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EFFECT OF DIFFERENT BIOPESTICIDES ON FECUNDITY AND EGG HATCHABILITY OF HOLOTRICHIA FISSA, HOLOTRICHIA SERRATA AND LEUCOPHOLIS LEPIDOPHORA (COLEOPTERA: SCARABAEIDAE)

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Abstract: *The white grubs are called as Chaffer beetles. It causes damage to the roots of commercial crops. We use some plant extractives to observe there effects. White grubs are they root feeders and their beetles feeds on the leaves of host plants. They are called as a May-June beetles. Plants are the major natural sources of biopesticides. After treatment of extracts of Partheneum histerophorus, Pongamia glabra, Azadirechta indica, Calophyllum inophyllum and Ipomoea fistulosa on the mated females of the scarabeidae beetles of Holotrichia fissa, Holotrichia serrata, and Leucopholis lepidophora showed decrease in fecundity. The data shows decreasing hatchability in case of Holotrichia fissa, Holotrichia serrata and Leucopholis lepidophora. The biopesticides also shows decreasing effect in order to Azadirachta indica, Ipomoea fistulosa, Partheneum histerophorus, Pongamia glabra, Calophyllum inophyllumin; Azadirechta indica, Partheneum histerophorus, Pongamia glabra, Ipomoea fistulosa, Calophyllum inophyllum and Partheneum histerophorus, Ipomoea fistulosa, Calophyllum inophyllum, Pongamia glabra, Azadirechta indica. The effect of biopesticides is in decreasing order in case of both species of Melolonthidae.*

Keywords: *Plant extract, Holotrichia fissa, Holotrichia serrata, and Leucopholis lepidophora, Melolonthidae, fecundity, egg hatchability.*

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INTRODUCTION:

White grubs are called root feeders and their adults are called chaffer beetles or May June beetle. White grubs of the family Melolonthidae cause root injury to crop plants. The damage caused by the White grub up to 70% recorded (Bhawane et al. 1997). However, some species of Scarabaeoidea are beneficial too which can be involved in biological control of dung born dipterian flies (Bornmissza, 1970; Blum, et. al., 1973; Hughes, et. al., 1978). Five major species of white grubs namely *Holotrachia consaguinea* Bl., *Holotrachia serrata* Fab., *Holotrachia fissa* Br., *Leucopholis lepidophora* Bl. (Melolonthidae), *Anomola sp.* (Rutelidae) are cosmopolitan in distribution. In Western Maharashtra, particularly three species, *Holotrachia serrata* Fab., *Holotrachia fissa* Br. and *Leucopholis lepidophora* Bl. Inflict heavy damage to the agricultural and horticultural crops, (Anon, 1990). Taking into account the severity of the problem of white grubs, in present study five different bio pesticides (plant extractives) were applied on three species of beetles for study.

MATERIALS AND METHODS:

Collection and maintenance of experimental beetles:

A. The collection of adults of *Leucopholis lepidophora* was made during the period of August and September, 2011 from infested areas of sugarcane fields near Alandi and Markal. The emergence of adults takes place at dusk (7.30pm) during which they take active flight for about 15-25 minutes and descend down on the leaves of sugarcane and mating takes place. The collected adults were brought to the laboratory and maintained in the insect cages. The bottom was overlaid with the soil, brought from the same fields. They the bottom was overload were fed on sugarcane leaves.

B. The adults of *Holotrachia fissa* Br. were collected during the period of June to August, 2011 and during the first monsoon shower in May and June, 2011 from infested areas of groundnut fields near Rajgurunagar (Wadgaon Patole). They also emerge at dusk (7.20 to 7.50pm), alighting on the host plants like Ber, Drumstick, Umber and Ain. They fed on tender foliage. The mating takes place on the host plants. The maintenance and feeding was carried out as earlier.

C. The adult of *Holotrachia serrata* Fab. Were collected during monsoon from infested areas of groundnut and Paddy fields near Dehoshi (Rajgurunagar). These beetles emerge at

dusk alighting on host plants i.e. Neem and Babul. Mating takes place on host plant. The collection and maintenance was carried out as described for *Leucopholis lepidophora.*

The plant extracts employed for the present studies are viz.

1. *Azadirechta indica* A. Juss (Neem)
2. *Partheneum histerophorus* L. (Partheneum)
3. *Pongamia glabra* Vent. (Karanja)
4. *Ipomoea fistulosa* Mart. Ex. Choisy (Beshram)
5. *Calophyllum inophyllum* L. (Undi)

Sources of plant extracts:

Plant extracts of *Azadirechta indica, Pongamia glabra,* and *Calophyllum inophyllum* were obtained from the Director of Jamanalal Balaji Centre Research Institute for Village Industries, Wardha Maharashtra.

The plants *Partheneum histerophorus* and *Ipomoea fistulosa* were extracted from the shade dried leaves, by employing method of Patil and Hegade, (1988). The plant extracts were dissolved in acetone, to form 5% stock solution, whereas concentration of *Azadirechta indica* was kept 0.2%. The plant extracts were further used for topical application on the beetles stared above.

Application of the plant extracts:

The plant extract were topically applied and site of application in adult was on the dorsum of thorax and abdomen below the elytra. The plant extract were topically applied by dorsum of micro liters syringe. The experimental insects of three species were divided into earthen pots containing moist soil. Five female beetles were kept in each earthen pot. The egg laying capacity of treated and untreated (control) female of three species was observed at the intervals of 1^{st} day, 5^{th} day and 7^{th} day for *Holotrachia fissa* and *Holotrachia serrata.* For *Leucopholis lepidophora,* observations were made on 1^{st} day, 5^{th} day and 9^{th} day. The number of eggs laid in each case noted simultaneously, experiments were replicated thrice for each group, three observations were made, and results were analyzed statistically.

RESULTS:

The data presented in the Table, 1 revealed the extent of changes induced by topical application of *Partheneum histerophorus, Pongamia glabra, Azadirechta indica, Calophyllum inophyllum* and *Ipomoea fistulosa* on the oviposition and hatchability.

In case of *Holotrachia fissa* Br. Females treated with *Partheneum histerophorus* extract, the numbers of eggs laid were decreased as compared to that of controls. The treatments of P. histerophorus extract, the numbers of eggs laid were decreased as compared to that of controls. The treatment of *Pongamia glabra* caused reduction in egg laying capacity resulting into significant decrease in number of eggs lay. *Azadirechta indica* extract treatment caused decreased in number of eggs laid. The treatment of *Calophyllum inophyllum* extract resulted into decreased in oviposition. *Ipomoea fistulosa* extract application also caused decreased in number of eggs laid. The treatment of egg *Azadirechta indica* caused maximum decreased in egg hatching. *Ipomoea fistulosa* extract treatment also reduced egg hatchability. The order of decreased egg hatchability due to topical application of plant extracts was *Azadirechta indica, Ipomoea fistulosa, Partheneum histerophorus, Pongamia glabra, Calophyllum inophyllum* as compared to that in controls.

The female of *Holotrachia serrata* Fab, which is treated with *Partheneum histerophorus* extract showed decrease in oviposition han that in controls. The treatment of *Pongamia glabra, Azadirechta indica, Calophyllum inophyllum, Ipomoea fistulosa* extracts could not elicit much effect on oviposition. The reduction in egg hatchability due to effect of plant extracts was found in of *Azadirechta indica, Partheneum histerophorus, Pongamia glabra, Ipomoea fistulosa, Calophyllum inophyllum*; *Azadirechta indica,* however, caused increased ovipossition.

In case of *Leucopholis lepidophora* Bl., female's egg lying was occurred least due to the treatment of *Partheneum histerophorus* and *Ipomoea fistulosa* extract. The treatment of *Pongamia glabra, Calophyllum inophyllum* extracts did not show much decreased in egg laying. The decreased in egg hatching due to the treatment of plant extract was found in the order *Partheneum histerophorus, Ipomoea fistulosa, Calophyllum inophyllum, Pongamia glabra, Azadirechta indica* treatment caused increased ovipossition, but decreased egg hatchability.

DISCUSSION:

The female beetles of *Holotrachia fissa* Br., treated with *Partheneum histerophorus, Azadirechta indica, Calophyllum inophyllum,* and *Ipomoea fistulosa* extracts showed decreased in egg laying capacity, which is indicative of the fact that they are more effective as compared to that of *Pongamia glabra.* They affected egg hatching slightly.

The female beetles of *Holotrachia serrata* treated with *Partheneum histerophorus* extract showed maximum decreased in egg laying capacity in comprised to other plant extracts and also affected hatching of egg showing most prominent among all plant extract applied.

In case of *Leucopholis lepidophora* female beetles, *Partheneum histerophorus* and *Ipomoea fistulosa* extract, treatment caused decreased in egg laying capacity in comparison to other plant extracts suggesting most active effect of all plant extract used. The same trend due to the plant extracts treatment was followed in egg hatching also.

Extract of soyabean have been shown to influence the oviposition behavior of *Calophyllum chinasis* (Applebaum, *et.al.,* 1978). Pouzet, (1978) reported that other extract of edible host plant substances influence oogenesis in *A. obtecutus,* Alkalods from *Erythrina indica* seeds are known to be interfearing survival, growth and development of insects (Mathavan and Pandian, 1975; and Muthukrishnan, *et.al.,* 1970). They modulate the oviposition behavior of *C. maculates.*

Phytochemicals extracts from *Azadirechta indica, Swietenia macrophylla* King and *Calophyllum inophyllum* showed ovicidal action on one old egg of *Myllocerus undecimpulatus* (Agarwal, 1990). Sub lethal carbyl exposure for short term and prolonged periods resulted in suppression of ovipossition and hatchability of egg in *Mylabris postulate* (Bharti and Govindappa, 1990). Topical application of purified extracts from seeds of *Azadirechta indica* caused disrupted normal development in larvae of Japanease beetles (Ladd, *et.al.,* 1984). According to Ascher (1980), Azardirachtin caused a strong reduction in fecundity of *Epilachna varivestis* females.

The treatment of plant extracts *viz. Partheneum histerophorus, Azadirechta indica, Calophyllum inophyllum, Ipomoea fistulosa* and *Pongamia glabra* caused significant reduction in ovipossition and egg hatching in *Holotrachia fissa.* Similarity application of *Partheneum histerophorus* extract caused reduction in egg laying and egg hatching in *Holotrachia serrata* and application of *Partheneum histerophorus* extract and *Ipomoea fistulosa* extract caused reduction in the egg laying and egg hatching in *Leucopholis lepidophora.* From the above observation it can be inferred than *Partheneum histerophorus* extract affects oviposition and egg hatching capacity in *Holotrachia fissa, Holotrachia serrata* and *Leucopholis lepidophora.* It was observed that the above three species of white grubs, especially females were prone to *Partheneum.* The females of *Holotrachia fissa*

appeared to be prone to all the plant extracts employed presently. The degree of potency was found highest in *Partheneum histerophorus* and later on undergoes gradual reduction in *Azadirechta indica, Ipomoea fistulosa, Calophyllum inophyllum*. The females of *Leucopholis lepidophora* were found to be prone to *Ipomoea fistulosa* and *Partheneum histerophorus* indicating their more potency than the extracts of the other plants.

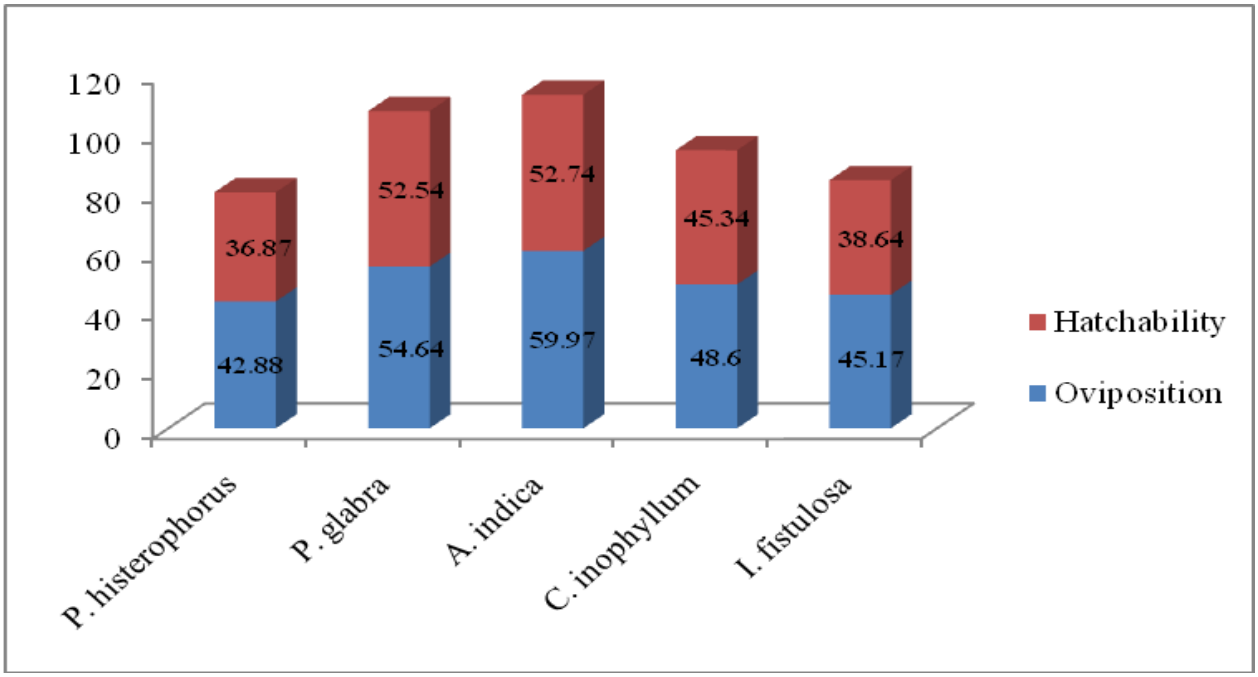

Fig. Effect of different plant extracts on oviposition and egg hatchability of *Holotrachia fissa, Holotrachia serrata. and Leucopholis lepidophora.*

Table 1: Effect of different plant extracts on oviposition and egg hatchability of *Holotrachia fissa, Holotrachia serrata* and *Leucopholis lepidophora.*

Treatment	*Holotrachia fissa*		*Holotrachia serrata*		*Leucopholis lepidophora*	
	Total No. of eggs laid	Total No. of eggs	Total No. of eggs laid	Total No. of eggs	Total No. of eggs laid	Total No. of eggs
Control	82.3±8.0	77.6±7.5	57.0±4.3	53.0±3.4	72.0±5.3	68.6±3.6
Partheneum histerophorus	37.66±3.0**	31.0±2.6**	39.0±2.0*	33.0±2.0*	52.0±4.6*	46.6±3.78*

Pongamia glabra	55.3±5.5	52.0±4.6*	48.0±2.64	44.6±1.5	65.6±5.03*	61.0±4.00
Azadirechta indica	31.0±4.6**	25.3±4.0**	68.6±7.0	60.3±6.0	80.3±6.5	72.6±5.7
Calophyllum inophyllum	40.5±5.6*	37.0±5.3**	41.3±5.0*	38.0±4.0*	64.0±4.58	61.0±4.6
Ipomoea fistulosa	38.3±4.6**	32.0±4.6**	43.6±3.51*	37.6±2.1*	53.6±2.1*	46.3±4.72*

Each value is the mean of three individual observations.

± Sign indicates the percent increase and decrease respectively.

*= P< 0.05; **= P< 0.001

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