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Research Article

INVESTIGATION ON EFFECT OF *THEVETIA PERUVIANA* (PERS) ON THE MORTALITY OF *HOLOTRICHIA SERRATA* (FAB) ADULTS (COLEOPTERA: SCARABAIEDAE)

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ABSTRACT
White grub is called as Chaffer beetle. White grub is a National pest, it has worldwide distribution. The white grub's damage agricultural crops and there adults were feed on leaves of economical and medically important host plants like *Azadirachta indica, Acacia arabica, Ziziphus zizyphus* and *Acacia catechu*. The *Holotrichia serrata* (Fab.), *Holotrichia fissa* (Br.) and *Leucopholis lepidophora* (Bl.) are important agriculture pest cause damage to commercial crops such as groundnut, potato, pea, maize, sugarcane etc. The bio pesticides or insecticides, an alternative to systematic insecticides and are organic, often low mammalian toxicity and less hazardous to the environment. In present study, the leaf of *Thevetia peruviana* (Pers.) or Yellow Oleander were extracted in aqueous and treated against the adults of *Holotrichia serrata* (Fab.). The tested aqueous leaf extract effectively produced 50 % mortality of *Holotrichia serrata* (Fab.) and their toxicity was 0.025 % after 48 hours bioassay.
Keywords: Bio pesticide, *Holotrichia serrata*, mortality, national pest, *Thevetia peruviana*, toxicity

INTRODUCTION

The Yellow Oleander or *Thevetia peruviana* (Pers) is belonging to the family Apocynaceae[1]. *Thevetia peruviana* (Pers) is an evergreen tropical shrub or small tree. *Thevetia peruviana* (Pers) is a plant known to central and southern Mexico and Central America. It is a close relative of *Nerium oleander*. It is commonly known as Yellow Oleander, and is also called as Bitti in India. The Yellow oleander is a small tree that grown in garden and roadside as ornamental plant. Flowers bloom from summer to fall. The long funnel shaped sometimes fragrant yellow flowers are in few flowered terminal cluster. The tender fruits is deep yellow in color which turn black when is mature. Each fruit contain two seeds. The leaves show a dark green surface. The leaves of *Thevetia peruviana* (Pers) contain poyhydroxy- dimono-terpinoides and dimonoterpenoid apiosylgucosides[2]. Leaf and seed extracts are toxic against *Tribolium castaneum*[3-5]. Seeds, leaves, fruits and roots of *Thevetia peruviana* (Pers) are considered as potential sources of biologically active compounds, such as insecticides, rodenticide, fungicide and bactericides[6-15]. The plants toxins have tested in experiments for the uses of biological pest control. It is a plant toxin insecticide for termites. *Thevetia peruviana* (Pers) seed oil was used to make paint with antifungal, antibacterial and anti termite properties. White grub is a Scarabaeidae beetles. In India, white grub known as root grub or root feeders have national importance during the last two decades. The C-shaped larvae are pale yellow/ white in color. This pest has includes in the category of national pests and large sum money is being spent on their control at national level. These are heavy cause damage to a wide variety of wild and medicinal plants[16]. The scarab beetles adults were collected at dusk time from the leaves of host plants such as *Azadirachta indica, Acacia arabica, Ziziphus zizyphus* and *Acacia catechu* etc and *Holotricha serrata* (Fab) was most abundant species found in Northern Western Ghats region, India[17]. Availability of abundant roots and adequate moisture for a longer time in sugarcane, groundnut and pea crop tend to increase the white grub build up markedly[18]. This is further facilitated by prevalence of host trees for adult feed on host plants. The scarab beetles are nocturnal; the grubs mostly live underground or under debris, so they are not exposed to sunlight. The major species of white grubs especially in Maharashtra, India namely *Holotrichia serrata* (Fab), *Holotrichia fissa* (Br), *Leucopholis lepidophora* (Bl) (Melolonthidae) are cosmopolitan in distribution. White grub have become serious pest of agricultural crops, fruits, vegetables, ornamental plants, turf and grass lawns, golf courses and forest as well as medicinally important trees in different parts of the world[19,20]. Pests are known to inflict considerable losses in cane yield as well as sugar output. The present study was made to assess the toxic effect of *Thevetia peruviana* (Pers) leaf extract against the adults of *Holotrichia serrata* (Fab.) with the special reference to biopesticide.

MATERIALS AND METHODS

Beetles collection and identification

The experiment was carried out at the Department of Zoology, Hutatma Rajguru Mahavidyalaya, Rajgurunagar, Pune, India. Adult surveys to determine species occurrence were conducted in the groundnut, potato, sugarcane, maize, pea growing areas of Khed Taluka during at the time of first monsoon season[21]. *Holotrichia serrata* (Fab.) beetles are nocturnal in habitat. The *Holotrichia serrata* (Fab.) beetles were collected by handpicked method from host plant of *Azadirachta indica, Acacia arabica, Ziziphus zizyphus* and *Acacia catechu* at the time of dusk. The collected adults were carried in laboratory, segregated and identified as per standard key[22-24]. Two plastic tubs (55 cm by 35 cm by 15 cm) were filled with sand. In every plastic tub four earthen

pots were placed. These earthen pots were filled with soil, and to provide food to adults host plant leaves. Then segregated adults divided into groups of ten adults (five male and female each) and kept into the earthen pots. Adults were supplied with fresh Neem leaves daily and maintained the moisture condition at normal level. A granular formulation of BHC powder was applied around the exterior of the tub to prevent adults from ants entering the pots. These earthen pots maintain the temperature (27-30 centigrade) and moist condition. The *Holotrichia serrata* (Fab) beetles feeding was discontinuous 48 hours before the treatment of experiment in the earthen pot.

Plant extracts preparation

The *Thevetia peruviana* (Pers) plant leaves collected from different regions. Herbarium sample of *Thevetia peruviana* (Pers) was deposited for identification at the laboratory of Department of Botany, Govt. Institute of Science, Post Graduate and Research Centre, Aurangabad, India. The collected leaves were washes with distilled water and weighed by an electronic balance and grind in to hand grinder or mortar and pestle. The grinded extract again weighed by electronic balance. For the plant extract preparation aqueous extraction method was used. Obtained of different leaf extract concentration a solution was prepared by mixing 0.015 g, 0.020 g, 0.025 g, 0.030 g and 0.035 g dissolved in 100 ml distilled water respectively in a conical flask, through shaken manually and stored in refrigerator.

The LC_{50} determination

Total fifty adults of *Holotrichia serrata* (Fab) were randomly divided into five group (ten each group). Each and every group, five male and five female adults were placed in experimental earthen pot. The fresh neem leaves were weighed by an electronic balance and dissolved in requisite five different concentrations (0.015, 0.020, 0.025, 0.030, 0.035 % w/v) solution and then filled in experimental earthen pot for feeding to *Holotrichia serrata* adults. Mortality was recorded after 24 hours, 48 h, 72 h and 96 hours exposure. Control batch for male and females was maintained with separate earthen pot. The experiments were conducted at 27 ± 2°C. The dead adults were removed immediately. After the 50 % mortality were found, analysis of the mortality was evaluated using a graphical method. The behavior of *Holotrichia serrata* adults in each pot were monitored and recorded every hour for the first four hour and then every 24 hours. The analysis of mortality was evaluated by graphical representation.

RESULTS

The present study result showed that the leaf aqueous extract of *Thevetia peruviana* (Pers) possessed toxic effect against *Holotrichia serrata* adults. The toxicity of *Thevetia peruviana* (Pers) Biopesticide on *Holotrichia serrata* (Fab.) was 0.025 g per 100 ml of 48 hours (Table 1). The 50 % mortality was recorded in 0.025 % after 48 hours. No published information regarding *Thevetia peruviana* (Pers) leaves extract against *Holotrichia serrata* (Fab.) adults. Behavioral movements of *Holotrichia serrata* (Fab) adults after treatment were very slow. Biopesticide of *Thevetia peruviana* (Pers) aqueous leaf extract were also affected on weight of *Holotrichia serrata* (Fab.) adults as compare to control adults. Biopesticide of *Thevetia peruviana* (Pers) is acts as excellent broad spectrum control of white grub adults on commercial growing crops as well as economical and medical important host plants.

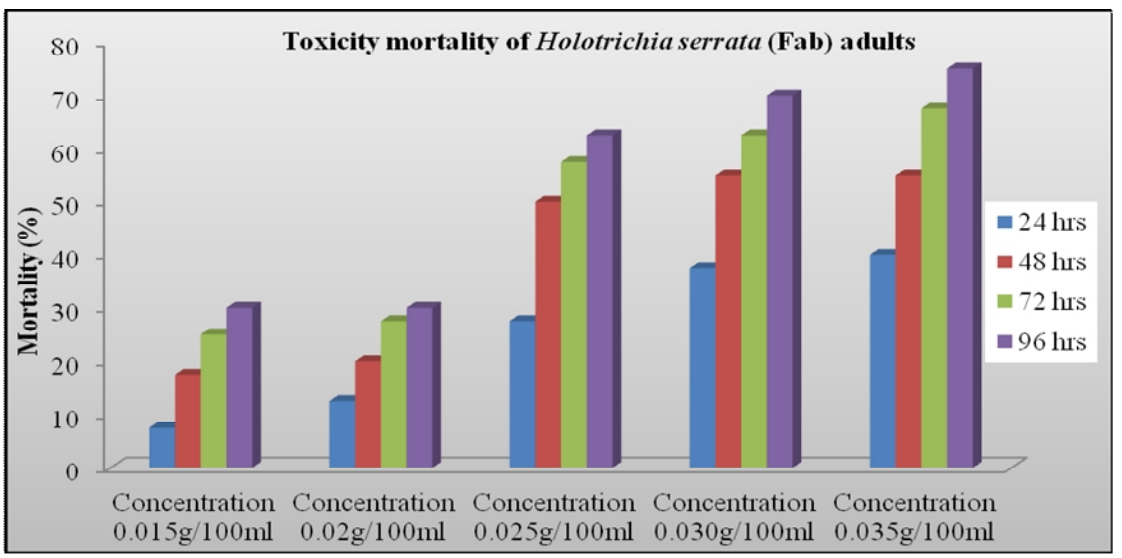

Figure 1: Determination of 50 % mortality for *Holotrichia serrata* (Fab) adults in different concentrations

DISCUSSION

Bio pesticide of *Thevetia peruviana* (Pers) is acts as excellent broad spectrum control of white grub adults on commercial growing crops as well as economical and medical important host plants. The adults would only be attracted to these plants and its quick flight down to the commercial crops growing area to lay their eggs. The leaf extract of *Thevetia peruviana* showed insecticidal effect against three stains of *T. castaneum* (CR1, CTC12 and FSS2) and their toxicity was in order; ethyl acetate> acetone> methanol> petroleum spirit[25]. Toxicity of *Thevetia peruviana* (Schum) extract to adults of *Callosobruchus maculates* F. (Coleoptera: Bruchidae)[26]. When used as an Integrated Pest Management (IPM) programs, pesticides can greatly decrease the use of conventional bio pesticides, while crop yields remain high. Pesticides have been recommended for control[27-29]. The use of chemical pesticides in nursery adversely affects the chemical balance of the soil. Bio pesticide cakes have both

contact and systematic action in plants or act as soil amendments[30].

CONCLUSION

However, this study was noticed to be resistant to plant extract used against the scarab species. The use of natural substances of plant origin in crop protection is an important means of promoting Bio pesticide in crop production. The bio pesticides can cheaper than chemical pesticides. These are allowed growers to maintain beneficial insect populations in their field, reducing the grower dependence on conventional chemical pesticides. The natural methods have always been among the used by farmers which are arguably the earliest agricultural bio pesticides. These products are harmless to the environment than synthetic pesticides. The bio pesticides often effective and often decompose quickly; thereby resulting in lower exposures and largely avoiding the pollution caused by conventional pesticides. The bio pesticides may contribute protection of turf, ornamentals and forests.

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