Abstract

Organisms face various types of environmental stress during their entire lifespan. Environmental stress acts as a major ecological driver and plays a significant role in driving the evolution of populations in nature. According to Hoffmann and Parsons 1991, environmental stress is “environmental factors causing change in the biological system which is potentially injurious”. A change in the optimum conditions in the biotic as well as the abiotic components of the organism’s habitat can lead to environmental stress. Temperature is an important abiotic factor of an organism’s environment which can control various important life history traits. Since most physiological and biochemical processes underlying behavioral patterns are dependent on temperature, it plays a crucial role in both the distribution and abundance of insect species as well as in their evolution. Multiple studies conducted previously in insects showed that cold stress (stress due to reduced temperature) can induce adult mortality and reduce gamete viability. A recent study from our own lab showed that egg viability, mating frequency, and male mating ability evolve in populations of Drosophila melanogaster selected for resistance to cold shock (Singh et al. 2015). Several different mechanisms have been reported in organisms that can potentially increase its resistance to cold stress. One among that is the increase in concentration of certain metabolites that acts as anti-freeze agents. Such metabolites include Glycogen, trehalose, proline, triacylglycerol etc. Chen and Walker (1994) showed a positive correlation between glycogen content and cold tolerance. Similarly studies conducted by Hodkova and Hodek in 2004 showed that trehalose acts as anti-freeze compound and helps to resist cold stress in organisms. So here in this study we hypothesize that the amount of glycogen produced will be higher in the FSB (selected) populations compared to the FCB (control) populations since they are being selected for resistance to cold shock for the last 90 generations. Using Drosophila melanogaster as model organism we are also looking at how glycogen concentration varies within a population post cold shock. xi In order to understand this, we designed an experiment where flies were collected at 4 different time points: immediately after eclosion, 4 hours post cold shock, 12 hours post cold shock and 24 hours post cold shock. 30mg of male flies were used in each treatment for conducting the assays. Our results indicated that there is no significant difference in the amount of glycogen produced in the male flies of selected and control populations subjected to cold stress. Effect of period and selection regime appeared to be insignificant while period effect was evident.