International Science and Technology Journal
المجلة الدولية للعلوم والتقنية

Volume 36 العدد
Part 1 المجلد

المجلة الدولية للعلوم والتقنية
International Science and Technology Journal
ISTJ

http://www.doi.org/10.62341/hmak1210

Received	**2025/01/29**	**تم استلام الورقة العلمية في**
Accepted	**2025/02/28**	**تم قبول الورقة العلمية في**
Published	**2025/03/01**	**تم نشر الورقة العلمية في**

Optimal temperatures for the presence of house mosquitoes (*Culex pipiens*)

A study conducted in the city of Zawia - Libya

Hanan Mohammed Ali Kasheem
Faculty of Science –Zawia-University of Zawia,-Libya
h.mohammed@zu.edu.ly

Abstract

Mosquitoes are the main vector of many diseases for humans and animals, including filariasis, yellow fever, and West Nile fever. This study was conducted in the city of Zawia in order to know the optimal temperatures for the presence of domestic mosquitoes *Culex pipiens* where only adults were collected and the collection was done using light traps in addition to using white covers with insecticide spraying on them, and they were classified according to (1988) during the period from August 2019 to January 2020. The study showed that this species is present throughout the year but in varying numbers depending on environmental conditions. The total number of mosquitoes collected during the six months were 573 mosquitoes, including 473 females and 100 males. Study noticed that the peak period for its presence was during the months of October, November and December, where the temperature ranged between 20 and 27 degrees Celsius, which is the optimal temperature for mosquito activity during the whole year.

Key words: *Culex pipiens*; temperature; peak; environmental; transmission.

International Science and Technology Journal
المجلة الدولية للعلوم والتقنية
Volume 36 العدد
Part 1 المجلد
http://www.doi.org/10.62341/hmak1210

درجات الحرارة المُثلى لتواجد البعوض المنزلي *Culex pipiens* (دراسة أُجريت في مدينة الزاوية ليبيا)

حنان محمد علي كشيم
كلية العلوم الزاوية– جامعة الزاوية – ليبيا
h.mohammed@zu.edu.ly

الملخص

البعوض هو الناقل الرئيسي للعديد من الأمراض للإنسان والحيوان منها الفيلاريا وداء الحُمى الصفراء وحمى النيل الغربي، أجريت هذه الدراسة في مدينة الزاوية وذلك لغرض معرفة درجات الحرارة المُثلى لتواجد البعوض المنزلي *Culex pipines* حيث تم تجميع حشرة البعوض البالغة فقط وكان التجميع بواسطة استخدام المصائد الضوئية CDC light traps بالإضافة إلى استخدام أغطية بيضاء مع رش مبيدات حشرية عليها، وتم تصنيفها وذلك خلال الفترة من أغسطس 2019 إلى يناير 2020.

أظهرت الدراسة أن هذا النوع متواجد طوال العام ولكن بأعداد متفاوتة حسب الظروف البيئية وقد كان العدد الكلي للبعوض الذي تم تجميعه خلال ستة اشهر 573 بعوضة منها 473 انات و100 ذكور، فترة الذروة لتواجد البعوض كانت خلال اشهر أكتوبر ونوفمبر وديسمبر حيث كانت درجة الحرارة تتراوح بين 20 – 27 درجة مئوية وهي درجة الحرارة الأمثل لنشاط البعوض تلك طوال السنة.

الكلمات المفتاحية: درجات الحرارة، الذروة، البيئية، نواقل بيولوجية *Culexpipines*

Introduction

Mosquitoes are considered one of the most important insects that transmit many pathogens, which cause many diseases in humans, including malaria, filariasis, yellow fever, West Nile fever, and dengue fever (Gabriel et al., 2008). Among these species is the domestic mosquito (*Culex pipines*) which is found in homes and belongs to the (Culicidae) Order, Diaptera, as we find that it is found in different areas in Libya, including the city of Zawiya, which is the study area. We find that this mosquito reproduces in different environments such as small ponds, rainwater pools, and sewage water (Alahmed *et al.*, 2010).

http://www.doi.org/10.62341/hmak1210

We find that all stages of mosquitoes, including the adult stages, are affected by temperature, relative humidity and rain, as these factors have an important and prominent impact on the development, distribution and behavior of the insect. (Abo alhab, 1997). Mosquitoes have a wide geographical distribution, as they are found in environments where there are water bodies suitable for laying eggs.

Description of the insect

This insect is characterized by its small size, with a spherical head with a pair of compound eyes and the absence of simple eyes. It has two antennae consisting of 15 segments with sensory hairs. These hairs are dense in males (feathery) and short and few in females (hairy). These hairs are important from a taxonomic point of view, as they are what determine the male and female. The female's mouthparts are of the piercing-sucking type for the purpose of taking a blood meal in order to obtain protein for building eggs, while the male's mouthparts are sucking (Harbach, 1988).

The thorax consists of three parts: the anterior, middle and posterior, and is connected to the head by a short membranous neck. The abdomen is long and cylindrical, consisting of ten segments, the first eight of which are clear, and on each side there is a pair of spiracles. The wings are long and narrow, and fit tightly to the body at rest. They are supported by veins used in classification processes, and the posterior pair of wings is transformed into balancing pins. The legs are long and cylindrical, covered with scales. Each of the last carpal segments of the female ends in a pair of small claws, while in the male only the posterior pair ends in small claws (Laffoon *et al*., 1971).

Temperature is considered one of the most important factors that affect the presence and distribution of mosquitoes, as many studies have shown that temperature has an effect on the age, fertility and feeding rate, so we find that it has an ideal temperature rate that mosquitoes seek to exist in.

It was noted that the average optimum temperatures preferred by mosquitoes range between 20 and 28 degrees Celsius, and this is what the study aimed at, which is to know the time of presence and spread of mosquitoes to determine the appropriate methods to combat them due to the inconvenience they cause and the transmission of diseases to humans.

http://www.doi.org/10.62341/hmak1210

Material and methods

The city of Zawia is located in the northwest of the Libyan coast between latitudes 32º 44` North and longitudes 12º 40` East and its population is about 350,000 people. The adult insect (the focus of the study) was collected twice a month from the study area (agricultural area) for six months during the period from August 2019 to January 2020 using light traps and bed covers with insecticides. The total number collected was 573 of the house mosquito *Culex pipiens*. The samples were then placed in Petri dishes and kept in the freezer in order to kill them. After that, they were taken out and left to relax their muscles so that they could be easily handled for the purpose of classifying them using a microscope and identifying males from females and determining the sex of *Culex pipiens* using the Herbach 1988 classification.

Result

Data were examined between temperature and *Culex* abundance.
Table 1 and figure 1 shows the Samples distribution by study month. As seen in table 2 no statistically significant correlations were found between temperature and total Culex numbers ($r = 0.387$, $p = 0.449$), male *Culex* numbers ($r = 0.460$, $p = 0.359$), or female *Culex* numbers ($r = 0.372$, $p = 0.468$). However, in figure 2 mosquito prevalence was observed between mean temperatures of 20 and 27°C, with the highest prevalence at 25°C. Thus, the results indicate that optimum temperatures lie between these two ranges, which is an important indicator of mosquito abundance in the studied area.

Table (1) Samples distribution

	August	September	October	November	December	January
Culex **Male -Female**	47	112	209	158	27	20
Temperature	30.0	27.8	25.1	20.2	16.8	12.9
Males	10	22	31	28	6	3
Females	37	90	178	130	21	17

http://www.doi.org/10.62341/hmak1210

Table (2) Correlation between temperature and the number of *culex*

Culex	Temperature	
	Correlation	***P*-value**
Total Number of *culex*	0.387	0.449
Number of males	0.460	0.359
Number of females	0.372	0.468

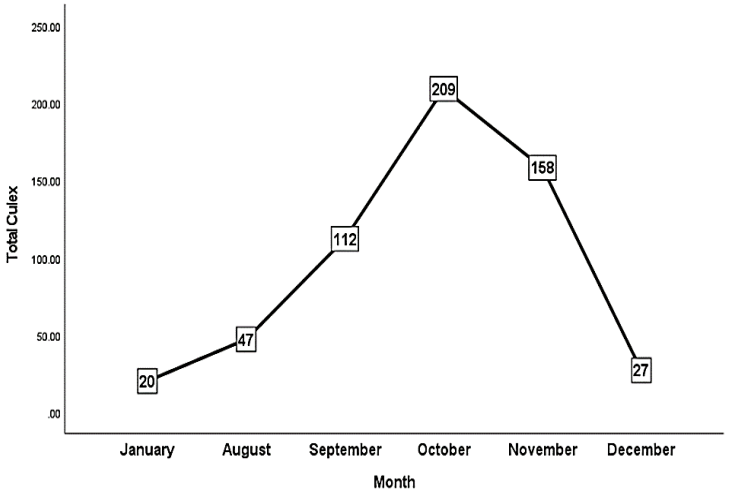

Figure (1) shows mosquito numbers by study month

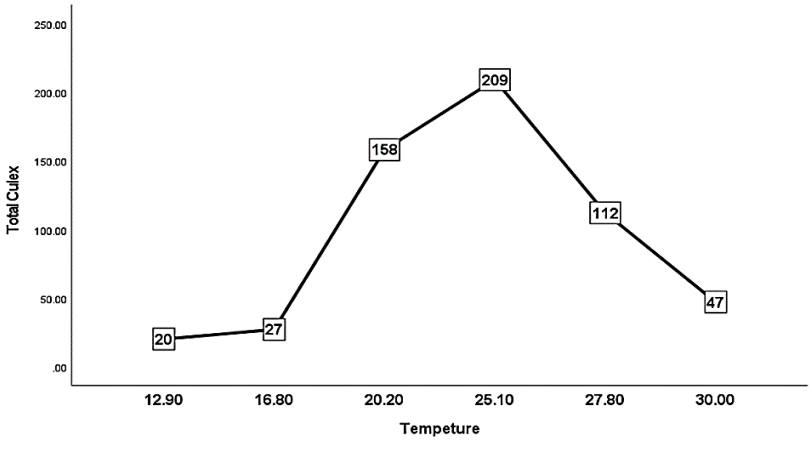

Figure (2) shows the effect of temperature on the presence of mosquitoes

Study notes that according to the first and second curves, the number of mosquitoes was abundant during the months of September,

http://www.doi.org/10.62341/hmak1210

October and November, and the peak was during October, when the optimum temperatures for the presence of mosquitoes were during these months. This is consistent with what was stated in the study of Bayoh and Lindsay (2003).

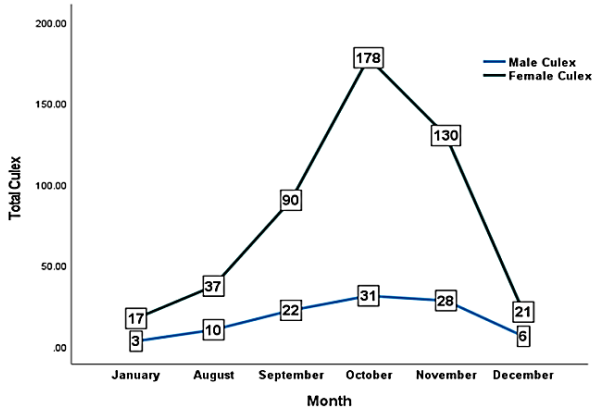

Figure (3) shows the distribution of males and females according to study months

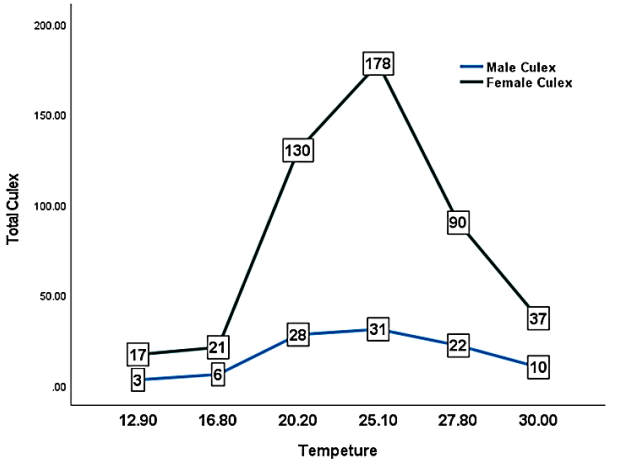

Figure (4) shows the effect of temperature on males and females

Through the curves shown in figures 3 and 4 study notes that the number of females is greater than the number of males, but the effect of temperature is the same on both sexes, except that females are more present, and perhaps one of the reasons for this is their constant search for blood meals that they need to use protein to lay eggs, and this is consistent with what was stated in the study of (Mohamed (2020).

http://www.doi.org/10.62341/hmak1210

Discussion

Environmental factors are important factors for the presence and reproduction of mosquitoes, and since temperatures affect them effectively, we focused in this study on the optimum temperatures for the presence of the house mosquito Culex pipiens, which is the most widespread worldwide and is the carrier of many pathogens and the main carrier of West Nile virus, and is found in abundance in temperate regions, especially around the Mediterranean basin. The study showed that the ideal temperatures for its presence were between 20-27 degrees Celsius, as shown in figure 2, which was indicated by the study of Bayo and Lindsay (2003), which indicated that the appearance of adult mosquitoes was at a temperature between 22-28 degrees Celsius, and this is an agreement between these two studies, and in comparison with the study of Alahmed et al.(2010), which showed that the number of mosquitoes is found between temperatures ranging from 26 to 34 degrees Celsius, which are the ideal temperatures for mosquito activity and the peak was during the month of October as shown in Table 1, they noticed that the number of mosquitoes increases when the temperature drops to 27 degrees Celsius. According to the data recorded in the results of the tables of this study, we find that there is an agreement between them, as the temperatures in which the numbers of mosquitoes were present ranged between 25 and 28 degrees Celsius.

Conclusion

Mosquitoes are considered insects that transmit many diseases to humans, and climate changes are considered one of the most important factors that helped in its spread. Therefore, this study focused on knowing the ideal temperatures for the presence of mosquitoes, which were between 20-27 degrees Celsius. Therefore, a long-term plan was developed to combat mosquitoes and the diseases they transmit.

Reference

Abu Al-Habb, Jalil Karim.(1997). “Medical and Veterinary Insects in Iraq”, (Theoretical Section). College of Agriculture, University of Baghdad, p. 450.

Alahmed, A.M., AL Kheir, S.M., AL Haqawi, H.M. and Sultan, E.A.A., (2010), “Mosquitoes (Diptera: Culicidae) And Their Seasonal Activity in Jazan Region”, Saudi Arabia, Journal ofthe Saudi Society of Agricultural, Vo1.9.

http://www.doi.org/10.62341/hmak1210

Bayoh, M.N., Lindsay S.W. (2003), "Effect of temperature on the development of the aquatic stages of *Anopheles* gambiae sensu stricto (Diptera: Culicidae)", Bulletin of Entomological Research, 93(5):375-81.

Gabriel, L.; Hamer, U. D.; Jeffrey, D. B.; Scott, R. L.; Marilyn, O. R.; Tony, L. G.; Edward, D. W., (2008), "*Culex pipiens* (Diptera: Culicidae): A bridge Vector of West Nile Virus to Humans", Journal of Medical Entomology, 45, 125-128.

Harbach, R.E., (1988), "The mosquitoes of the subgenus *Culex* in southeastern Asia and Egypt(Diptera: Culicidae)", American Entomological Institute, 7, 246.

Laffoon,L.J., Knight,K.L.,(1971), "A mosquito taxonomic glossary v, abdomen (except female genitalia)", Mosquito Systematics, 3(1), 8-24.

Mohamed, S.M., (2020)," On the Relationship of *Culex* Genus to the Transmission of lephantiasis", Zagazig Journal of Agriculture Research, Department of Natural Resources – Institute of Asian Research and Studies, Zagazig University, Egypt, Vol 47, P. 941-950.