



**CHROMOSOMAL RESPONSE TO COLD SHOCK IN FLESH-FLY
SARCOPHAGA RUFICORNIS (FAB.) (SARCOPHAGIDAE : DIPTERA)**

JAYA TRIPATHI¹, UMA RANI AGRAWAL² AND RAGHAV RAM TEWARI^{3*}

¹Department of Zoology, Iswar Saran Degree College,
University of Allahabad, Allahabad 211004, U.P., India.

²Department of Zoology, C.M.P. Degree College,
University of Allahabad, Allahabad 211002, U.P., India

³Cytogenetics Research Laboratory, Department of Zoology,
University of Allahabad, Allahabad- 211002, India.

ABSTRACT

Chromosomal response to cold shock was studied in the polytene chromosomes of pupal foot pad cells of *Sarcophaga ruficornis*. The stress was given at -10° C and -20° C for different time intervals. A single large puff was induced at region 12A in the chromosome arm II L. However, the cold shock has no effect on any other region of the polytene complement. This puff is also induced by heat shock as well as by treatment with different chemicals. Thus, it seems that a common set of gene loci is responsible for the puffing response to diverse stresses in the genus *Sarcophaga*.

KEY WORDS: Flesh fly, Cold shock, Stress response, Polytene chromosomes.



RAGHAV RAM TEWARI

Cytogenetics Research Laboratory, Department of Zoology,
University of Allahabad, Allahabad- 211002, India.

INTRODUCTION

The cellular response to environmental stress was initially analyzed by Ritossa^{1, 2} in salivary gland polytene chromosomes of *Drosophila busckii* which unraveled a novel set of chromosomal puffs. Temperature is one of the most important environmental factors influencing physiological functions in an organism. Low temperature endangers the life of animals and plants through chill injuries, even when well above freezing. The studies on the cold shock response have been limited only to a few dipterans namely *Delia antiqua*^{3,4}, *Drosophila melanogaster*⁵⁻⁸, *Sarcophaga crassipalpis*⁹⁻²¹, *Sarcophaga bullata*¹⁰, *Peckia abnormis*¹⁰, *Sarcodexia sternodontis*¹⁰, *Blaesoxipha plinthopyga*¹⁰ and *Musca domestica*^{22,23}. However, the chromosomal response to the cold shock has not been reported in dipterans. In the present study an analysis response to cold shock has been carried out in foot pad polytene chromosomes of *Sarcophaga ruficornis*.

MATERIALS AND METHODS

The response of polytene chromosomes in laboratory stocks of *Sarcophaga ruficornis* (Fab.) was observed by exposing pupae to cold shock. For *in vivo* cold shock treatment 7 day old male pupae were kept in test tubes (containing 10 pupae each), plugged with cotton and placed at -10° C and -20° C for 5 min., 10 min., 20 min., 25 min., 30 min. and 35 min. in a deep freezer. Control pupae were kept at room temperature (26 ± 2°C) for the

same time intervals. The foot pads of control and cold shock treated pupae were excised in insect saline and pupal cuticle was removed. Foot pads were fixed in aceto alcohol (1 part glacial acetic acid : 3 parts ethanol) for 2 minutes, stained in 2% aceto orcein for 20 minutes and squashed under a clean coverslip. Puffs were scored in temporary squash preparations and photographs were taken with Nikon Eclipse 80 i Microscope equipped with CCD Camera. Puffing activity was determined as the ratio of diameter of the puffed region (D) with that of the neighbouring nonpuffed region (d) in the chromosome in accordance with the method of Berendes²⁴. In all experiments mean size of puffs has been calculated on the measurement of 20 puffs.

RESULTS AND DISCUSSION

Puffs are the region reflecting the gene activity and thus provide an opportunity to look at the gene activity directly. The cold shock induces a single large puff at region 12A of chromosome arm III. The relation between cold shock and the puff induction is represented in Fig-1. The photographs in Fig. 2a, b and 3a, b represent the control and treated polytene chromosomes. The induction of puff is apparent as early as 5 min. The maximum induction of puff at -10° C was at 20 min., whereas, the puff was maximally induced at 15 min. at -20° C.

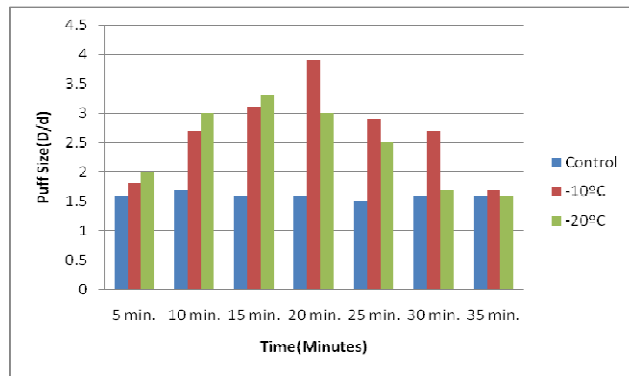


Figure 1
Puffing activity at the region 12A of chromosome arm II L after in vivo cold shock treatment.

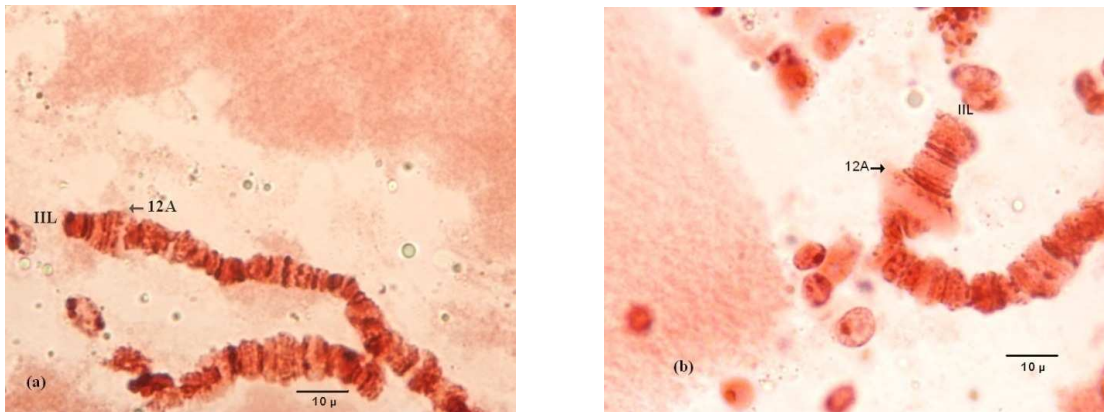


Figure 2
Cold shock induced puff in pupal foot pad chromosomes of *S. ruficornis* at region 12A of chromosome arm II L (a)Control (b)Cold shock treated at -10°C.(arrow indicates the region 12A).

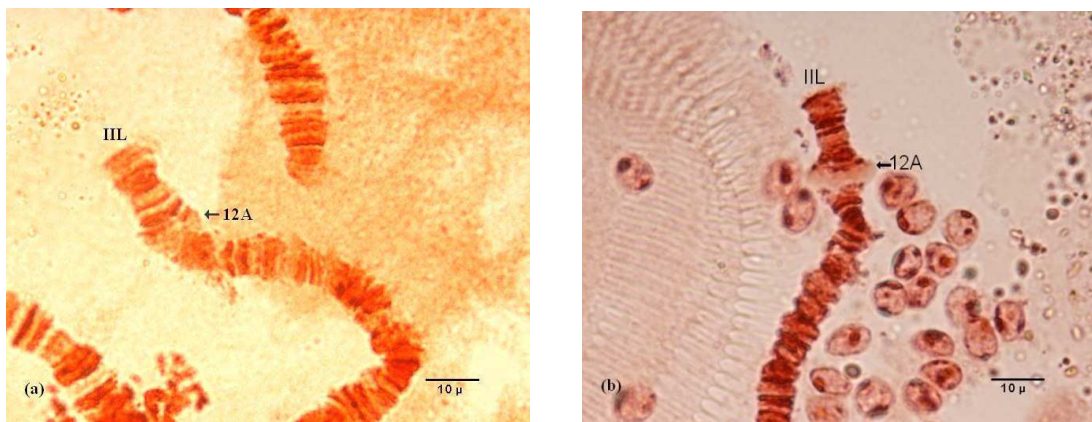


Figure 3
Cold shock induced puff in pupal foot pad chromosomes of *S. ruficornis* at region 12A of chromosome arm II L (a)Control (b)Cold shock treated at -20°C. (arrow indicates the region 12A).

CONCLUSION

The polytene complement of sarcophagids is known to respond to various stresses with the induction of a single puff near the distal tip of chromosome arm II L²⁵⁻³⁰. Tripathi et al.³⁰ opined that this may be a characteristic feature of stress response in sarcophagids. The present finding gives credence to the above opinion.

ACKNOWLEDGEMENT

Thanks are due to the Head of the Department of Zoology (UGC-SAP and DST-FIST scheme sponsored), University of Allahabad, Allahabad for providing the necessary facilities.

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