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POPULATION DYNAMICS OF MOSQUITO LARVAE OCCUR IN STAGNANT WATER OF TALUKA KHAIRPUR NATHAN SHAH DISTRICT DADU SINDH, PAKISTAN.

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ABSTRACT

A Study was carried out to assess the population dynamic of mosquitoes in the water bodies of the Taluka Khairpur Nathan Shah of District Dadu Sindh Pakistan. The five selected stations were monitored monthly. This study recorded 6119 mosquito larvae. They recorded the highest in April, May, August, September, and October and the lowest in January and July. The data were sorted and identified into genera *Anopheles* and *Culex.*

Keywords: Mosquito larvae, Population dynamics, Stagnant water, Taluka Khairpur Nathan Shah, District Dadu

INTRODUCTION

The mosquito larvae are found in freshwater and normal saline water bodies, because of their low salt tolerance capability as surface dwellers. According to the World Health Organization (WHO) report 2017, mosquitoes transmit disease to more than 700 million people yearly due to malaria and dengue. Mosquitoes are important arthropods that play a major role in the ecology of the food chain and the transmission of diseases. They are bloodsuckers and create a nuisance to

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man, mammals, reptiles, amphibians, and fishes. It is a known fact that hundreds of species of mosquitoes are transmitting disease to humans and animals. Furthermore, 90% of deaths due to malaria happen in Africa WHO 2017. *Plasmodium falciparum*, a dangerous protozoon also carried out by mosquitoes.

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MATERIALS AND METHODS

In the present study, five sampling stations were selected for the collection of water samples and mosquito larvae biomass qualitatively and quantitatively from Taluka Khairpur Nathan Shah. The collection and studies were started in January 2017 and continued until December 2017. Samples and readings of results were done at bimonthly intervals. This site contains TMA Sewerage water storage located west of Khairpur Nathan Shah town. It is a sewage stagnant water reservoir spread over 50 acres from Mir Khan Mohalla to the motorway bypass road Khairpur Nathan Shah. Mix water, TMA drainage sewerage, and paddy irrigation water from the different sides of the sewerage water stores here. Many species of aquatic insects, green vegetation, and pamphlet fish are present. During my study on this site, mosquito larvae were found in large quantities (Fig.3-2&4). The Jamali water pond is in the village Jarwar near GDC KN Shah. It is a small fishpond. In this site, water comes from the irrigation channel khudawah. Little vegetation and a population of mosquito larvae are found here. (fig 3-3). This site is along the motorway near PSO Bughio petrol pumps bypass road Khairpur Nathan Shah. It is a large water reservoir ditch consisting of more than 100 acres. Many kinds of aquatic insects some varieties of fishes and mosquito larvae in much quantity are present. It is 2nd largest lake in District Dadu Sindh Pakistan after the Mancharlake. The largest natural lake of Taluka Khairpur Nathan Shah measures 34 square km and is filled by a Rice canal at the end of paddy season, vegetation is common small and large grasses were found, other insects, green turtles, frogs, aquatic snakes, many kinds of fishes and mosquito larvae are present along with the shores. (fig 3-4). It is situated along with Mehar Road Khairpur Nathan Shah. It is a small narrow ditch filled also from the Rice canal through paddy crop. In small ponds in this research area, small and large grasses are present. Other insects, some species of amphibians, reptiles, and fishes are present several mosquito larvae are also present. (fig 3-6). Water quality parameters were measured in the field with the help of digital meters. A few samples were collected from the proposed sites at a depth of 1-3 ft depth through a measuring gadget glass 1L water sampler, preserved in sterilized plastic bottles in ice by adding 2% HCL. Samples were brought to the laboratory for detailed studies. The temperature (°C) of water was measured by dipping a mercury thermometer and recorded during the sampling period. These parameters were measured with a WTW 320 conductivity meter. Water samples were placed into clean beakers, conductance cell of the meter was immersed into the sample solution. The resistance was measured in µs/cm or mS/cm, depending upon the concentration of salts in a sample, similarly, the readings of salinity and total dissolved solids were noted with the conductivity meter by changing mode of measurement to salinity and TDS. The cell was rinsed in a beaker with distilled water after each reading. The calibration measurement was performed in 0.00702 NKCI solutions. This solution has a specific conductance of 100 µmhose at 25 °C.pH was measured with Orion 420 A pH meter. Before use, it was calibrated according to the instructional manual provided by the manufacturer. Dissolved oxygen was measured with the help of Oxy. 315i/SET meter. The mosquito larvae samples were collected with plankton net No. 25 (mesh size 55um) bimonthly during early morning and late evening (Twice a day) (Fig. 4). The samples were preserved in 5% formalin in sterilized plastic bottles; however, the samples were also brought to the laboratory for assessment qualitatively. For quantitative analysis, samples were strained from a known volume of water with a measuring cylinder of 1000cc. The sample volume was filtered and strained in a plankton net. The residues as quantitative mosquito biomass from the selected sites were examined in the laboratory. The identification and examinations were done, and further detailed studies will be carried out in the laboratory with the help of taxonomic keys and the latest illustrations.

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Figure 3.2. Collected of Sample

Figure 3.3. Mosquitoes larvae

Figure 3.4. Collected mosquito larvae samples

Figure 5. Collection and identification mosquito larvae of Culex and Anopheles

RESULTS & DISCUSSION

The sample of mosquito larvae was collected from five stations of stagnant water of Taluka Khairpur Nathan Shah from January 2017 to December 2017. Water bodies are Ditches, Ponds and lakes during January 2017 to December 2017 permanent stagnant water bodies all samples observed under microscope. After the morphological identification, two types of genera of mosquito larvae were found from collected water samples from five stagnant water bodies Jamali pond, TMA drainage sewerage, Bughio Pond, Kandichukhi Lake and Jakhro Lake. These two Genus of larvae of mosquito were found *Culex* and *Anopheles* showed only two types of mosquito larvae in all the five stagnant water bodies. Some important identification characters through external morphological features. Show in table no: 4.1

Table 4.1. Identification of mosquito larvae on the basis of morphological characters

Morphological Characters	Culex	Anopheles

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1, Siphon	Present	Absent
2,Setae on the siphon	In several pairs	Absent
3,Pectin teeth	Present in several no	Ab sent
4,Palmate hair	Absent	Present
5,Structure of antenna	With spicules	Without spicules

Table 4.2. Monthly collection of population of mosquito *Anopheles* larvae of (1000ml) at five Stations of Taluka Khairpur Nathan Shah during 2017

Months	St.1	St.2	St.3	St.4	St.5	Mean	STDEV
January	5	0	1	5	6	3.165233	2.221861
February	34	18	26	17	31	20.9139	9.321211
March	97	60	67	65	65	57.87444	24.89554
April	115	55	61	54	44	55.91669	27.64348
May	140	47	57	48	25	57.14958	37.37667
June	5	0	0	11	6	4.286222	3.769775
July	4	0	0	6	1	2.178966	2.191725
August	65	6	8	17	45	26.6782	21.1556
September	125	52	55	40	50	55.98815	30.79521
October	186	98	94	106	120	100.4589	45.09157
November	104	54	71	91	97	68.56314	29.75512
December	4	0	1	5	3	2.395836	1.71669

Table 4.3. Monthly collection of population of mosquito *Culex* larvae of (1000ml) at five stations of Taluka Khairpur Nathan Shah 2017

Months	St.1	St.2	St.5	St.4	St.5	Mean	STDEV
January	6	0	2	0	9	3.4	3.555278
February	56	9	10	80	22	35.4	28.05423
March	270	26	29	42	66	86.6	92.77845
April	332	24	40	70	90	111.2	112.7589
May	301	22	31	41	55	90	106.0679

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June	4	4	0	0	2	2	1.788854
July	0	0	0	0	3	0.6	1.2
August	170	14	34	13	25	51.2	59.89791
September	312	22	35	16	38	84.6	113.9888
October	410	23	16	12	86	109.4	152.6979
November	25	11	8	5	22	14.2	7.884161
December	6	0	4	5	9	4.8	2.925748

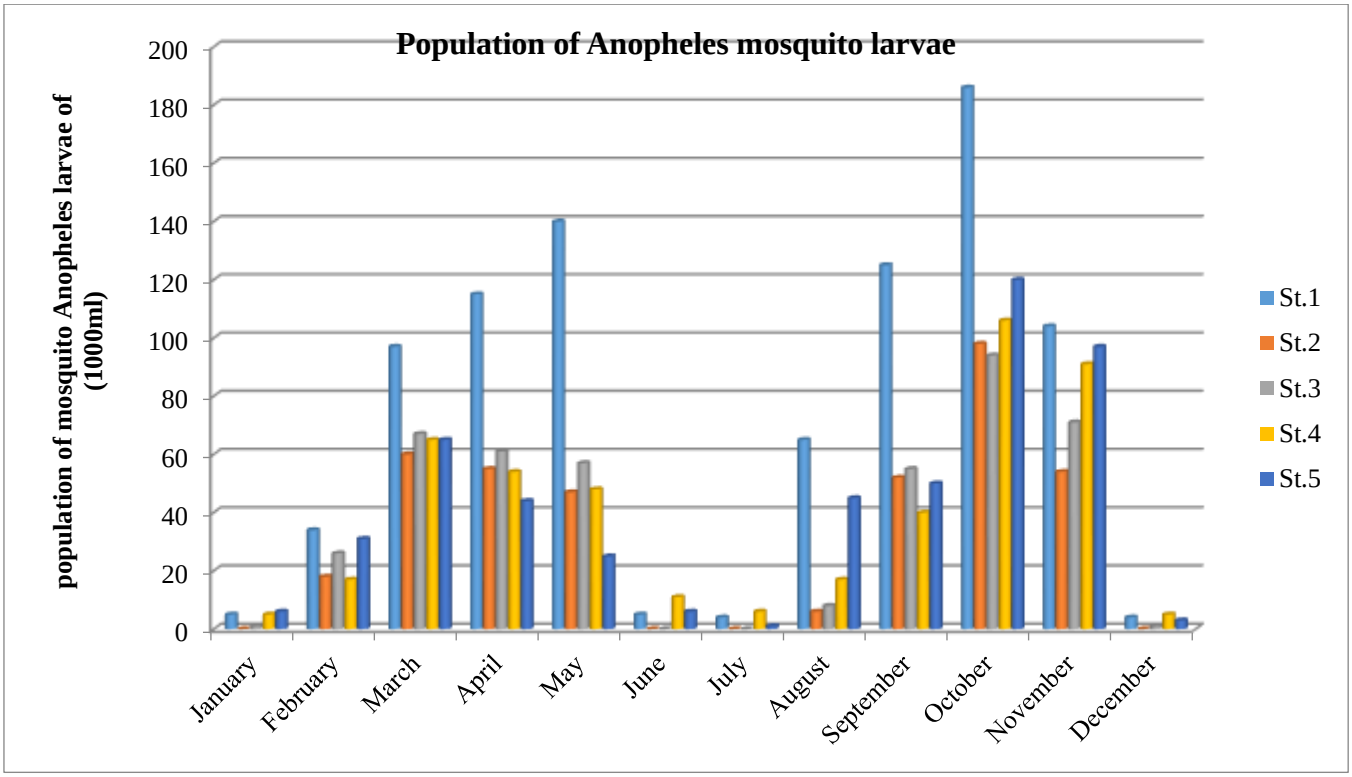

Figure 4.1. Monthly collection of population of mosquito *Anopheles* larvae of (1000ml) at five Stations of Taluka Khairpur Nathan Shah during 2017.

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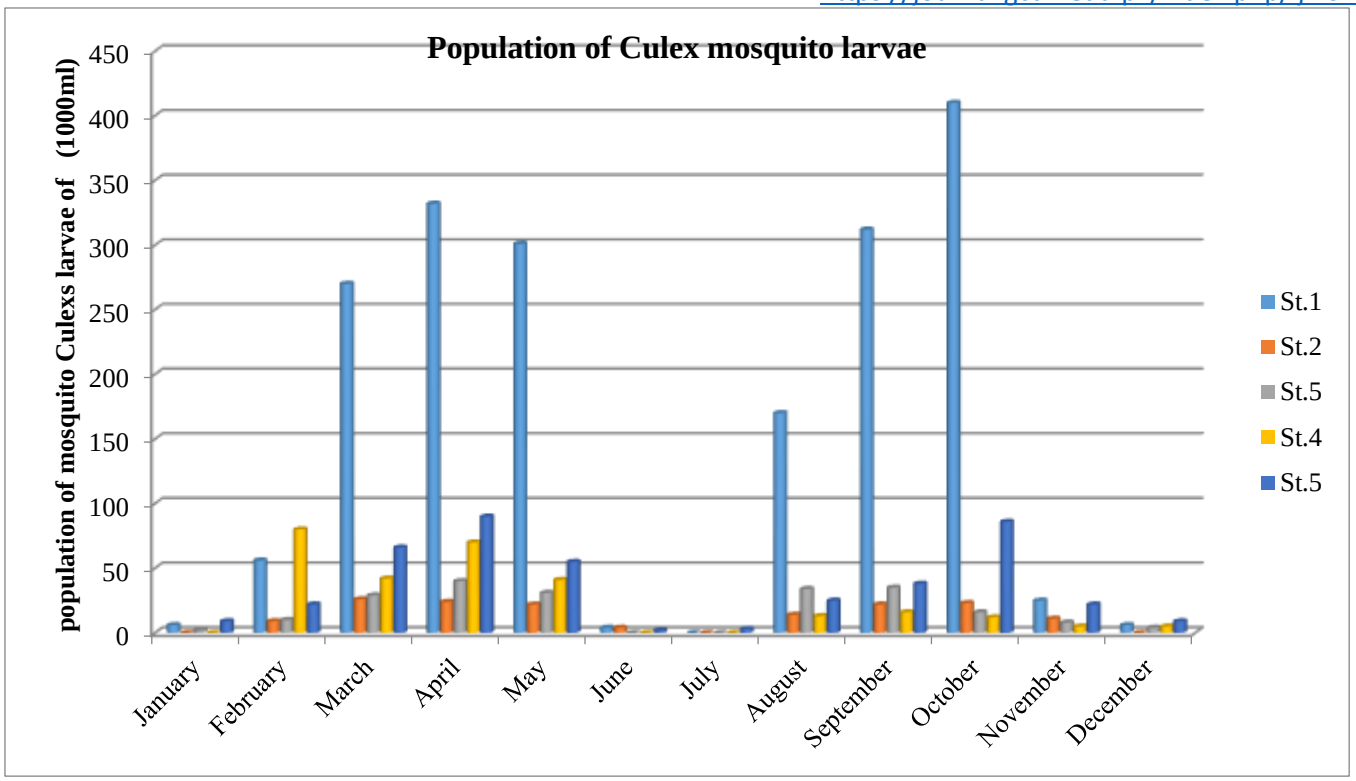

Figure 4.2. Monthly collection of population of mosquito *Culex* larvae of (1000ml) at five stations of Taluka Khairpur Nathan Shah larvae 2017

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Population dynamic of mosquito larvae at various stations:

Water samples from station no 01 possessed varying populations of *Culex* and *Anopheles* larvae. The larvae of *Anopheles* found in larger than *Culex* larvae in January. The acceleration hype in larvae was recorded in February but *Anopheles* were in greater numbers than *Culex* larvae. The highest larvae of *Culex* were recorded in October and no larvae were collected so far in July from station no1. The highest population of *Anopheles* larvae was recorded in March and a very low count was noticed in July. Moreover, the population of *Anopheles larvae* was reported higher than *Culex* in station 01(Table 421&4.3).

Water samples collected from station 02 showed a swing trend in the mosquito larvae population. The highest population of *Culex* mosquito larvae in March and October and no larvae were recorded in January and December. In the case of *Anopheles* larvae highest were recorded in February and March and no population was observed in January. July, August, November and December. Furthermore, overall mosquito larvae were observed less in station 02, as compared to station 01(Table 4 1&4.2).

The water samples from station no3 showed an increased trend as compared to the previous station. The population of *Culex* larvae recorded highest in April and September. However, no *Culex* was observed in June and July. While statistics of *Anopheles* show that there is hype in population in April and the lowest population was noticed in January and December.

The samples from station 04 Kandichukhi Lake contain an abundant population of *Culex* and *Anopheles*. It is observed that the highest count of *Culex* larvae numbered in February whereas zero population of *Culex larvae* was observed in January, June and July. In the same statistics the highest number of *Anopheles* larvae was noticed in April, but no larvae were found in the sample in June, July and August.

The samples from Jakhro Lakes Station 05 contain an ample population of mosquito larvae. The highest population of *Culex* larvae was seen in April and the lowest was recorded in June and July. Furthermore, the highest population of *Anopheles* larvae was also recorded in April and no *Anopheles* were recorded in June, July and August. (Table 4.1&4.2).

The population dynamic of mosquito larvae at all stations: TMA drainage sewerage (station 01) Jamali pond (station 02) Bughio ditch (station 03) Kandichukhi Lake (station 04) and Jakhro Lake showed the same trend except TMA drainage and sewerage. The highest annual population of *Culex* larvae was 1892 and *Anopheles* larvae was 1725 recorded from TMA drainage and sewerage. While a uniform trend was noticed in the rest of the stations, the lower populations of *Culex* larvae were noticed in Jamali pond (station no 02). In Bughio ditch and Kandichukhilake, the population of *Culex* was the same the population dynamic of Anopheles larvae was noticed lower in (station 02) Jamali pond. The population of *Anopheles* larvae recorded the same Bughioditch (station no 03) and Kandichukhi Lake (station no 04). To sum up, the highest number of mosquito larvae was observed in station 01 and the lowest in station no02.

Physico-chemical analysis was carried out regularly from designed stations. The water was analyzed when samples were taken. These parameters include temperature, pH, alkalinity total dissolved solids, salinity and dissolved oxygen. These were recorded on the spot and in the laboratory. The correlation between environmental factors and the abundance of larvae population was done. It also tried to corroborate the influence of physico-chemical quality with biological implications. Each of these are discussed below.

Temperature is a pertinent factor in water ecology. It regulates the abundance of biodiversity in it. It plays a great role and is the chief driving force of this ecosystem.

The mosquito larvae positively related to the increase in temperature. A low count of larvae was found in the lowest and highest temperature months whereas larvae were abundant in moderate temperature periods. Moreover, prevailing conditions and temperature in all stations favour *Culex* and *Anopheles* larvae and no aedes were

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recorded so far. Furthermore, the highest population of *Anopheles* was recorded in designed stations.

It is observed that pH negatively impacts the abundance of mosquito larvae in some stations. While it was noted that it is in significant factor in station 2&3 the lowest and highest ph do not favor growth in larvae population. While moderate pH favors the abundance of the mosquito population.

Alkanity is minor factor in controlling mo values mosquito larvae population. In Station 1 it was observed that it impacted positively as other stations do not show any correlation.

The study shows that TDS content fluctuates from January to December 2017. A decrease (2239-3072mg/l) was found from March to July. While TDS value accelerated(3588.6-4865.6mg /l) during the month of September to January. It may be due to less evaporation. The highest value was recorded station in 3 in January while lowest value was found in station4 in months of December (Table 4.6)

The mosquito larvae population was found to be positively co-relation in station 1 and 2. While station 3,4,5 found a negative relation with it. Moreover, it is insignificant to conclude presence in presence of other physic- chemical factor, which has major relations.

In this study, the value of dissolved oxygen is calculated regularly.

The lowest ratio of dissolved oxygen (3.8mg/l)was measured at station 5 in July and highest value (9.5 mg/l)was recorded at station 4 in February month. It is also significant to follow the pattern of dissolved oxygen meticulously. It is inversely related to a change in temperature. (Table 4.7)

The value of dissolved oxygen at all stations was recorded between 0.76+0.07- 5.83+0.71. The requirement of dissolved oxygen is commonly less than 10mg /l. Therefore, the value of dissolved oxygen in all stations shows that these sites are the favorite habitat for mosquito growth and population abundance.

DISCUSSION

Sindh is the 2nd largest province of Pakistan in terms of having 23% of the human population spread out in rural and urban areas. Pakistan is now facing the problem of diseases like Malaria, Yellow Fever, Dengue and Zika virus which spread through Mosquito species resulting human being severely affected health injuries as well as destroying the economies of the country. Literature indicated that in Pakistan lot of cases of dengue, malaria have been reported therefore it is necessary to pay serious attention to the biological control of mosquito and its larvae. Present applied nature research work is the first step in connection with population dynamic of mosquito larvae occurring in Taluka Khairpur Nathan Shah in Dadu Sindh.

Today mosquitoes are a major problem for human health injuries and loss of economies throughout the world and especially in tropical areas where mosquitoes spread a number of diseases [16]. Mosquito larvivorous fish sizes 1.5 to 5.7 inches are effective for biological control [10]. These fish start feeding very quickly till fullness of their stomach and such small predator fish can consume 80 to 200 mosquito larvae in a day. These days the small size of fish species is declining because of overfishing exploitation and the use of illegal nets, pesticides and toxic chemicals in the aquatic resources of Sindh.

In the proposed research work, Indigenous and exotic fish will be used to observe their role in the control of mosquito larvae, the feeding mechanism of mosquitofish, consumption of larvae per day and assessment of pre- and post-mosquito biomass will remain as the prime aim of this research Dengue fever and Malaria is spread through mosquitoes. Both the diseases are lethal and dangerous. Fishes like mosquito larvivorous fish (*Gambusiaaffinis*), Mollies (*Poeciliasphenops*), Platies (*Xiphophorus*sp.), Guppies (*Poecilia reticulate*), Tilapia (*Oreochromesmossambicus*and*O. niloticus*) and Goldfish (*Carassiusauratus*) etc are also feeding

CONCLUSIONS

The present study explored the population dynamic of mosquitoes in Taluka Khairpur Nathan Shah. It is well known fact that larvae and breeding areas

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are prime sources of mosquito infection in the human population. Therefore, the present study recommended that breeding sites especially Taluka municipal ponds and gutter storing areas must be cleared and properly maintained to avoid population expansion of mosquitoes. It also recommended that open spaces and open gutter lines be closed to reduce the breeding site of mosquitoes and the growth of larvae.

Moreover, the present study also investigated that water having a high content of dissolved solids is a favorable ground for mosquito breeding. So the solid waste usually emitted from houses in gutter lines provides a feeding and protection habitat for mosquito larvae. These solid wastes must not be allowed to go with drainage water. If this is done it will reduce the larval population. The present study studied the physical parameters of the breeding sites of mosquitoes. It is recommended that biological parameters must be a certain fact whether physical or biological components are supporting the larval population. This study also recommended that civic conditions should be improved to mitigate the impact of mosquitoes in urban areas.

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