Gis Based Site Selection For Fixing Uv Light Adult Mosquito Trap And Gravid Adult Mosquito Trap For Epidemic Control In The Urban Settlements

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ABSTRACT: The mosquito's nuisance becomes major problems in the metropolitan cities in India now days. The endemic situation of vector borne diseases (VBDs) and the sporadic of such diseases, known as, malaria, filariasis, JE, dengue and chikungunya have been most important challenging problems in the urban settlements now days in India. The Arc View 3.2, Arc View Spatial analysis and Arc View image analyst GIS was used for creating a systematic grids on 2.5 km interval for fixing the UV adult traps for collecting the optimum vector mosquitoes in the domestic and peripheral domestic areas in the city. The GIS based (2.5km X 2.5km) grid map was overlaid on the Pondicherry town digital map on 1:50,000 scale. GARMIN 12XL GPS was used for site selection for fixing the adult UV traps in the inter section or nearby inter section of the grids points. The of *Anopheles* genus, *Culex* genus and *Aedes* genus vector mosquitoes were collected every day, using normal light adult trap and UV light adult trap, and it was transferred to MS excel work sheet for mapping and analysis. The GIS was used to analysis and recommended for control activities and management of the present situation of mosquito nuisance in the metropolitan cities.

Keywords: GIS grid sampling, GPS, UV light adult mosquito trap, gravid adult mosquito trap, mosquito nuisance, vector mosquito control, epidemic control

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1. Introduction

The mosquito nuisance and the vector borne disease epidemics have been major challenging problems and becomes serious threat to the public [1-22] especially in the past developing cities in India [9-19],21, [22], [24]. India has become host for all kind of epidemics including malaria, dengue, chikungunya, and JE, and also endemic host for filariasis parasites [13]. GIS was used to mapping the environmental determinants of the vector abundance [1-4], [7], [11], [16], [17], spatial analysis for illuminating the disease transmission, and priority of the areas for mosquito control activities and management [11-15], [18-20]. It is a heavy burden to the government authority to meet the yearly expenditure for treatment of the epidemic diseases, transmission control and management of the present situation in the country. The present study was designed for utilizing GIS technology for site selection for fixing the Ultra Violet (UV) adult light trap for controlling mosquitoes in the urban environment. Consequently, GIS may perhaps, assisting to disease surveillance and controlling the epidemic situation in the urban areas in advance [11-16], [18], [20], [22].

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2. Aims and objectives

1. To applying GIS based site selection for fixing the Ultra Violet (UV) light adult mosquito trap for mosquito control and filariasis and malaria transmission control in the city
2. To applying GIS based site selection for fixing gravid adult mosquito trap for dengue epidemic control in the city.
3. To standardizing the systematic grid sampling procedure for fixing UV light adult traps for mosquito control measures.

3. Study site

The study site, Pondicherry is the capital of Pondicherry Union Territory, which is located in the East coast of South India about 160 Km south of Chennai (formerly Madras), it geographically extends between (11° 53' 45" N to 11° 58' 55" N), and (79° 46' 15" E to 79° 50' 50''E). It has the geographical area measured to 48.06 Sq. Km (Fig.1). It is experienced with monsoon from Mid-October to December in every year.

4. Material and methods

The Arc View 3.2, Arc View Spatial analysis and Arc View image analyst GIS was used for creating a systematic grids on 2.5 km interval for fixing the UV adult traps for collecting the optimum vector mosquitoes in the domestic and peripheral domestic areas in the city. The GIS based (0.6km X0.6km) grid map was overlaid on the Pondicherry town digital map on 1:50,000 scale. GARMIN 12XL GPS was used for site selection with <2.5km for fixing the adult UV light adult mosquito traps and fixing the gravid adult mosquito trap in the inter section or nearby inter section of the grids points with 0.6km distance. The mosquitoes was collected every day and it was transferred to MS excel work sheet for mapping and analysis (Table 1).

5. Result and Discussion

The ultra violet light adult trap and the blue light trap were tested in the Pondicherry urban areas to collect the adult

mosquitoes, the result was provided that the ultra violet light adult trap has effective and efficient to collect the adult mosquitoes including the *An. stephensi*, *An. subpictus, Culex vishnui* groups, *Cx. quinquefasciatus, Ae. a*egypti and *Ae. albopictus, and Armigeres subalbatus.* The UV trap has collected 67 % of the adult mosquitoes and the normal blue light has 33 % of the total collection (Table 1, Fig 3). So that, the UV adult trap was recommended for adult mosquito collection [12-16]. Since, the adult mosquito (malaria, filariasis and JE vector mosquitoes) has maximum flight range of 2.5 km [13], and dengue and chikungunya vector mosquitoes (*Aedes a*egypti and *Ae. Albopictus)* has maximum flight range of 600 meters[12], [14], [16], the sites have been selected for setting up the UV light adult mosquito trap in the place of intersection of GIS based grids map with <2.5 km distance interval, and the sites for

fixing gravid adult mosquitoes trap with 0.6km distance interval for collecting the *Aedes a*egypti and *Ae. albopictus* mosquitoes [12], [14], [16] (Fig.2). The intensive and regular reconnaissance survey has to be conducted with the interval period of once in 10 to 15 days in the major cities for source reduction of dengue and chikungunya vector mosquito breeding habitats and keep away from aggressive day biting mosquitoes (*Ae. a*egypti and *Ae. albopictus)* and making awareness among the people to prevention measures help to control the disease epidemics [1], [2], [4], [12-14], [16]. The source reduction of mosquito breeding could be provided the safe environment and keep away from the vector mosquito borne disease transmission and for dengue epidemic control in the metropolitan cities in the country [1-10], [12-6], [22].

TABLE 1
The adult mosquito collection using Ultra Violet light trap and the normal blue light trap for the period of 30 days in Pondicherry urban settlement areas

| Sl. No	Rue Sufferon (Site 1)					Goubert Salai (Site 2)						(Site1+Site 2)	
	UV	Normal	Male	Female	Total	UV	Normal	Male	Female	Total		UV	Normal
1	144	138	53	229	282	849	840	716	973	1689		993	978
2	153	61	53	161	214	1421	357	771	1007	1778		1574	418
3	126	197	181	142	323	799	394	669	524	1193		925	591
4	385	170	239	316	555	3082	1584	2523	2143	4666		3467	1754
5	429	213	97	545	642	4782	721	1892	3611	5503		5211	934
6	395	217	139	473	612	2066	668	724	2010	2734		2461	885
7	313	93	176	230	406	938	419	576	781	1357		1251	512
8	360	187	245	302	547	1518	753	880	1391	2271		1878	1705
9	528	332	293	567	860	5530	417	1790	4157	5947		6058	749
10	443	163	197	409	606	1833	1299	1114	2018	3132		2276	1462
12	588	271	433	426	859	7266	5780	6015	7031	13046		7854	6051
13	418	193	309	302	611	8525	4320	6719	6126	12845		8943	4513
14	314	91	203	202	405	5445	5543	5610	5378	10988		5759	5634
15	161	262	165	258	423	5265	1513	2434	4334	6778		5426	1775
16		265	65	200	265	2690	1926	874	3742	4616		2690	2191
17	2412	193	816	1789	2605	2772	97	995	1874	2869		5184	290
18	4047	208	584	3671	4255	3641	19	571	3089	3660		7688	227
19	2023	50	262	1813	2073	5191	265	811	4645	5456		7214	315
20	959	158	402	715	1117	3618	101	431	3288	3719		4577	259
21	2097	403	1130	1370	2500	3624	109	1812	1921	3733		5721	512
22	1165	367	671	906	1532	1338	39	597	780	1377		2503	406
23	579	84	212	451	663	1497	57	834	720	1554		2076	141
24	1172	367	368	1171	1539	2851	880	1121	2610	3731		4023	1247
25	1187	448	608	1045	1635	2502	984	1719	1767	3486		3689	1432
26	1151	610	784	987	1761	708	448	520	636	1156		1859	1058
27	545	66	174	437	611	5359	134	1940	3546	5493		5904	200
28	715	942	737	965	1657	888	79	384	587	967		1603	1021
29	284	279	394	169	563	523	214	477	271	737		807	493
30	1564	456	824	1196	2020	3856	33	1811	2078	3889		5420	489
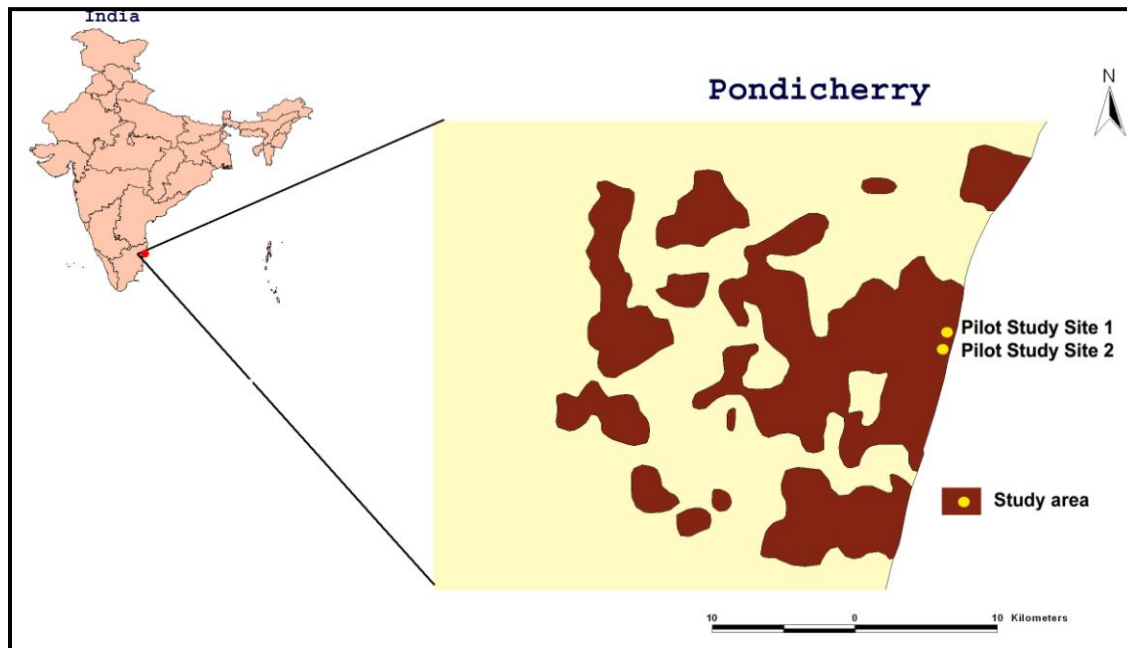
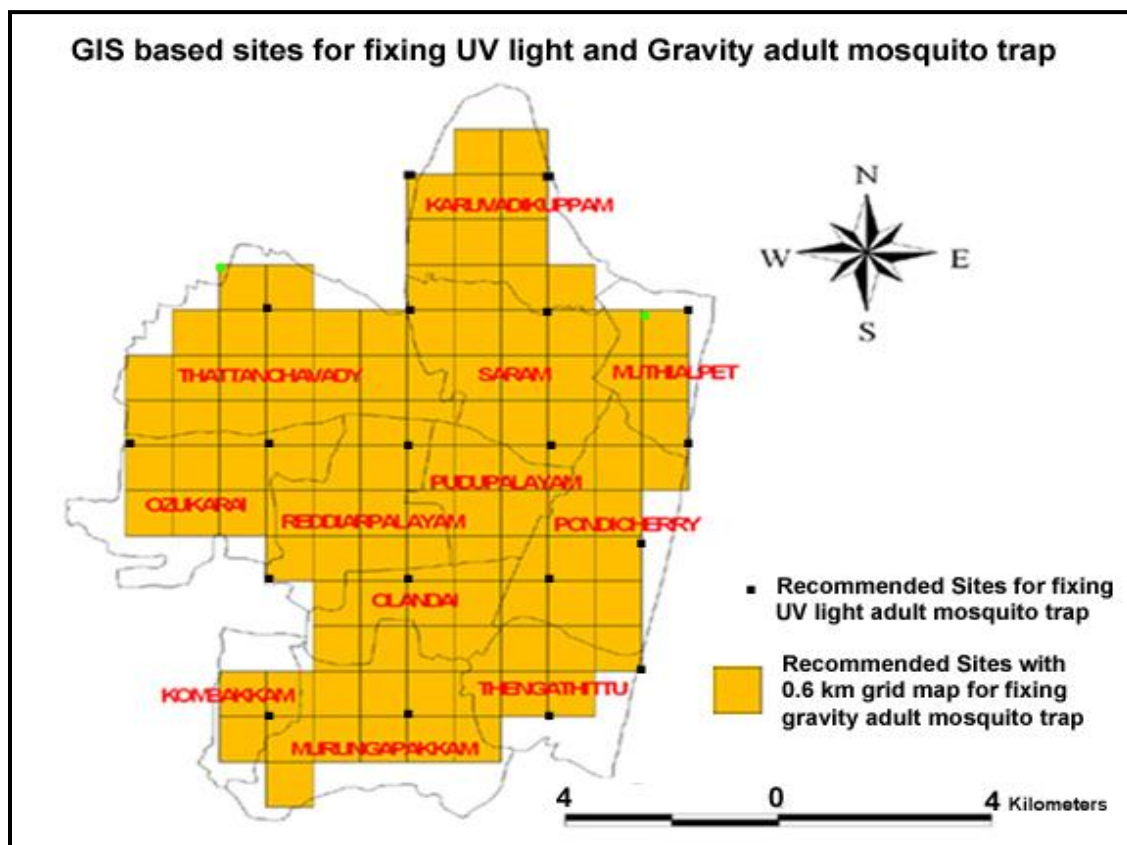**Fig .1** Pilot Study site1 and site2 in the Pondicherry town

Fig .2 Study sites for fixing the UV light and gravid adult mosquito trap in the Pondicherry urban areas
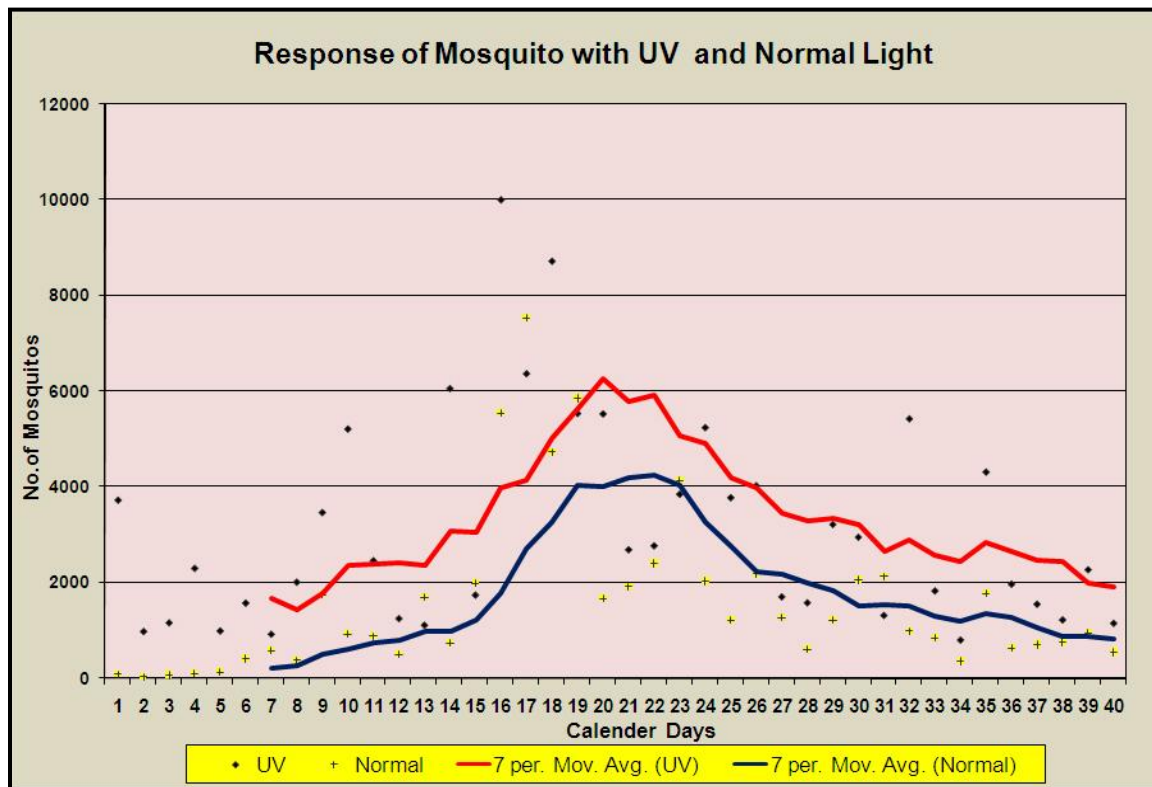
Fig 3 The adult mosquito collection in the Pondicherry urban areas, using the UV light and the normal blue light adult mosquito traps

6. Conclusion

GIS based master plan for mosquito control was found to be not only very low cost, but also rapid methods and accuracy, which need to be used in most of the metropolitan cities in India. The unplanned and the sea change population was creating conducing environment for fueling to huge amount of vector mosquito breeding in the cities in India. However, on the other side, the available GIS technique was found useful and has provided the datum of useful guidelines for giving priority with site specification of the areas to fixing the adult UV light adult mosquito trap with <2.5 km distance interval, and fixing the gravid adult mosquito trap with <1km distance interval for the optimum mosquito collection, and perhaps, by means of making awareness among the people for mosquito breeding source reduction to control the present situation and management of the mosquito nuisance in the urban areas. The utility of GIS technology for site selection of fixing the adult mosquito collection and the combined intensive vector control measures enable us to master plan for mosquito control in the city successfully.

7. Acknowledgment

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