Effect of temperature on development, survival and reproduction of the mealybug, Phenacoccus solenopsis Tinsley (Hemiptera: Pseudococcidae) on cotton

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Source:
Crop protection 2012 v.39 pp. 81-88

ISSN:
0261-2194

Subject:
cotton, life tables, linear models, Phenacoccus, Gossypium hirsutum, fecundity, males, instars, sex ratio, adulthood, sexual reproduction, population growth, temperature, Solenopsis, heat sums, females

Abstract:
The effect of temperature on life cycle of the solenopsis mealybug, Phenacoccus solenopsis Tinsley, on cotton (Gossypium hirsutum L.) was assessed under laboratory conditions at ten constant temperatures (18â□□40Â Â°C). The development duration of female and male nymphal instars linearly decreased with the increase in temperature from 18 to 32Â Â°C. Cumulative developmental time of females ranged from 43.9Â d (18Â Â°C) to 15.0Â d (32Â Â°C). Survival of crawlers to adulthood was lowest (<53%) at 20 and 36Â Â°C and highest (80%) at 32Â Â°C. The solenopsis mealybug exhibited obligate sexual ovoviviparous reproduction and the pre-oviposition period in mated females showed a significant decreasing trend between 20Â Â°C (23.0Â d) and 30Â Â°C (9.5Â d). The oviposition period of 10.2â□□11.5Â d at â□¥25Â Â°C was nearly half the duration than at 20Â Â°C and the highest fecundity (245 eggsÂ +Â crawlers) was observed at 30Â Â°C. Longevity of mated females was significantly prolonged at 20Â Â°C (46.0Â d) compared to 30Â Â°C (21.4Â d). Proportion of females was highest (97.5%) at 25Â Â°C. Males required higher degree-days (363.6) for their cumulative development compared to females (317.5). Lower temperature thresholds estimated from the linear model for cumulative female and male development were 11.7 and 10.1Â Â°C, respectively. The estimated optimum temperature thresholds for nymphal instars (32â□□33.4Â Â°C) from Î² type distribution function were closer to the observed maximum developmental rate compared to Lactin-2 model. The population trend index using survival, fecundity, and sex ratio of P.Â solenopsis with an initial population of 100 crawlers in the Morris-Watt life table model indicated a potential population increase of 170.3 and 97.6 times at 30 and 35Â Â°C, respectively, in the next generation. The usefulness of the information on the temperature-dependent life cycle of P.Â solenopsis in understanding its field abundance and distribution on cotton and implications for management is discussed.

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