Research Paper

EFFECT OF THIO-TEPA ON THE CHROMOSOME MORPHOLOGY OF UZI FLY, *EXORISTA SORBILLANS*

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ABSTRACT-

To effects Thio-TEPA on theCytology of uzifly,*Exoristasorbillans* was studied. The cytogenetic effects of different concentrations (15, 25, 50, 100 and 150 ppm) of the thio-TEPA on chromosomes during meiosis are of both physiological as well as structural. The most common physiological effect observed was chromosome stickiness at metaphase and at anaphase. Higher concentration of 100 and 150 ppm appears to be more effective in induction of chromosomal anomalies compared to lower concentrations of 50, 25, and 15 ppm thio-TEPA. Higher concentrations bring about all types of chromosomal aberration while, lower concentrations did not affect much on the chromosomes of Uzi fly.

KEY WORDS- *Exoristasorbillans, meiosis, thio-TEPA, Chromosomal aberrations, sterility.*

INTRODUCTION-

The Indian Uzi fly, *Exoristasorbillans* is an important pest of Silkworm, *Bombyxmori* belongs to tribe Exoristini of the sub family Goniinae has become extremely important in India and other sericultural countries. Thio-TEPA is a polyfunctional alkylating agent used widely for obtaining biological effects and have been tried on various insects to show their efficacy to sterilize insects to appropriate dose concentrations (Chaudhary and Kapil, 1976; Madharajan and Channabasavana, 1980; Sharma and Theriault, 1983).Puttaraju (1989) found various kinds of chromosomal abnormalities like abnormal chromosomal pairing, chromosomal breakage, sister chromatid exchange, bridges, laggard and ring chromosomes in mitotic chromosome during oogenesis of Mosquito, *A.aegypti* fed with 0.1% thio-TEPA. He (1990) suggested that thio-TEPA is one of the best chemicals to induce chromosomal mutations in the Mosquito, *Culex p.fatigans* and recorded different types of chromosomal abnormalities.

MATERIALS AND METHODS

The testes of pupae treated with different concentration of different chemicals were used for chromosome preparation in order to evaluate the effect of the chemicals on the chromosome morphology and behavior during sperm formation.

The testes of pupae treated and control were first dissected out in 0.56 percent potassium chloride solution and allowed in fresh hypotonic solution for 30 minutes, followed by fixation in Carnoy's solution (1:3 Aceto methanol) for 30 minutes. The chromosomes were prepared and stained with Geimsa according to methods followed by Bedo (1980) and Manjunath and Puttaraju (1992 a).

RESULTS

The normal meiotic stages obtained from control are shown in Figure.1A to E. The diploid chromosomes number was 12 (n=6) and of these five pairs are autosomes and a pair of heteromorphic sex chromosomes which includes a slightly bigger sub-metacentric 'Y' chromosome and a small dot shaped 'X' chromosome were confirmed (Puttaraju and Chowdaiah, 1984; Manjunatha and Puttaraju, 1992 a & b).The cytogenetic effects of different concentrations (15, 25, 50,100 and 150 ppm) of the thio-TEPA on chromosomes during meiosis are of both physiological as well as structural.The most common physiological effect observed was chromosome stickiness at metaphase and at anaphase (Figure.2 D and E;Figure.2 D). This was prevalent at the chromosome ends due to end to end touching. Various degrees of stickiness were discerned, the ultimate of which were clumping. Further, the stickiness of chromosomes resulting in the loss of chromosomal identity. This type of chromosomal aberrations were observed at higher concentrations (100 and 150 ppm).

The structural aberration induced by Thio-TEPA includes chromosome breaks at prophase, metaphase and anaphase. Both centric and terminal breaks were also common in one of the chromatids. Missing of an arm at gonial prophase. Despirlization and formation of ring chromosomes and fragments were recorded (Figure.2 A to C). Terminal breaks and lesions were also observed at gonial metaphase. Formation of ring chromosomes and clumped at metaphase-II were (Figure.2 F;Figure.3 A) observed.Chromosome breaks at anaphase resulting in the formation of laggards were common (Figure.3 B) in all the concentration treated.In addition, various types of bridges namely bridge with fragments, single bridge at anaphase were observed frequently (Figure.3 B and C).Formation of bridges, bridges with fragment and dicentric bridge are also generally found at telophase (Figure.3E and F).The percentage of aberrant cells observed during meiotic stages is presented in table.1. The table also revealed that, different concentrations of thio-TEPA treated on Uzi fly were capable to induce different types of anomalies in meiotic chromosomes compared to control batch. The table clearly indicates that metaphase, anaphase and telophase are highly sensitive to thio-TEPA than prophase. Further, the percentage of chromosome anomalies at metaphase and telophase proportionately increase with increased concentration of thio-TEPA and also the percentage of anomalies increased from prophase to telophase.

Table.1. Effects of Thio-TEPA on male meiotic chromosomes of the Uzi fly,*Exoristasorbillans*

Conc.ofThio-TEPA ppm)	Aberrant cells (%)			
	Prophase I & II	Metaphase I & II	Anaphase I & II	Telophase I & II
15	1.30	7.25	14.76	17.35
25	1.81	10.31	31.35	33.71
50	0.00	19.02	36.35	50.96
100	15.00	41.34	52.12	62.96
150	11.11	45.04	75.98	78.47
Control	0.00	0.00	2.70	5.37

DISCUSSION

It is evident from the present study that thio-TEPA caused physiological aberrations such as chromosome stickiness and clumping a metaphase and anaphase stages. A similar type of aberrations also recorded in Mosquitoes (Puttaraju, 1989, 1990, 1994) due to thio-TEPA treatment and he attributed that it leads for sterility. The stickiness observed was due to depolymarization and cross linking of the DNA of the chromosomes in agreeing with Darlington (1942) and Darlington and Lacour (1945) and this was also supported by physiological studies on DNA solutions by Evans (1962). According to Sturelid (1971) chromosomal aberrations appears due to the replication of DNA damaged by alkylation.The metaphase stage was more sensitive than prophase stages, resulting in the number of chromosomal aberrations.

The most common type of aberrations observed were chromosome breaks at terminal or centric in one of the chromatids, the thio-TEPA was more toxic to the metaphase, anaphase and telophase stages compared to prophase stage.Appearance of breakages, fragments, stickiness, laggards, formation of ring chromoosomes, bridges seen in the present investigation was also been recorded using thio-TEPA by Puttaraju (1988, 1989, 1990 and 1994). Rai (1964); Grover et al., (1973) using other chemicals in Mosquitoes and in other insects (Metz et.al., 1961 and Oliver et.al., 1972) using radiation.The chromosomal bridges, bridges with fragments, single bridge, dicentric bridges at anaphase and telophase I and II were probably due to the chromosomal stickiness at prophase and metaphase stages. The production of dicentric bridges was mainly due to the spontaneous breakage of meiotic chromosomes (Lewis and John, 1966). All the chromosomal aberrations recorded in the study will ultimately lead for genetic sterility as evidenced by earlier several workers.

CONCLUSION

All the chromosomal aberrations were found in the reproductive cells, most of them may be heritable and ultimately lead to genetic imbalance and consequent sterility.

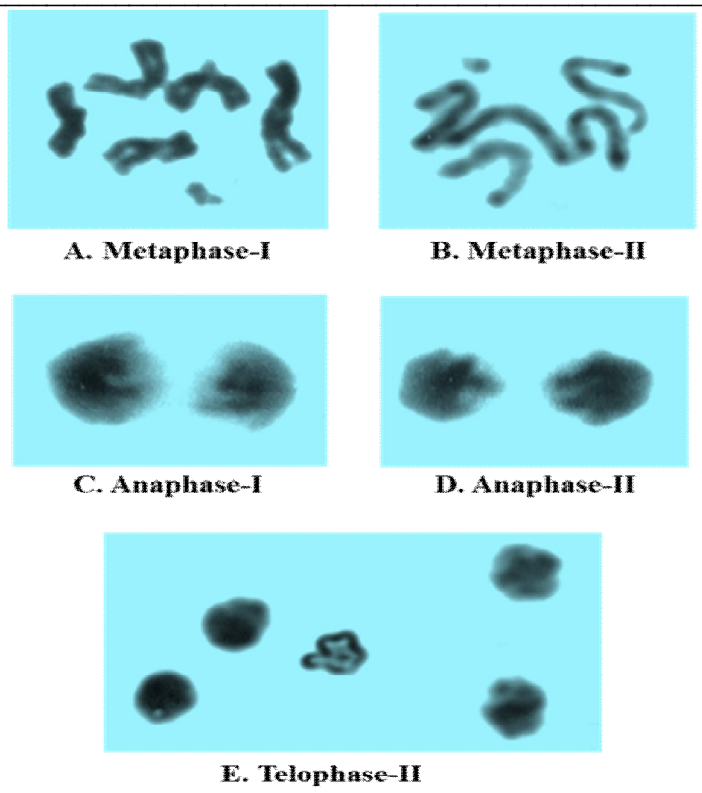

Figure.1.Meiotic Division of Uzi fly, *Exoristasorbillans*

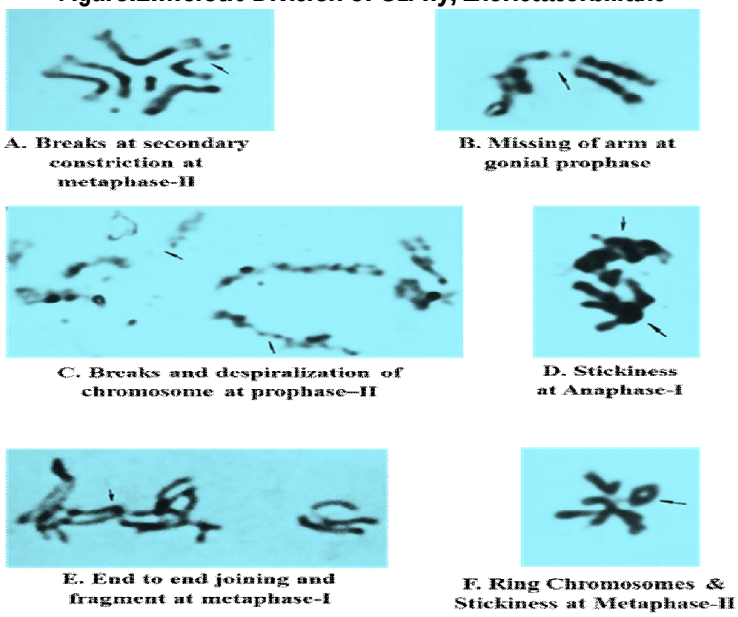

Figure.2. Chromosomal abnormalities caused by Thio-TEPA duringMeiosis

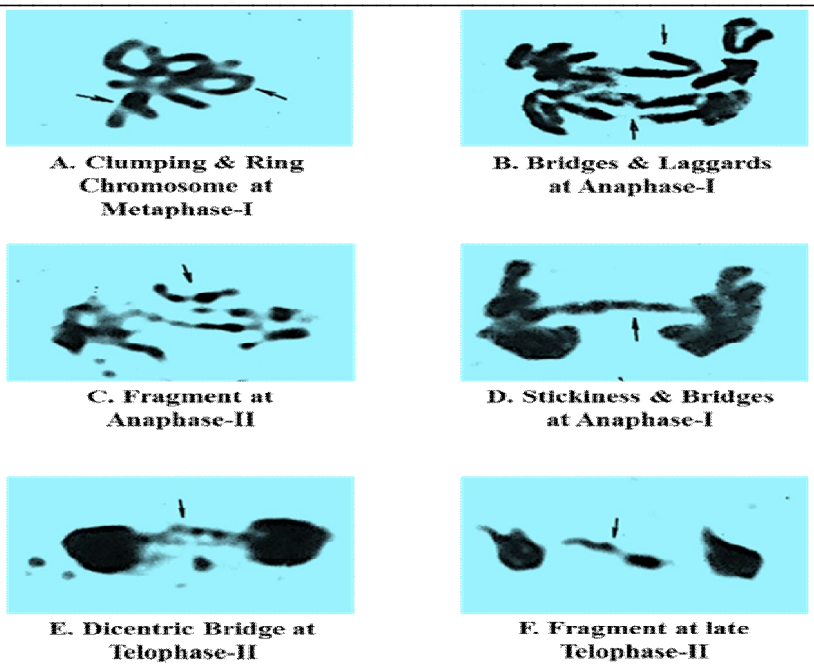

Figure.3. Chromosomal abnormalities caused by Thio-TEPA duringMeiosis

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