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ABUNDANCE, LEAF FEEDING AND CONTROL OF EPILACHNA BEETLE IN BRINJAL AT PSTU CAMPUS

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ABSTRACT

The production of the brinjal is hampered due to severe infestation by epilachna beetle. The experiment was conducted to investigate the abundance of epilachna beetle on brinjal at Patuakhali Science and Technology University (PSTU) campus during January to May 2022 and to determine the effectiveness of different insecticides on mortality and leaf consumption. Three treatments viz., T_1 = Caught 10 EC @ 1 mlL^{-1} of water, T_2 = Bioclean (D-Limonin 5% M L) @ 1 mlL^{-1} of water, T_3 = Fyfanon 57 EC @ 1 mlL^{-1} of water and an untreated control. Results revealed that the highest number of grub (31.5) and adult (2.06) per plant was recorded in May while the lowest in January. The highest leaf area (35%) consumed by the grub was observed at 72 hours after release (HAR) followed by 48 HAR (28%) but the lowest (23%) in 24 HAR. Similar trend was also observed in leaf area consumed by adult beetle at 72, 48 and 24 HAR. The mortality of grub and adults were recorded 100% from the leaf treated by T_1 (Caught 10 EC @ 1 ml L^{-1} of water), T_2 (Bioclean (D-Limonin 5% M L) @ 1 mlL^{-1} of water) and T_3 (Fyfanon 57 EC @ 1 mlL^{-1} of water) while no mortality was observed in the untreated control. No leaf consumption by epilachna beetle was observed after 24 hours of release when treated by T_1 (Caught 10 EC @ 1 mlL^{-1} of water), T_2 (Bioclean (D-Limonin 5% M L) @ 1 mlL^{-1} of water) and T_3 (Fyfanon 57 EC @ 1 mlL^{-1} of water) while 24% and 17% leaf consumption by grub and adult, respectively in the untreated control. Though all these treatments were effective for controlling epilachna beetle but Bioclean could be the best option for eco-friendly management.

Keywords: Epilachna beetle, Incidence, leaf consumption, insecticidal efficacy.

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INTRODUCTION

Epilachna beetle is a polyphagous pest, and feed mainly on cucurbits, tomato, potato, and kidney bean as well as brinjal. This beetle is considered as one of the most serious pest of brinjal (Padwal *et al*. 2016). Brinjal contain nutrients such as dietary fiber, vitamins, minerals that contributes to the diets of the human especially when other vegetables are in scarce (Padwal *et al.* 2016). But brinjal faces severe threats from several pests and diseases during the crop cycle. Among them, the beetle *E. dodecastigma* belonging to the sub-family Epilachninae is considered as the destructive plant-feeding Coccinellid (Shankar *et al*. 2010). They are the most economically significant pests in Australia, North America, East Indies, East Asia, Central Asia, Sri Lanka, Malaysia, China, India and Bangladesh (Zhou *et al*. 2015, Khan *et al.* 2000). The beetle can cause considerable damage to a number of solanaceous and cucurbitaceous crops (Khan *et al*. 2000, Islam *et al.* 2011, Jamwal *et al*. 2013). Yield loss of brinjal crop due to the attack of this pest varies from 10 to 20% (Alam 1969). Fruit yield reduction up to 60% and leaf damage up to 80% have been reported (Rajagopal and Trivedi 1989, Mall *et al*. 1992). The minimum damage of leaves (1.11 %) and flower (4.44 %) followed by maximum damage in 46th (28.89 %) and 39th (16.67 %) standard week (Mawtham *et al*. 2020). Hossain *et al*. (2009) studied the effect of different host plants on growth and development of epilachna beetle. Ramandeep and Mavi (2005) reported that food consumption of Epilachna beetle is greatly influenced by morphological and compositional variation of host plants (Hossain *et al*. 2009).

Different chemical stimuli and physiological factors in host plants influence the food consumption rate of epilachna beetle (Jones *et al*. 1981). This beetle may also be controlled through foliar applications of synthetic pesticides like malathion, parathion, methoxychlor and rotenone (Robert 1978). Among the different management practices, chemical control is commonly practiced by the farmers for the management of insect pest on brinjal and the vegetables (Saimandir and Gopal 2012, Latif *et al*. 2010). The use of insecticides could be more effective depending on selection of chemicals, doses, method and time of application. Considering above fact the present study was conducted to know the abundance, leaf feeding and control of epilachna beetle in homestead area.

MATERIALS AND METHODS

The abundance of epilachna beetle was observed and recorded on brinjal plants as number of beetles per plant grown in homestead garden of Patuakhali Science and Technology University (PSTU) campus. Laboratory experiment was done in the Department of Entomology, Patuakhali Science and Technology University, Dumki, Patuakhali during January to May 2022. The fresh undamaged brinjal leaves were collected from the homestead garden and kept them in separate petridishes. The grub and adult of *Epilachna vigintioctopunctata* were released separately in petridish to feed supplied leaves. The percent damage caused by grub and adult beetle was measured by eye estimation at 24, 48 and 72 hours after release. Three treatments viz., T_1 = Caught 10 EC @ 1 mL^{-1} of water, T_2 = Bioclean (D-Limonin 5% M L) @ 1 mL^{-1} of water, T_3 = Fyfanon 57 EC @ 1 mL^{-1} of water and an untreated control were maintained. Laboratory experiment was laid out in a Completely Randomized Design (CRD) with three replications.

Statistical analysis: Data were analysed by using WASP 1.0 statistical software. MS Excell program was used to represent data graphically.

RESULTS AND DISCUSSION

Abundance of epilachna beetle $plant^{-1}$

The highest number of grub per plant was recorded in May (31.5) followed by April (20.11) while the lowest in January (8.22) followed by February (9.11). Similar trend was also observed in case of adult beetle where the highest number was found in May (2.06) while the lowest (0.84) in January (Fig. 1).

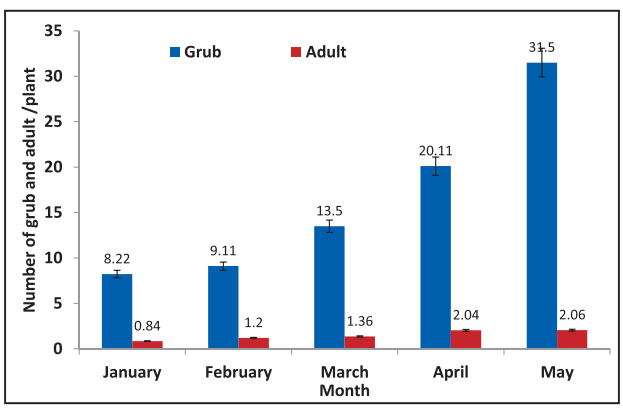

Fig. 1. Number of grub and adult of epilachna beetle per plant during January to May 2022

Leaf area consumption by grub and adult under laboratory condition

The highest leaf area (35%) consumption by the grub was observed at 72 hours after release (HAR) followed by 48 HAR (28%) but the lowest in 24 HAR (23%). In case of adult, the highest leaf area consumption was observed at 72 HAR (28%) followed by 48 HAR (23%) while the lowest in 24 HAR (18%) (Fig. 2).

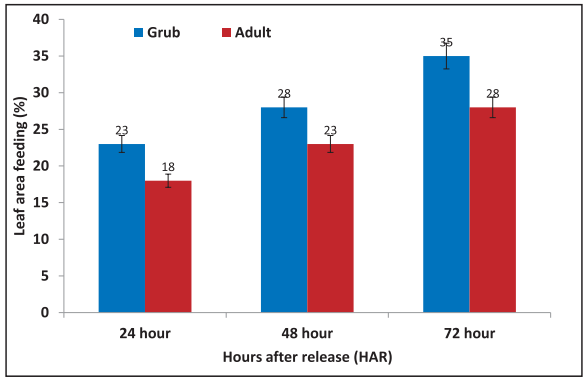

Fig. 2. Percentage of leaf area consumed by the grub and adult of epilachna beetle at different hours after release under laboratory conditions

Efficacy of different treatments on the mortality of epilachna beetle

The mortality of grub and adult received 100% from the leaves treated by T_1 (Caught 10 EC @ 1 mlL^{-1} of water), T_2 (Bioclean (D-Limonin 5% M L) @ 1 mlL^{-1} of water) and T_3 (Fyfanon 57 EC @ 1 mlL^{-1} of water) while no mortality was observed in the untreated control (Fig. 3).

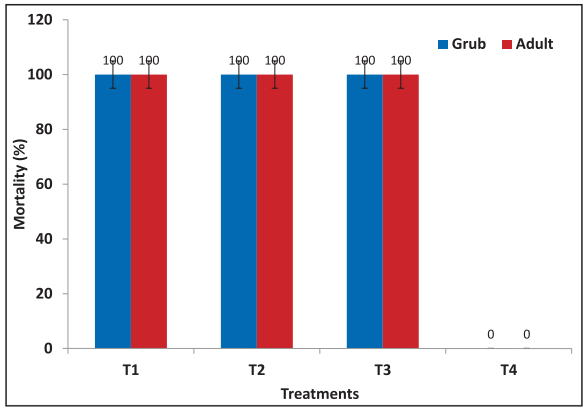

Fig. 3. Efficacy of different treatments on the mortality of epilachna beetle after 24 hours under laboratory conditions. T_1 = Caught 10 EC @ 1 mlL^{-1} of water, T_2 = Bioclean (D-Limonin 5% M L) @ 1 mlL^{-1} of water, T_3 = Fyfanon 57 EC @ 1 mlL^{-1} of water and T_4 = Untreated control.

Efficacy of different treatments against leaf area feeding by epilachna beetle

No leaf area consumed by adult beetle was observed after 24 hours of release following the application of T_1 treatment (Caught 10 EC @ 1 mlL^{-1} of water), T_2 (Bioclean (D-Limonin 5% M L) @ 1 mlL^{-1} of water) and T_3 (Fyfanon 57 EC @ 1 mlL^{-1} of water) treatments while the 24% (grub) and 17% (adult) leaf area was recorded in the untreated control (Fig. 4).

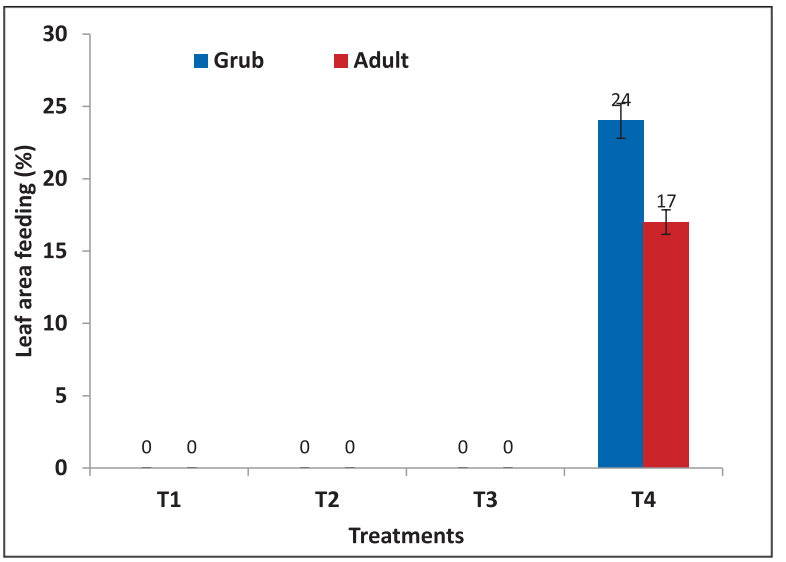

Fig. 4. Efficacy of different treatments on leaf area consumption by epilachna beetle after 24 hours of release under laboratory condition. T_1 = Caught 10 EC, T_2 = Bioclean (D-Limonin 5% M L), T_3 = Fyfanon 57 EC and T_4 = Untreated control

The results of the present study are in agreement with the findings of Ghule *et al.* (2014) who stated that the active period of epilachna beetle was recorded from March to May. Increased number of grubs had also been reported by Raghuraman and Veeravel (1999). The peak incidence of grubs occurred in the early to mid-season of crop and started to decline. This was in accordance with the findings of Haseeb *et al*. (2009). They cited that the adult beetle occurred on a very low intensity throughout the cropping season. This was supported by Varma and Anadhi (2008). The average number of Epilachna grubs per plant indicated their abundance starting from sixth standard week till 14th standard week. The damage decreased with decreasing number of grubs.

Aola *et al*. (2009) stated that variation of beetle incidence was due to variability in food value and succulent host plant leaf. Mallick *et al*. (2018) observed that the leaf damage by Epilachna beetle, fruit damage (both on number and weight basis) and marketable fruit yield were however, found unaffected by the nutrient sources tested. Food consumption both by a single larva and adult was found to be the highest on the variety Thamba and the lowest on kata begun and Amjuri. The larva and adult mostly preferred the variety Thamba followed by ISD 006 and Kazla (Das *et al.* 2011). The higher laboratory feeding preference of epilachna beetle in free choice test recorded on *Physalis angulata* (0.45) followed by *Solanum nigrum* (0.25), *Datura metal* (0.21), *Solanum trilobatum* (0.16) and the lowest leaf area consumption recorded on *Solanum xanthocarpum* (0.27) (Manikandan *et al*. 2019). Bala *et al.* (2016) carried out field trials to test the effectiveness of insecticides i.e. cypermethrin 25 EC against epilachna beetle (*E. vigintioctopunctata*), infesting brinjal and found all the treatments were significantly superior over untreated control. The most effective treatment was cypermethrin 25 EC @ 0.4 kg a.iha^{-1} followed by cypermethrin 25 EC @ 0.3 kg a.iha^{-1}.

CONCLUSION

The highest abundance of epilahna beetle grub and adult was recorded in the month of May. The highest percent leaf area feeding by grub and adult was found 72 hours after release. Though all these treatments were effective for controlling epilachna beetle but Bioclean could be the best option for eco-friendly management.

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