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OUTDOOR DENSITY OF ADULT *PHLEBOTOMUS ARGENTIPES*, THE VECTOR OF *VISCERAL LEISHMANIASIS*, IN DIFFERENT BIOTOPES IN AN ENDEMIC FOCI OF BIHAR INDIA

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ABSTRACT As a part of Kala Azar elimination programme in Bihar, indoor insecticide residual spray (IRS) is being done for two rounds per year. IRS is covering up to 1.8 meter i.e. 6 feet height in human dwellings as well as cattle sheds to control *Phlebotomus argentipes*, the vector of Vis*ceral leishmaniasis* or kala azar. As per a recent study by Das Chandrima *et al* which was conducted between March '17 to November '17 in a highly Kala Azar endemic block of Bihar, it was noted that statistically significant (*p* value 0.193) number of *P.argentipes* (26.95%) were found in outdoor peri domestic area. In the present study using overnight CDC light trap in six different types of peridomestic biotopes , in three selected study villages, a significant number of *P.argentipes* were trapped from clusters of Bamboo and Banana trees (352 and 179 respectively). The *p* value for Bamboo cluster is 0.243 and for Banana bushes is 0.486. The sand flies have also been trapped from clusters of Litchi, Dates, Palm and Mango trees . Therefore, it is a high time to evaluate the vector control strategies in Kala Azar endemic areas of Bihar for its successful elimination from India.

KEYWORDS : Outdoor density of *P.argentipes* , vector of *V.Leishmaniasis*, Bihar. India

INTRODUCTION:

Phlebotomus (Euphlebotomus) argentipes, the vector of *Visceral leishmaniasis* or Kala azar in the endemic states like Bihar ,West Bengal are predominantly endophilic in nature [1, 2] . *P. argentipes* is light shy species, rest in cracks and crevices on walls, inside rodent burrows in dark corners of rooms, especially in mud huts and cattle sheds. They are found more in cattle sheds than human dwellings. It has also been noted that *P.argentipes do* not fly / rest above 240cm (6 feet) from ground level [1, 2,3]. Therefore since 1976, as a part of kala azar vector control programme, indoor residual spray (IRS) of DDT at the rate of 1gm / sq. meter was conducted in human dwellings and cattle sheds up to 240cm i.e 6 feet height . Noting the wide spread DDT resistance problem in *P.argentipes* [4, 5,6,7], since 2015, Government of India along with the Government of Bihar have started vector control programme as a part of Kala azar Elimination Programme with two rounds of IRS with synthetic pyrethroid insecticide like Alpha-cypermethrine twice a year up to 240cm (6 feet) level of height .But the state of Bihar is yet to achieve successful Elimination of Kala azar (VL), may be one of the reason that the flies have changed their resting behaviours. In a recent study [8,9] 26.7 percent (p value 0.001) of *P.argentipes* were collected from outdoor peri domestic situations from a highly kala azar endemic Block Warisnagar, District Samastipur, Bihar in 2017 . Again a nine month study was conducted between March to November 2017 in the same villages of Block Warisnagar , District Samastipur with the intention to note the outdoor population of *P.argentipes* in different biotopes and vegetation .

MATERIALS AND METHODS

In India, Bihar state alone has contributed more than 72 percent of total kala azar cases per year between 2012 to 2017 (Dpt. of NVBDCP. Government of India). District Samastipur, (25º5' N, 85º 5' E) alone has contributed more than 8.5 percent Kala Azar cases of Bihar between 2014 to 2016 (Personal communication Dpt. NVBDCP. Government of Bihar).Soil of District Samastipur is alluvial with high subsoil water. Rice, Wheat and maize are the major crops. Apart from that there are large number of fruit plants like banana, mango, litchi, palm dates along with bamboo groves. Fruits like banana, Litchi, Dates along with bamboo are highly prevalent inside the three selected study villages ie, Satmalpur , Mannipur (villages under IRS) and Kishanpur (a non IRS village) in Block Warisnagar. In a recent study [8, 9] , 26.7 percent *P.argentipes* adults were recorded from outdoor peri domestic situations in the same proposed study villages in the same study period . In continuation to that, a study was designed to note the distribution of *P.argentipes* adults in different vegetation / biotopes in peri domestic situations where sunlight is low and soil is moist in comparison to other outdoor situations. Cattle sheds and human dwellings have typical conditions for sand fly breeding and significant density of *P.argentipes* was noted and marked there . Within five to eight meter surroundings of the marked houses and cattle sheds, twelve dark and damp biotopes with different vegetations were selected. Two orchards for each type of fruit trees like mango ,litchi, banana, bamboo, palm and dates were selected randomly for the study, Therefore, in each village twelve peri domestic outdoor situations were selected for our study between March 2017 to November 2017 .

CDC miniature light traps model 512, specially designed for sand fly collection (made by John W. Hock) were installed for overnight collection (dusk to dawn) below the heights of 0.6 meter (2feet) by standard WHO method. In each village every month 2 CDC light traps were installed in comparatively dark and damp biotopes like bamboo , banana , palm , dates , litchi and mango orchards . Next morning after uninstallation, all light traps were brought to the laboratory for identification by the method of Lewis [10] . All data were noted down for further analysis .

RESULTS AND DISCUSSION

Overnight collection of adult *P.argentipes* from, using CDC Light traps from Bamboo, Banana, Litchi Palm, Dates and Mango orchards within the time period ofMarch to November 2017 are shown in tabular form. Light traps were installed inside bushes of Bamboo, Banana, Litchi Palm, Dates and Mango trees where soil is moist and has poor light availability . From the Table it was noted that in the study villages , maximum P,argentipes were trapped from Bamboo (total numbers were 352) followed by Banana (179) .Litchi (125), Dates (100),Palm (81) and Mango (59).

Table: Showing Outdoor density of *P. argentipes* trapped 16 **from different biotopes in study villages of Block Warisnagar, District Samastipur Biha**

Villages	Number of *P.argentipes* trapped by light trap method from different outdoor situations					
	Bamboo	Banana	Litchi	Palm	Dates	Mango
Satmalpur	47 (3)	39 (2)	70 (4)	18(1)	37(2)	19(1)
Mannipur	237 (13)	49 (3)	25(1)	28(2)	29(2)	19(1)
Kishanur	68 (4)	91 (5)	30(2)	53(3)	34(2)	21(1)
Total	**352(7)**	**179 (3)**	**125(2)**	**81(1.5)**	**100(2)**	**59(1)**

- Two CDC Light traps were installed per night per biotopes (Bushes) from March to November 2017.Eighteen CDC LT /biotopes for nine months
- Numbers shown in parenthesis denotes average number of P.argentipes /night /trap'

The nine months study from March to November 2017, average density of *P.argentipes* per night per CDC Light trap was calculated as 7 for Bamboo,3 for Banana , 2 each in Litchi and Dates, 1.5 in Palm and 1 in Mango orchards. Among six vegetations statistically significant number of *P.argentipes* were found in Bamboo orchard where *p* value is 0.243 and in banana where *p* value is 0.486.

Very little information is available regarding availability of *P.argentipes*

in outdoor condition in kala azar endemic states like Bihar. Poche et al [11] in 2018 reported negligible numbers of *P.argentipes* in Outdoor in Bihar. In a recent study Das Chandrima et al [8] in 2018 noted 26.7 percent *P.argentipes* (p value 0.001) from peri domestic situations in three study villages of Block Warisnagar, District Samastipur, Bihar, India. Our present study corroborates with the findings of Das Chandrima *et* al which denotes irrespective of IRS (Mannipur, Satmalpir) and non IRS (Kishanpur) villages, the sand-flies are found outdoor throughout the study period. They were mainly found inside the bunch of froots / bamboo trees where the soil is dark and damp and minimum entry of direct sun light. They were found throughout the study period except in the months of August and September when very low density of the flies was noted which may be due to excess rain fall in the study area. Therefore from the present observation it may be concluded that present day *Phlebotomus argentipes* are showing change in their behaviour . Therefore it is the time to modify on going vector control programme in order to eliminate the disease successfully from the Indian subcontinent.

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