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SUSCEPTIBILITY STATUS OF *XENOPSYLLA CHEOPIS* AND *X. ASTIA* TO DDT

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In the present study, the susceptibility status of two flea species namely *Xenopsylla cheopis* and *X. astia*, collected from Distt. Baghpat of western U.P. India has been discussed. The fleas were tested for 4% DDT by WHO standard methods for 1 hr. The *Xenopsylla cheopis* showed 82.69% mortality while *X. astia* showed 92.66%. Males were found more susceptible than females in both the species. The results showed that the fleas of *Xenopsylla cheopis* possessed a considerable degree of resistance to DDT. It is inferred that the fleas have been exposed to DDT in local environment due to various sanitary conditions.

Key words : Susceptibility, *Xenophylla cheopis* (Rat flea), *X. astia*, DDT.

The present study which was conducted on the above mentioned flea species are involved in the transmission of plague, a deadly bacterial disease. The resurgence of plague again and again after some lapse is associated with the abundance of rodent flea vectors as well as the resistance of flea to various insecticides . In the present study, the degree of resistance of fleas to DDT in this area has been discussed.

A colony was reared by collecting the fleas from rats trapped from various localities of the study area .The susceptibility tests were carried out on fleas reared in the laboratory. The WHO technique (WHO Tech. Report, Series 191) for determining the flea susceptibility was employed. Approximately 10 fleas were taken in each test tube. The DDT impregnated papers having 4% of insecticide supplied by WHO were utilized for experiment. The fleas were exposed for 1 hour. After the exposure, the fleas were transferred to different tubes of same size. The fleas were kept for 24 hrs in these tubes after which their mortality was recorded. The dead fleas were identified for different species and sex. One replicate of control was also kept. The mortality was corrected by using Abbott's formula as under :

$$\text{Corrected mortality (percentage)} = \frac{\text{Percentage test mortality} - \text{Percentage control mortality}}{100 - \text{Control mortality}} \times 100$$

RESULTS AND DISCUSSION

The results showed the overall mortality of 82.69% in *X.cheopis*. Due to the control mortality of 0.00%, the test mortality is also 82.69%. The mortality of *X. astia* for similar conditions has been observed as 93.33%. This mortality has been corrected to 92.66%, which is 9.97% higher than *X. cheopis*. The mortality of males for this compound is almost equal for both the species. It is recorded as 89.28% for *X. cheopis* and 100% for *X. astia*. While females had remarkable differences in mortality. The female *X. cheopis*

showed 75% and in *X. astia* showed 90% mortality. The details of mortality of adult *Xenopsylla* species to 4% DDT have been depicted in Table I and II.

Table 1 : Susceptibility status of *Xenopsylla cheopis* to DDT.

Conc. & time of exposure	No. of replicates	No. of fleas exposed			No. of fleas dead			Test mortality	Corrected mortality
		M	F	Total	M	F	Total		
4% 1 hr	1	8	4	12	7	3	10	83.33	83.33
	2	6	5	11	5	3	8	72.72	72.72
	3	5	8	13	5	7	12	92.30	92.30
	4	9	7	16	8	5	13	81.25	81.25
Mean		7.0	6.0	13.0	6.25	4.5	10.75	82.69	82.69
Control				9			0	0.00	

M : Male; F : Female.

Table II : Susceptibility status of *Xenopsylla astia* to DDT.

Con. & time of exposure	No. of replicates	No. of fleas exposed			No. of fleas dead			Test mortality	Corrected mortality
		M	F	Total	M	F	Total		
4% 1 hr	1	2	4	6	2	4	6	100.00	100.0
	2	3	6	9	3	5	8	88.88	87.76
Mean		2.5	5.0	7.5	2.5	4.5	7.0	93.33	92.66
Control				11			1	9.09	

M : Male; F : Female.

The results of Ahn & Soh (1974) showed 43.8% mortality on exposing *X. cheopis* for 4% DDT for 1 hour, while it was 13.6% for 1% DDT and 100% mortality by 24 hrs exposure for the same concentration of DDT.

Thaung (1977) studied in Burma that exposure of *Xenopsylla* sp. to 4% DDT for 1 hr. shows 62.5% susceptibility. He observed partial resistance to DDT in *Xenopsylla* sp. Renapurkar (1988) tested the effect of DDT on *Xenopsylla* sp. in Bombay and found LC 50 for *X. cheopis* as 1.18%. He also found 1 out of the 12 populations as fully resistant, 7 to be intermediate and 4 to be susceptible. Rao *et al.* (1972) recorded the susceptibility status of fleas from 23 localities in Maharashtra state and found that 4% DDT impregnated filter papers exposed for 24 hours to *X. cheopis* recorded less than 50% mortality thus showing high resistance in 22 localities.

Kumar *et al.* (1996) reported that *X. cheopis* showed resistance to DDT as they found 28.3% mortality against 4% DDT by exposing them for 1 hour. Sustriyu et al.(1980) recorded the susceptibility status of *X. cheopis* to 4% DDT and found 25% mortality by 1 hour, 37.5% by 2 hours 45% by 4 hours 65% by 8 hours and 75% by 24 hours exposure.

Fanara *et al.* (1979) exposed *X. cheopis* to 4% DDT impregnated papers for 24 hrs and found LC 50 as 2.3%. They showed high degree of resistance to DDT in *X. cheopis*.

Ratovonjato *et al.* (2000) also studied toxicological effects of 4% DDT on *X. cheopis* in Madagascar and found it as resistant to DDT and concluded that DDT can no more be recommended for flea control.

Chumakova & Kozlov (1981) found that *X. cheopis* was resistant to DDT in USSR, however, resistance varied from place to place. Resistance increased in areas where DDT was being used for many years for plant protection.

The results of the present study show that the fleas of *X. astia* are sensitive to DDT while fleas of *X. cheopis* are developing resistance to DDT and can be said as partial resistant to DDT or population is a mixture of DDT resistant and DDT sensitive individuals.

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