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EFFECT OF BIOTIC AND ABIOTIC FACTORS ON *CULEX QUINQUE FASCIATUS* AND *CULEX MOLESTUS* IN IRAQ

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ABSTRACT

A study was conducted, between Juley and April 2013, to investigate the environmental factors (biotic and abiotic) affecting the relative abundance and distribution of mosquito in College of Agriculture/ Baghdad University. The sampling unit comprised different aquatic habitat types including basins, ponds and trocar. Morphological identification revealed two mosquito species, *Culex quinquefasciatus* and *C. molestus*. Statistical analysis indicated that *C. quinquefasciatus* individuals were significantly higher than *C. molestus* in all habitats. The relative abundance of both species was 80.3 and 16.6 respectively in trocars. Results showed the presence of other aquatic habitats including five insect families belonging to three orders (Odonata, Diptera and Coleoptera), frogs and snails.

Key words: mosquito, biotic and abiotic factors, relative abundance, distribution

INTRODUCTION

Mosquitoes, *Culex pipiens* (Linnaeus, 1758) complex (including *C. quinquefasciatus* Say) have a great fundamental, medical and veterinary importance worldwide, as a vital blood feeder and disease vectors (Vinogradova, 1997, 2000). They impact man and/or animals primarily in urban environments and serve as vectors of several pathogens (Venogradova, 2003). Mosquito species differ in the type of aquatic habitats prefered for oviposition based on location, the physicochemical condition of the water body, and the presence of potential predators (Shililu et al., 2003, Piyaratnea et al., 2005). Many physico-chemical factors influence oviposition, survival, and the spatiotemporal distribution of important disease vector species, including salts, dissolved organic and inorganic matter, degree of eutrophication, turbidity, presence of suspended mud, presence or absence of plants, temperature, light and shade and hydrogen ion concentration (Mogi 1978, Amerasinghe et al., 1995, Gimnig et al., 2001). Understanding how these factors affect the distribution of a particular vector species and how they influence larval abundance is essential for larval biology and of great importance in the design and implementation of integrated vector management plans. Several studies have examined the relationship between habitat characteristics and larval abundance. *Culex quinquefasciatus* Say larvae, in Peninsular Malaysia, were the most abundant in polluted drains containing 1.0 to 2.0 g/liter of dissolved oxygen, 1.02.4 g/liter of soluble reactive phosphate and 0.1-0.9 g/liter of ammoniacal nitrogen (Hassan et al. 1993). About 5% of all extant species within the family, Culicidae (mosquitoes) can survive in salt water (Bradley, 1994). Patrick and Bradely (2000) indicated that *C. quinquefasciatus* responded to increased environmental salinity with increased hemolymph levels of serine but suffered a significant reduction in levels of trehalose.

Despite the medical and veterinary importance of *Cx. quinquefasciatus* in direct harm and transmission several disease agents worldwide including Iraq (e.g. *Bancroftian filariasis*) (Mwandawiro et al., 1997, Ali, 1999), no studies have reported the association of the genus *Culex* and environmental factors effecting biological and physiological of immature stage living in Iraqi aquatic habitats. The objectives of this study were to characterize biotic and abiotic factors of mosquito larval habitats and identify the factors that influence the relative abundance and distribution of *C. quinquefasciatus* in different aquatic habitats.

MATERIALS AND METHODS

Sampling: Mosquitoes larvae and other invertebrates' samples were collected from four aquatic environments, including basins, ponds and trocar located in Baghdad Province. Sampling process took about eight weeks between April and July 2013 at interval of one sample/ week. Sample size was 1 liter taken by a dipper sized 250 ml on average of four dips per sample. Samples were kept in 100% ethyl alcohol for calculating and diagnosing.

Aquatic habitats characteristics: Based on shape and size, mosquitoes immature stage aquatic habitats in urban environments were divided in to three types of habitats, trocar, ponds and basins. Trocar contained sewage, drainage, rainwater and possibly groundwater. Ponds contained rainwater and continuously to increase or decrease in the volume of water depending on their locations and environmental conditions such as temperature and rain.

Basins contained mostly groundwater, some-time full of rain. Environmental parameters measured were biotic and abiotic factors including length, width, depth of the water and vegetative growth (floating plants and submersible as a measure of organic materials for feed immature stages of mosquitoes). Floating plants estimated with an area of vegetation related to the surface of water. Vegetative growths under the ground level plants was considered as submersible.

Statistical analyses: Experiments were desi-gned according to the complete randomization using Least Significant Difference (LSD) to compare means. Data analysis was performed using the statistical program SPSS.

RESULTS

Data from table 1 indicated that there were no significant differences in the relative abundance between the two mosquitoes *C. quinquefasciatus* and *C. molestus* inhabiting different environments. While there were significant differences in relative abundance between the two species in each of the different environments. Relative abundance of *C. quinquefasciatus* was higher compared to *C. molestus* which was to 80, 20, 80.3, 16.6 in and 83.3, 16.6 in docks, ponds and trocar of the two species respectively.

Table 1: relative abundance of immature phases of *C. quinquefasciatus* and *C. molestus* in different aquatic habitats.

Type of habitats	*C.quinquefasciatus*	*C.molestus*
basins	80	20
Ponds	80.3	16.6
Trocar	80.3	16.6
LSD	3.75	2.33

Table 2 shows clear differences in the distribution of *C. quinquefasciatus* among different environments. The highest distribution percent was 75% in the trocar while the lowest was in the ponds with 20%. Similar distribution results of *C. molestus* were obtained, when percentages were 15% and 5 % respectively. More differences were found between the two species in distribution rates at each environment.

Table 2: Distribution of immature stage of *C. quinquefasciatus* and *C. molestus* in different environments

Habitat type	*C. quinquefasciatus*	*C. molestus*
Basins	20	5
Ponds	50	10
Tracor	75	15
LSD	3.52	2.41

Table 3 referred to the abiotic factors including length, width, depth and surface area of the environment from which samples were taken. In addition, PH and temperature were similar in different environments.

Table 3: Abiotic factors effecting immature of *C. quinquefasciatus* and *C. molestus*

Habitat	basins	ponds	tracor
Length	3	3	2
Width	3	2	2
Depth	1.75	0.25	1
Surface area	6	1.5	2
PH	7.17	7.10	6.86
temperature	27.80	29.42	26.38

Data showed in table 4 flora and fauna associated with the two species in the aquatic environments. They were from different insect families including Coenagrionidae: Odonatan, Hydrophilidae, and Curculionindae: Coleoptera and Empidoidae: Diptera. Other animals such as frogs and snails, in addition to floating and submersible plants were found

Table 4: The vertebrate and invertebrate exist in different immature aquatic habitate.

Family	Basins	Ponds	trocar
Coinagrionidae (Odonata)	0	5	0
Hydrophlidae (Coleoptera)	0	8	0
Curculionidae (Coleoptera)	0	5	5
Empidoidae (Diptera)	1	2	0
Ephydridae(Diptera)	0	5	1
% Floating plant	3.6	4.6	8.11
% Submerged plant	0.8	0.5	0.03
Frogs	5	10	70
Snails	5	5	5
LSD	2.23	1.12	3.22

DISCUSSION

The relative abundance and distribution indicated the superiority of *C. quinquefasciatus* against *C. molestus* in different environments. This dominance may occur due to competition between the two species, and the availability food sources. Other abiotic factors including length, width, depth and surface area (PH) and temperature or other factors such as heredity may favor C. quinquefasciatus immature stages.

C. quinquefasciatus was found to prefer polluted environments, particularly waste-water, as they supply the organic material needed for the growth and development of the immature stages (Ishii and Sohi 1987). Ali, (1999) suggested that the two species were associated in all different environments, regardless the relative abundance of the two species in different habitats. Muturi et al., 2008 noted that *C. quinquefasciatus* and *C. molestus* are inversely related to aquatic plants.

The type aquatic surface area and the type of environmental characteristics of the biological factors represented by aquatic plant and water area such as floating and submersible plants, length, depth and height (which represents the volume of water), PH and temperature can inhibit the process of larvae breathing.

Patrick and Bradly (2000) indicated that the relative abundance and distribution of mosquitoes were affected by the lack or increase of salinity in water. The larvae of each mosquito species of s have certain limits of tolerance to water salinity as it controls the osmoregulation of the insect's blood related to aquatic organisms. Kramer and Garicia (1989) showed that mosquitoes avoid oviposition in environments where predators exist. As there is no relationship of *C. Quinquefasciatus* mosquitoes with aquatic predators because predators non-specialized which indicates, the presence of mosquito larvae may encourage the presence of such insects or other organisms to reproduce. Mosquitoes use chemical and pyloric sensors to detect larvae and avoid oviposition and breeding larvae in such environments (Blaustein and Kotler 1993). Lamp and Britt 1981 also noted that some insect families such as the Heptgeniidae family feed on immature stages.

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