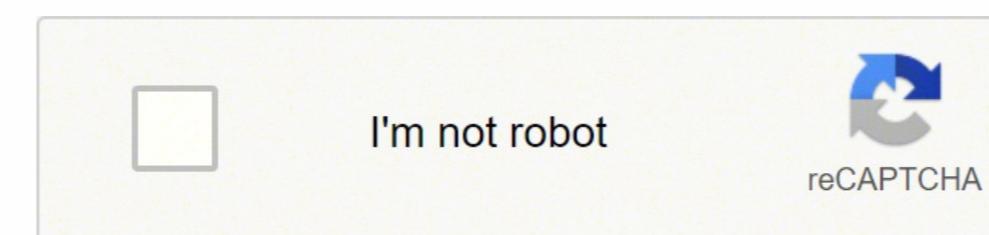


Trichogramma evanescens pdf



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ElhabawyDepartment of Economic Entomology, Faculty of Agriculture, Kafrelsheikh University, Kafrelsheikh 33516, EgyptFind articles by El-Said M. Elhabawy, moc.oohay@z.sisain Received 2021 Jun 12; Revised 2021 Jul 14; Accepted 2021 Aug 3.Copyright © 2021 The Author(s)This is an open access article under the CC BY-NC-ND license (. This experimental study was done at the Biological Control Laboratory, Sakha Agricultural Research Station, Sakha, Kafrelsheikh, Egypt.. We aimed to estimate the impact of different cold (10 °C) storage durations [0 (non-cold-stored parasitized eggs), 3, 6, 9, 12, 15, 18, 21, 24, 27, and 30 days], on Trichogramma evanescens (Westwood) (Hymenoptera: Trichogrammatidae) during the pupal stage using the eggs of Sitotroga cerealella after exposing to T. evanescens. The emergence percentage of non-cold-stored eggs of S. cerealella was higher than all cold-stored durations. Also, the female's percentages of T. evanescens in the cold storage durations were lower than the non-cold storage one, and they were influenced by extended cold storage durations. There were non-significant differences in the female's longevity of T. evanescens obtained from 0, 3, and 6 days cold-stored parasitized eggs of S. cerealella at 10 °C, but it began to decrease from those produced after 9 days of cold-stored eggs. In addition, the emergence percentage in F1 progeny of T. evanescens was greater than 50% until 21 days of cold storage. It could be concluded that cold storage reduced the % emergence, % females, female's longevity, and emergence percentage in F1 progeny of T. evanescens. For a successful biological control program, the decrease of T. evanescens performance after cold storage durations should be considered in mass production, and the release percentage should be increased by the equivalent of a lack of % emergence. Also, the economic importance of using cold storage periods in commercial mass rearing should be assessed in the biological control program.Keyword: Biological control, Cold storage, Egg parasitoids, F1 progeny, Sitotroga cerealella, Trichogramma spp.Biological control can play an essential role in reducing pest numbers in field crops, fruit orchards, and forests. Trichogramma spp. are true egg parasitoids, and they are considered the most natural enemies widely used in the world, partially due to their ease of mass production and their ability to attack a variety of serious insect crop pests (Li, 1994), especially lepidopterous ones in their early stages (their eggs) (Smith, 1996).Storage of natural enemies is extremely useful to be available when needed. Developing storage strategies for biocontrol agents is essential to provide efficiency and flexibility in mass rearing, synchronizing a desired stage of development and have enough stocks for a maximum release (Leopold, 1998, Gosh and Ballal, 2017).Developing storage ways for parasitoids without affecting their fitness is very important in the mass rearing process as indicated by (Leopold, 1998). In the last few years, many studies on the storage of Trichogramma spp. have been conducted due to its importance in the biological control field (Huang et al., 2017).Immatures of many Trichogramma species have the ability to enter quiescence or diapauses within their host eggs, allowing them to tolerate long times of cold temperatures (Smith, 1996, Abbes et al., 2020).Quiescence is a fast reaction to unsuitable environmental conditions (e.g., low temperature) and may involve physiological changes and causes development to be stopped or slowed, then comes back to grow when appropriate conditions return. Diapauses in several species of Trichogramma make it easy to store them for long durations (Bonnemaison, 1972). Many previous studies have evaluated the impacts of cold storage periods at 2–10 °C on essential biological parameters of many Trichogramma spp. Ayvaz et al., 2008, Aydin et al., 2009, Rodrigues and Sampaio, 2011 have indicated the short term of cold storage periods (5–25 days) at 8–10 °C have no negative impact. Whereas, Jalali and Singh, 1992, Ahmad et al., 2011, Lessard and Boivin, 2013 have found negative effects on F1 progeny after long-term cold storage (45–100 days) at 2–6 °C. According to Iacob and Iacob (1972), the emergence rate of egg parasitoid was significantly lower after cold storage at 9–12 °C. Abd El-Gawad et al. (2010) indicated that the emergence percentage was higher at 4 °C than at 10 °C. Furthermore, the decline in the emergence percentage becomes significant after 21 days of cold storage at 4 °C for T. brassicae and T. evanescens (Ozder and Saglam, 2004). The emergence rate of T. carverae decreased significantly after 3 weeks of cold storage (10 °C) (Bradley et al., 2004). Also, cold storage durations had a clear negative impact on the emergence rate with T. nerudai (Tezze and Botto, 2004), and T. cordubensis (Ventura Garcia et al., 2002). The reduction in the percentage of adult females increased by extended cold storage times (El Khayat et al., 2001, Mohamed and El-Heneidy, 2020). Moreover, the longevity of adult females of T. evanescens decreased as the storage durations extended at 4 °C (Karabörkli and Ayvaz, 2007).Sitotroga cerealella Olivier (Lepidoptera: Gelechiidae) is a commercially important host of Trichogramma parasitoids under laboratory conditions (Hassan, 1995).Also, the efficiency of Trichogramma parasitoids may be affected by the cold storage of the host eggs that will be exposed to the parasitoid after being stored for various periods (Rundt et al., 2004).The survival of the parasitoids produced as a result of prolonged cold storage may be harmed, with a significant reduction in the productivity of produced females (Ozder, 2004).The main aim of this study was to estimate whether T. evanescens could be stored during the pupal stage at 10 °C for various durations without losing efficiency. This estimation will lead to calculate the right release percentages when the cold storage parasitized eggs were used in a biological control program.This study was conducted at the Biological Control Laboratory, Rice Research and Training Center, Sakha Agricultural Research Station, Sakha, Kafrelsheikh, Egypt in 2019 to assess the effect of various colds (10 °C) storage durations for Trichogramma evanescens during the pupal stage.The mass rearing of Sitotroga cerealella (Olivier) (Lepidoptera: Gelechiidae) was done as described by Hassan (1995). The rearing of T. evanescens was done according to the method of Abd and Hafez (1995) by adding the new eggs (

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