

“Effect of Different Ranges of Temperature, PH Value & Light Conditions on Rearing and Emergence of Larvae in Selected Species of *anopheles* , *culex* & *aedes* Species in Laboratory”

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Abstract:- Present study is based upon experimental work to observe the effect of different physical ecological factors on emergence of mosquito larvae belonging to three *Anopheles* species (*An. subpictus* , *An. stephensi* and *An. culicifacies*) ,one *Culex* species (*Cx. quinquefasciatus*) and one *Aedes* species (*Ae. aegypti*) . Effect of different ranges of temperature, pH value and intensities of light was observed on emergence of larvae of selected species of mosquitoes in presented study. Separate experimental setups were established for estimating effect of each physical ecological factor. Higher water temperature range, high pH value of water and unavailability of light proved unfavorable for emergence of mosquito larvae. Effect of rise in temperature caused the faster developmental rate in all species; whereas rise in pH and darkness delayed the developmental phase.

I. INTRODUCTION

Still mosquitoes are a big hazard for human life in underdeveloped and developing countries and causing serious damage to human lives and economy. Mosquitoes are related with various epidemic diseases acting as vectors of these diseases like Malaria, Filariasis, Dengue, Dengue-hemorrhagic fevers and several viral Encephalitis. Present experimental work is an exercise to conclude relationship among important physical factors and emergence of selected species of mosquito larvae..

This experimental work was conducted on five selected species of mosquitoes, out of which three belonging to genus *Anopheles* (*An. subpictus* , *An. stephensi* and *An. culicifacies*) , *Culex quinquefasciatus* and *Aedes aegypti* .The effect of three important environmental factors viz. temperature , pH and light intensity were studied in laboratory condition on emergence of larvae of five selected species of mosquitoes.

II. METHODOLOGY

For the effect of temperature on emergence of larvae from eggs, the range of temperature for study was fixed between 24°C to 40°C ; and observations were taken separately at each point range viz. 24°C, 28°C, 32°C, 36°C and 40°C .Total five containers were maintained, each with specific temperature and containing mixed batches of eggs of mosquitoes of all five selected species . The water temperature of larva containing containers was maintained separately by using thermostat based aquarium heaters. The pH value in all containers was kept fixed on 7.0 and light conditions natural.

For the study of effect of pH , range was kept between 6.0 to 8.0 and observations were taken on different pH values separately viz.6.0 , 6.5 , 7.0, 7.5 and 8.0 .Five different containers with mixed batches of eggs of all selected species of mosquitoes were used, and in each container specific pH value of water was maintained . The acidity and basicity of water, containing larvae was maintained by adding adequate amount of acid and base respectively . Temperature was kept on the range of room temperature range i.e. between 30°C to 32°C and light conditions were kept natural.

Three parameters for light intensity viz. dim, full and dark were used for study of effect of light on growing larva stages of selected five mosquito species. Three containers were used, one for each light condition .Temperature range was kept fixed between 30°C to 32°C and pH value was maintained on 7.0 .

III. OBSERVATION AND DISCUSSION

Among all considered species of mosquitoes maximum emergence was observed on 32°C , which was recorded between 70.25% (*An.subpictus*) to 85.10% (*Ae. aegypti*) and in 40°C temperature range larval emergence was recorded minimum between 42.30% (*An.culicifacies*) to 46% (*An. subpictus*). Maximum development period for emergence of larvae observed on 24°C between 14-17 days (*Cx. quinquefasciatus*) and minimum days took for emergence on 40°C between 4-5days (*An.stephensi*) to 7-8days (*An. culicifacies*).

Physical Ecological factors	<i>An. subpictus</i>		<i>An. stephensi</i>		<i>An. culicifacies</i>		<i>Cx. quinquefasciatus</i>		<i>Ae. Aegypti</i>	
	Deve. Pd. (days)	Emergence (%)	Deve. Pd. (days)	Emergence (%)	Deve. Pd. (days)	Emergence (%)	Deve.Pd. (days)	Emergence (%)	Deve. Pd. (days)	Emergence (%)
<i>Temperature</i>										
24°C	15-16	54.10	17-18	57.20	16-17	53.20	14-17	55.50	18-19	55.20
28°C	12-15	75.30	13-16	74.10	12-14	74.00	10-12	73.50	14-16	70.80
32°C	09-11	76.20	11-14	83.20	10-13	84.10	12-14	80.20	15-16	85.10
36°C	07-09	70.00	05-07	58.80	08-09	62.30	10-12	65.60	09-11	63.20
40°C	06-07	46.00	04-05	40.80	07-08	42.30	05-07	53.60	06-08	44.00
<i>pH</i>										
6	13-16	42.60	12-15	40.20	13-16	44.00	15-17	41.8	15-19	53.10
6.5	12-15	61.80	11-14	60.30	11-15	58.00	12-14	63.1	14-18	56.70
7	10-13	60.20	10-13	54.00	10-13	63.10	09-14	55.3	10-13	60.20
7.5	16-19	38.60	14-17	36.80	16-19	40.02	14-16	44.1	07-11	40.10
8	-	-	08-10	15.00	-	-	07-09	19.2	-	-
<i>Light</i>										
Dim	15-20	52.30	15-20	54.60	15-20	54.00	16-20	52.60	14-19	45.90
Full	11-15	62.30	12-16	61.70	11-14	67.03	12-16	68.00	15-16	62.00
Dark	50-70	20.30	65-70	19.70	50-65	21.01	55-65	22.60	60-70	25.60

Table 1- Effect of different physical ecological factors on developmental period & emergence of mosquito larvae
Deve.Pd.-Developmental period, An.-Anopheles, Cx.-Culex, Ae.-Aedes

Overall maximum success rate of emergence among all mosquito species larvae was observed in *An.subpictus*, i.e. at 28°C, 36°C and 40°C temperature range was recorded highest 75.3%, 70.0% ,46.0% respectively .

Under the effect of different pH ranges the rate of emergence recorded maximum was on two pH values viz. 6.5 and 7.0, it was recorded between 54.0% (*An.stephensi*) to 63.0% (*Cx. quinquefasciatus*) and no emergence was recorded in *An.subpictus*, *An. culicifacies* and *Ae. aegypti* at pH 8.0.

Minimum emergence period was observed 7- 11 days in *Ae. aegypti* and maximum , 16-19 days in *An.subpictus* and *An. culicifacies*.

With reference to light conditions overall maximum emergence was observed in full light condition between 61.70% (*An.stephensi*) to 68 % (*Cx.quinquefasciatus*) & minimum in dark condition between 19.70% (*An.stephensi*) to 25.60% *Ae.aegypti* & absence of light drastically increased the length of developmental period upto 50-70 days (All species) ; whereas in full light condition developmental period was observed minimum i.e 11-16 days (All species).

IV. CONCLUSION

All selected species of mosquito in present experiment responded in almost similar manner except *An.subpictus*, *An. culicifacies* and *Ae.aegypti* which could not withstand pH value 8.0.

With reference to effect of temperature maximum emergence was seen on 32°C & best response 85.10% was shown by *Ae.aegypti* & the lowest response on this temperature range was shown by *An.subpictus*

76.20%.Overall minimum emergence was recorded on 40°C, In this range of temperature maximum emergence 46% was shown by *An.subpictus* whereas minimum rate of emergence 40.8% was recorded in *An.stephensi*. Overall best performer mosquito species with reference to temperature effect was *An.subpictus*. Temperature also effected developmental period as it represented a decreasing trend i.e. 15-16 days (24°C) to 6-7 days (40°C). Final conclusion regarding effect of temperature on developmental period and emergence of selected mosquito larvae can be stated as with the increase of temperature the developmental period and rate of emergence decrease gradually.

The most favorable pH range for emergence of mosquito larvae was recorded 6.5-7.0 in which maximum 63.10% emergence on pH 7.0 was observed in *An.culicifacies* whereas lowest emergence in this range was 54% on pH 7.0 in *An.stephensi*. Three species viz. *An.subpictus* ,*An.culicifacies* & *Ad.aegypti* were not able to withstand pH value 8.0, on this value emergence rate of *An.stephensi* was 15% & *Cx.quinquefasciatus* was 19.2%. pH value did not affect developmental period much as it remained between average 10-19 days. Hence, finally regarding effect of pH it is concluded that, the pH value does not affect developmental period too much but the percentage of emergence is affected by increase or decrease in pH.

Full light condition was found to be best condition for emergence of mosquito larvae between 61.7% (*An. stephensi*) to 68%(*Cx.quinquefasciatus*) and dark condition was proved worst only 19.7%(*An. stephensi*) to 25.6% (*Ae. aegypti*).Developmental period found lowest in bright light between the average range of 11- 16 days and in dark phase it increased to 50-70 days.

Hence high water temperature range, high pH value of water and unavailability of light proved unfavorable for emergence of mosquito larvae. Effect of rise in temperature caused the faster developmental rate in all species ; whereas rise in pH and darkness delayed the developmental phase.

REFERENCES

- [1]. **Ansari et. al** (1978): Mass rearing procedure for *Anopheles stephensi* (Liston) *J. Comm. Dis.*, 10 (2): 131-135.
- [2]. **Ansari et. al** (1982) : Ecology of Anophelines In Basantpur village situated on the bank of Jamuna. *Indian j. Malariol.*, 19:65-68
- [3]. **APHA, AWWA, WPCF** (1981): Standard methods for the examinations of water and waste water . *Fifteenth edition* pp 1-53
- [4]. **Armstrong et.al** (1961): The maintenance of of a colony of *Anopheles gambiae*, with observations on the effect of changes in temperature . *Bull. Wld. Org.*, 24 ,427-435.
- [5]. **Batra, C.P.,et.al** (1979): Breeding of *Anopheles stephensi* (Liston) in wells and cisterns of Salim, Tamil Nadu . *Indian J. Med. Res.*, 70(suppl.):144-122.
- [6]. **Bhatt, R.M., et.al** (1991) : Seasonal prevalence of Anopheline in Kheda district Gujrat. *Indian J. Malariol.*, 28(1)–(18).
- [7]. **Bhatt, S.D. and Negi, U** .(1984): Phyco-chemical features and phytoplankton population in a subtropical pond . *Comp. Physiol. Ecol.*
- [8]. **Biswas, S., et. al** (1980): Successful laboratory colonization of *Anopheles annularis* . Van Der Wulp, 1834, *J. Comm. Dis.* 12 (1): 55-57.
- [9]. **Coetzee et.al** (1988): Effects of salinity on the larvae of some Afrotropical Anopheline mosquitoes . *Med. Vt. Entomol.* , 2:385-390
- [10]. **Das, B.P., et. al** (1990): Pictorial key to Indian Anopheline mosquitoes . *Zoology* .2(3):132-162.
- [11]. **Gerberg, E.G.**(1970): Manual for mosquito rearing and experimental techniques. *Am. Mos. Cont. Assoc. Bull.*, 5:1-109
- [12]. **Imms. A.D., et.al** (1963): General text book of Entomology . *Elbs. Edition, Asia Publishing House New Delhi*: 884 pp.
- [13]. **Jenson, L.D., et.al** (1969): The effects of elevated temperature up on aquatic Invertebrates. *Edison Res. Project No. 49 Rep. No. 4*, 1-252