Development and fecundity of *Amyelois transitella* reared on mummy host material

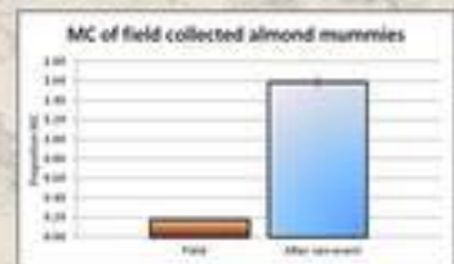
Devin A. Clarke,[1]
Justin E. Nay,[2] Frank G. Zalom,[3] Elizabeth A. Boyd[1]

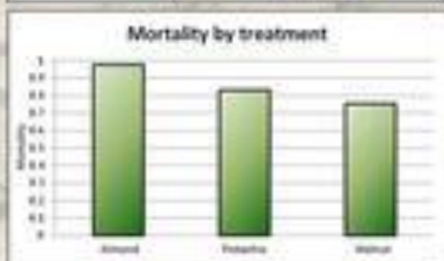
Abstract

Amyelois transitella (Lepidoptera: Pyralidae), is a primary pest of almonds and pistachios, as well as a secondary pest of walnuts in California. In each cropping system, the fecundity of *A. transitella* ultimately determines potential damage, and overwintering generation developmental time can influence subsequent management practices. Previous studies determined fecundity and development parameters of this pest on different hosts under numerous temperatures and light regimens, however, results were highly variable and no studies documented these response variables with *A. transitella* reared from mummy nuts. The objective of this study was to measure male and female development and female fecundity from colony-sourced neonates reared on almond, pistachio, and walnut mummy host diets. Results from this research offer insight into *A. transitella* reproductive capacity and development in the overwintering generation and may facilitate more accurate management thresholds, timing, and sanitation practices for these cropping systems.

Introduction

Amyelois transitella (Lepidoptera: Pyralidae), is a primary pest of almonds (*Prunus dulcis*) and pistachios (*Pistachio vera*), as well as a secondary pest of walnuts (*Juglans regia*) in California. Management practices are dependent on timing appropriate tactics based on developmental stages of this pest. Past studies have documented a range of fecundity and development rates for *A. transitella* under different temperature and light regimes, though none have compared these response variables on primary and secondary host material while controlling relative humidity, temperature, and moisture content (MC) of the diet as limiting factors (Wade, 1961, Kellen & Hoffman 1983). Nay and Perring (2006) documented highly variable development times for a closely related Phycitinae (Lepidoptera: Pyralidae) moth under different larval diet MC regimes. Almonds have been documented to contain ca. 30% and 20% MC at hull split and maturity, respectively (Hawker and Buttrose, 1980). This difference in MC could potentially explain some discrepancies in development rates from past studies and have implications for the suitability of the standard degree-day model in determining developmental stages of this pest in the field. The objective of this study was to measure male and female development and female fecundity from colony-sourced *A. transitella* neonates reared on almond, pistachio, and walnut host diets while controlling temperature, relative humidity, and moisture content of the diet.

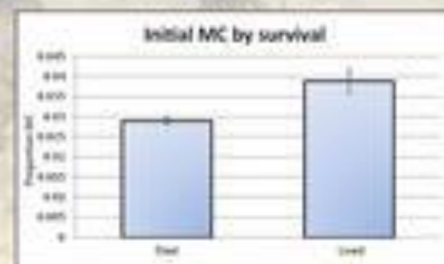


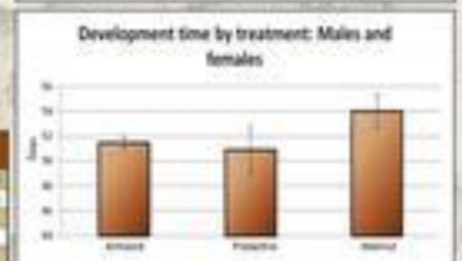


Materials and Methods

- Host mummies collected from California Central Valley
- Host diet material chopped and dried in oven at 48° C for 12 d until plateau of moisture loss for starting point of zero MC
  - Weight measured daily
- Average of 2 g each diet randomly assigned to 90 cups, which were randomly assigned to humidity chambers in temperature cabinet
- All cups held in respective humidity chambers for 13 d to equilibrate to constant MC
  - Weight measured daily
- < 1 d old neonates placed in each cup using camel hair brush (successful transfers observed)
- Each cup weighed daily for maximum 80 d or larvae confirmed dead or adult moth emerged
- Emergence date, weight, sex for each moth recorded
- Females placed individually in jars to record counts of sterile eggs oviposited

Host Material	Host stage	Avg. Degree Days till adult emergence	Source
Almond	New crop	424-427	Seaman & Barnes, 1984
Almond	Mummy	623	Seaman & Barnes, 1984
Almond	Mummy	824.3	Current Study
Pistachio	Mummy	823.07	Current Study
Walnut	Mummy	875.45	Current Study





Discussion

Results from this study indicate *A. transitella* survival is compromised on host mummies at low fruit moisture contents. Field collected almond mummies from Nov 2011 averaged 17% MC while fresh crop almonds at hull split are reported to contain ca. 30% MC (Hawker and Buttrose, 1980). Considering development on these host stages reportedly ranges from 424-427 DD and 623 DD, respectively, and results herein showed an average of 824 DD at ± 3-4% MC at a constant temperature using the same calculation methods, it is evident that fruit MC also plays a substantial role in development time of this pest (Seaman and Barnes, 1984). This inconsistency with the standard degree day model projections for the development time of *A. transitella* could seriously impact the efficacy of management tactics in an integrated pest management program.

References

Nay, J. E. and T. M. Perring. 2006. [illegible]

Seaman, W. J. and M. M. Barnes. 1984. [illegible]

Hawker, J. S. and M. S. Buttrose. 1980. [illegible]

Kellen, M. R. and K. C. Hoffman. 1983. [illegible]

Wade, W. H. 1961. [illegible]

[1]California State University, Chico, [2]Integral Ag. Inc., [3]UC Davis

Acknowledgements:
UC/CSU/CC Collaborative Projects Grant, Association of Applied IPM Ecologists & Applied Insects Ecologists Foundation Scholarship
CSU Chico, College of Agriculture, Dr. Colleen Hatfield- CSU Chico Dept. of Biological Sciences, Dr. Patrick Doyle- CSU Chico College of Agriculture,
Nikki Nicola- UC Davis, Chuck Sellars and Kathy Barrey-Garrett CSU Chico College of Agriculture