

***SURVEILLANCE FOR MOSQUITO BREEDING SITES AT
FAYOUM GOVERNORATE AND STUDY THE EFFECT
OF SOME NATURAL PRODUCTS ON THE MOST
COMMON LARVAL SPECIES.***

By

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English Summary

Mosquito are blood sucking insects and considered as vectors for many diseases like; dengue, Japanese encephalitis, malaria and filarial. Mosquito surveillance helps in figuring out their biodiversity and this in turn plays an important role in mitigating disease transmission risks.

The geographical and climatological nature of El-Fayoum Governorate, Egypt, provides a fertile environment for mosquito spreading. So, the present study was conducted and aimed to determine the effect of urbanization, ecological and climatological factors on the prevalence of mosquito species within the Governorate. Moreover, there was a determination for the effect of some natural materials on the most common larval species.

In this study, larvae were collected, by dipping method, from the appropriated breeding sites throughout the six administrative districts of the Governorate. Collected larvae were transported to the laboratory for morphological identification. Water temperature, pH, nitrite, chloride, alkalinity, TDS and EC were recorded. Also, there was a determination for the most effective bioclimatic variables that influence habitat suitability for each species by using maxent. The program estimates the suitable habitat for a species and generates response curves for each bioclimatic variable to estimate the relationships between a species' habitat suitability and bioclimatic variables. ArcGIS 10.3 was used to produce maps for each species, species richness for species included in modeling and risk map for all species.

Additionally, the effect of propolis, bee venom, marjoram, garlic and anise oils were tested against the most common larval species. Also,

treated larvae were tested for estimating the total amount of proteins carbohydrates and lipids.

Our results reported presence of nine mosquito larval species; *Culex pipiens*, *Culex antennatus*, *Culex theileri*, *Culex perexiguus*, *Anopheles multicolor*, *Anopheles sergentii*, *Ochlerotatus caspius*, *Culiseta longiareolata* and *Uranotaenia unguiculata*. These species are belonging to five genera; *Aedes*, *Anopheles*, *Culex*, *Culiseta* and *Uranotaenia*. Of the nine species, *Culex pipiens* was the most abundant especially in Abshway district, followed by *Oc. caspius*.

Mosquito larvae (2559 larvae) were collected from 42 breeding sites including; irrigation channels, canals, agricultural puddles, sewage tanks, stagnant water puddles, and swamps. The most frequent types were canals and stagnant water puddles. Breeding sites with high larval density were beside or close to houses.

For water physico-chemical characteristics, temperature ranged from 19 to 29.8 °C. The mean pH 7.98 showed the alkaline tendency of the larvae. There was a variation in nitrite, alkalinity, chloride, TDS and EC between habitats. *Oc. caspius* and *Cx. antennatus* were significantly correlated positively with Cl⁻, TDS and EC while *Cx. perexiguus* was significantly correlated positively with Cl⁻ only.

There were four bioclimatic variables influencing in the distribution of each mosquito species. Mainly, temperature and precipitation related variables were the most effective. Temperature related variables were the most effective with *Culex antennatus*, *Culex perexiguus*, *Culex pipiens* and *Ochlaerotatus caspius*. Precipitation of wettest month (bio 13) was effective in four species (*Anopheles multicolor*; *Culex antennatus*; *Culex perexiguus* and *Culex pipiens*).

Sites in north and west of El-Fayoum district (Zawyat El-Karadsah, Beni-Saleh and Monshat Abd-Allah), Tamiya in Kafr Mahfouz, south Abshway especially in Tobhar, north Atssa, south and center of sinnuris marked as high risk area while the peripheral sites of the Governorate are vulnerable to low mosquito risk.

For biological control, late third *Cx. pipiens* larval stages were treated by different concentrations of the tested materials for 24 hours. Propolis and bee venom didn't show any significant effect on larval mortality while garlic, marjoram and anise oils showed larvicidal activity with LC₅₀ values 1323.81, 840.71 and 577.53 ppm, respectively. Out of the three essential oils, anise oil was the most effective one.

The metabolic rate change within the treated larvae was estimated through determination of total proteins, carbohydrates and lipids. Garlic oil significantly reduced protein content from 33.8 ± 0.98 to 30.4 ± 0.4 mg/g. Marjoram and garlic oils significantly reduced carbohydrate content from 15.76 ± 0.7 to 11.43 ± 0.66 and 11.2 ± 0.7 mg/g respectively. Anise oil significantly increased lipid content from 3.11 ± 0.21 to 3.57 ± 0.14 mg/g.

In conclusion, the study recorded *Cx. pipiens* as the most abundant mosquito species. Temperature and precipitation related bioclimatic variables affected in distribution and abundance of mosquito larvae. Sites like; Tamiya (Kafr Mahfouz), Abshway (Tobhar), El-Fayoum (Beni-Saleh), south and centre of Sinnuris are high risk area and more vulnerable to mosquito-borne diseases. Additionally, anise oil showed a good larvicidal activity with *Culex pipiens*.