: средний вес куколок, процент окукливания, процент смертности личинок, процент отродившихся личинок, соотношение полов и количество овариол.

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DOI: 10.21248/contrib.entomol.36.2.233-235