Title:	Exploring the effect of caffeine on life-history traits and immunity of laboratory populations of Drosophila melanogaster adapted to larval crowding
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Abstract:	An organism's ability to survive in its adult stages is largely dependent on the resources it obtains through- out its formative stage. In nature, larval crowding is a frequent stressor that can have long-term consequences for species. It is well recognized that an organism's juvenile environment has an impact on its adult stage. The major- ity of resource acquisition occurs in the larval stages of holometabolous insects, such as Drosophila melanogaster, the model organism employed in this study. It has been demonstrated that exposure to Drosophila melanogaster larval crowding reduces the size of adult flies' bodies as well as other characteristics including reproduction and longevity. Additionally, larvae who have acclimated to these circumstances have demonstrated higher levels of tolerance, competitiveness, and feeding rates . Immune responses can be majorly classified as innate and adaptive. Invertebrates lack a proper adaptive immune system but have an elaborate innate immune system. Innate immunity can be further of two types - cellular and humoral. The humoral innate immune response is mediated through antimicrobial peptides specific for a class of pathogens, ROS, etc. while the cellular innate immune system comprises the 3 types of hemocytes: Lamellocytes, Crystal cells, and plasmatocytes. This study explores the influence of caffeine, a stimulant, on life-history traits and immunity in Drosophila melanogaster populations adapted to larval crowding. Widely consumed across the globe, caffeine is a naturally occurring stimulant found in over 60 plant species. This white, odorless powder with a slightly bitter taste, chemically known as 1,3,7-trimethyl xanthine, impacts various systems within the human body. Its effects, ranging from positive to negative, depend on the amount consumed, the source (coffee, tea, etc.), and individual factors like sex, age, and diet. We investigated how various concentrations of caffeine exposure affect life-history parameters like development time, and survivorship in these flies. Additionally, we assessed the impact of caffeine on their immune function. We found that caffeine increased developmental time and has shown certain effects depending on different caffeine concentrations.
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