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Age-stage, two-sex life tables and predation analyses of the predatory mite *Cheyletus malaccensis* Oudemans at different temperatures

Weiwei Sun, Liyuan Xia, Miao Cui, Qing Yu, Yang Cao, Yi Wu*

Academy of National Food and Strategic Reserves Administration, Beijing, 100037, China.

*Corresponding author's email: wuyi@ags.ac.cn

ABSTRACT

Cheyletus malaccensis Oudemans is a predatory mite inhabiting grain depots. The relationship between temperature and the population growth rate of *C. malaccensis* will be useful for predicting its population dynamics. Age-stage, two-sex life tables of the predator, *C. malaccensis*, reared on *Acarus siro* were constructed under laboratory conditions at 22, 24, 28, 30 and 32°C, and 75% relative humidity in dark. Based on predation analysis, predation capacity of *C. malaccensis* on *A. siro* was evaluated for the treatment temperatures of 22, 30 and 32°C. Results showed that increasing temperature led to a shorter development time of immature stages. The life history of *C. malaccensis* varied from 11.10 d to 27.50 d. Life table parameters showed that 28°C was the optimum temperature for the growth and development of *C. malaccensis*. The highest net reproductive rate ($R_0 = 290.25$) and highest fecundity (544.52) occurred at 28°C. Temperature significantly affected the intrinsic rate of increase (r), fecundity, and finite rate of increase (λ). The peak value of the age-specific fecundity curve (m_x) was 28°C>24°C>30°C>32°C>22°C, while the peak value of the age-stage-specific fecundity curve ($f_{x,t}$) showed the same trend. The age-specific predation rates increased inconsistently with age and the order was 32°C>30°C>22°C. The order for cumulative net predation rate was 22°C>30°C>32°C and for the transformation rate was 30°C>22°C>32°C. The predation rate at 32°C was the highest while the cumulative net predation was the lowest, and the predation rate at 22°C was the lowest while the cumulative net predation was the highest. The adults of *C. malaccensis* with the highest predatory ability had a short developmental duration and a low cumulative net predatory rate at high temperatures. Supplementary introduction of *C. malaccensis* might be a better biological control strategy.

Keywords: *Cheyletus malaccensis* Oudemans, Biological control, Age-stage two-sex life table, Predation rate