

Malnutrition Delays Onset of Sexual Behavior and Slows Secondary Sexual Organ Growth in Pest Fly

Sexual Organ Growth in Pest Fly

Samantha Thomas, Clancy Short, and Daniel Hahn

Department of Entomology and Nematology, University of Florida, Gainesville, FL 32611, USA



Background

- Animals need proper nutrients to mature properly. Without them, it takes longer for animals to sexually mature.
- Tephritids are a major family of fruit fly pest that causes millions of dollars worth of agricultural damage every year.
- SIT controls many insects, including the tephritid *Anastrepha suspensa*, and decreases pest populations without the harmful chemicals.
- Studying secondary sexual organs could help scientists in determining how to generate more competitive males, thus improving SIT.

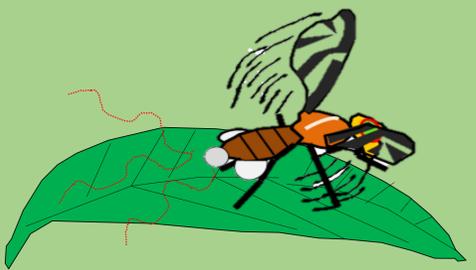


Fig 1. The salivary ball glands of *A. suspensa* are secondary sexual organs that produce pheromones to attract females. Bulging of the pleural and anal glands release the pheromones and wing fanning spreads them out. This is how tephritids exhibit calling behavior.

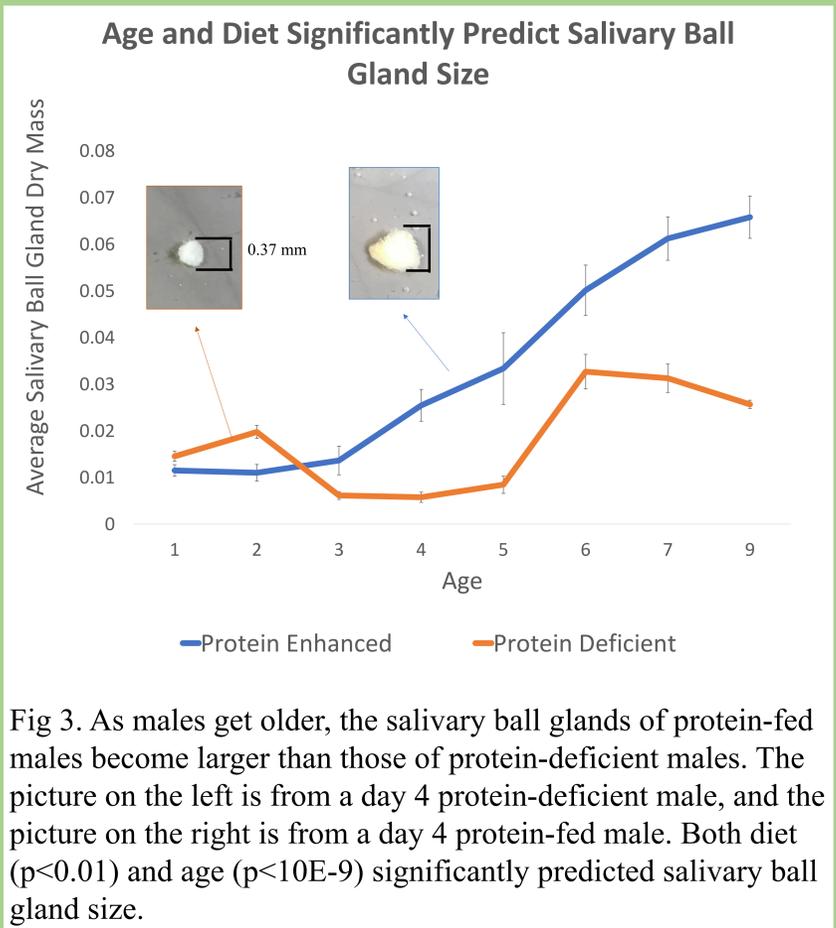


Fig 3. As males get older, the salivary ball glands of protein-fed males become larger than those of protein-deficient males. The picture on the left is from a day 4 protein-deficient male, and the picture on the right is from a day 4 protein-fed male. Both diet ($p < 0.01$) and age ($p < 10E-9$) significantly predicted salivary ball gland size.

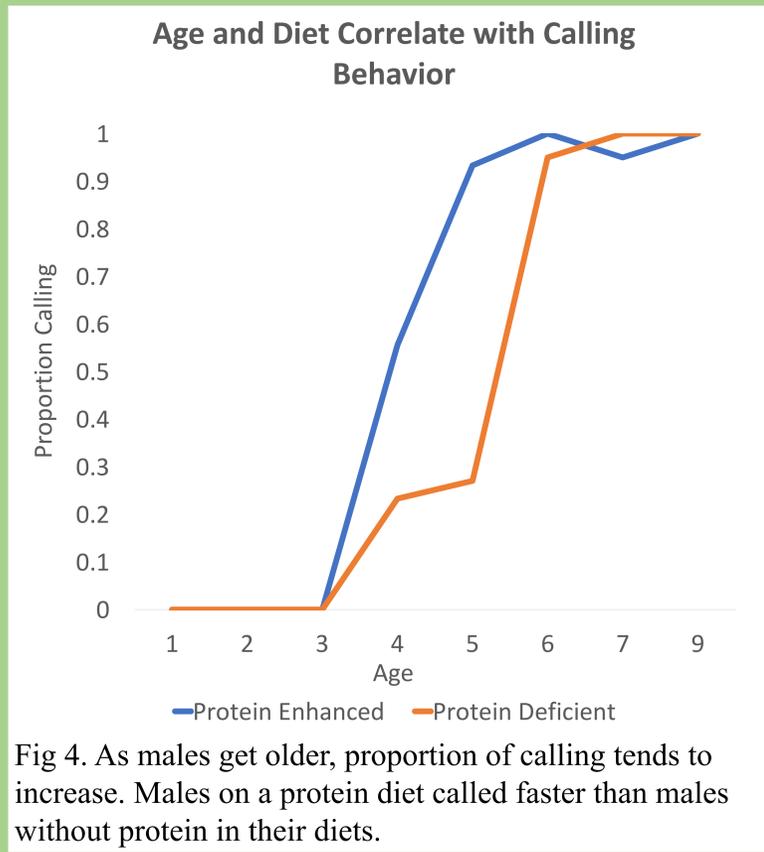


Fig 4. As males get older, proportion of calling tends to increase. Males on a protein diet called faster than males without protein in their diets.

Conclusion

- Future loss of function and gain of function studies may confirm that the salivary ball gland regulates calling behavior.
- Larger salivary ball glands in male tephritids could lead to increased competitiveness in males and an improvement in the Sterile Insect Technique.
- We can make SIT more effective by exploring whether more developed secondary sexual organs accelerate sexual maturity and improve performance.
- With these improvements to SIT, we can help in the fight against these agricultural pests.

Key Question:
To what extent does diet affect the size of the salivary ball gland and size of salivary ball gland affect sexual maturation (calling behavior)?

Methods

Sample male flies on day of emergence (day 0) through day 9 of adulthood

Put on diets with and without protein

Perform courtship assays on males 3-9 days old

Dissect out salivary ball gland and dry to measure dry mass

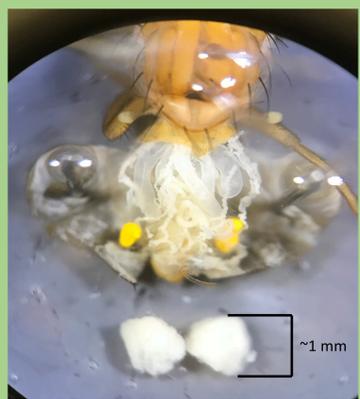
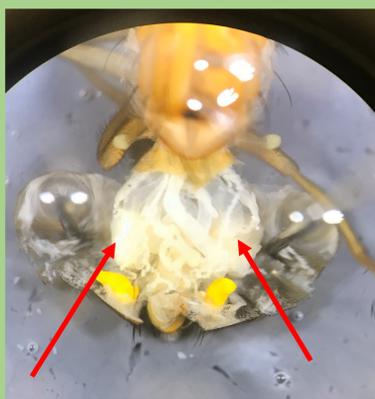


Fig 2. Day 7 protein-deficient fly with salivary ball glands in body cavity (left) and outside body cavity (right).

Reference: Lima, I., House, P., Nascimento, R. 2001. *J1.9B6raz. Chem. Soc.*, Vol. 12, No. 2, 196-201.