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ACUTE TOXICITY AND MANAGEMENT CONTROL OF FIRE ANT, *SOLONEPSIS GEMINATA*(HYMENOPTERA: FORMICIDAE) USING HERBAL EXTRACTS IN PAUNI, DISTRICT BHANDARA

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ABSTRACT
The evaluation of some herbal leaf extracts of plants *Azadirachta indica*(Neem), *Ipomoea carnea(*Beshram), *Vitex negundo*(Nirgudi), *Tridax procumbens*(Kambarmodi) and *Pongamia glabra(Karanj)* are the best plants species shows numerous volatiles compounds having toxic, insecticidal, repellent and diverse pest control properties against the household pest, red ant, *Solonepsis geminata* in Pauni, district Bhandara. Pauni is the tahsil where rice is the main crop in agriculture. also most rice mills are located near most villages, where the *Solenopsis* like species are causing damage to the rice and certain food crops. The laboratory experimental evaluation of the leaves of such commonly occurring plants shows the highest toxicity and repellent activities againstthe household insect pest, red fire ant, *Solonepsis geminate in* the tahsil place, Pauni district, Bhandara. The red fire ants are found everywhere, mainly attackingFood, Rice, flour, grains and sweet food products. The fumigant mixture of 20 % methanolic plant extract of *Vitex negundo*(Nirgudi) resulted in the highest mortality rate and repellent activity during 72 hours of the experiments. The mortality rate shows at an inclined concentration of plant extract as compared to the commercial bioformulation, 0.02 % Lindane. These herbal extracts contain the alkaloids, phenolics, glycosides and tannins types of volatile compoundsshowing defensive activities when mixed with methanol,affecting the insect feeding and unpalatable to the insects.

Key words: Lindane, Herbal extract, toxicity, phenolic, red fire ant, *Solonepsis geminate,* Pauni

INTRODUCTION
The chemical compounds contained in some herbal extracts act as toxins and repellents to kill the insect pests. The herbal methanol formulations act as a safer alternative to the synthetic insecticides act as eco-friendly products. Plant extracts contain compounds that show ovicidal repellent, anti-feedant, sterilization and toxic effects in insects (Nawrot and Harmatha, 1994; Isman, 2006). The heavy usage of pesticides created a great concern on the environment,especially in the case of household control of pests left higher levels of insecticide residues and led the environmental problems, including health hazards to humans. These chemical insecticides find maximum residue limits in the samples of milk, cattle drinking water, fodder and feed collected from the cattle colony (Parveen and Masud, 1992). Awareness regarding food safety has increased the demand for organically produced food, which necessitates evaluating the performance of herbal based pesticides as safer alternatives to conventional insecticides (Faheem Akbar *etal.,*2010). The chemicals used as fumigants are an extensivelymixture of organo-phosphate (OP),Methyl bromide, added as a synergist but it is

restricted due to its potential ozone depleting properties. So in the present study the mortality rate of five different herbal extracts against household insect pest, red fire ant, *Solonepsis geminata* was tested by *Azadirachtaindica* (Neem), *Ipomoea carnea(*Beshram/sadafuli),*Vitex negundo* (Nirgudi), *Tridax procumbens* (Kambarmodi) and *Pongamia glabra(Karanj)*having diverse pest control properties (Kadu *et al.,* 2010). These plants contains the alkaloids, phenolic, glycosides and tannins types of chemical defensive compounds when mixed with alcoholic groups becomes unpalatable to the insects and effects on the insect feeding (Amritraj and William, 1999). In most of the investigations, the adult stage alone was tested. It is well known that for fumigants, the active stages (adults and non-diapausing larvae) of insects are more susceptible than the sedentary stages (eggs and pupae) due to differences in their respiratory rate (Tripathi *et al.*, 2003). Such tests had been carried out with pure compounds obtained from commercial sources (Lee *et al.,* 2003a) or synthesized in the laboratory (Peterson *et al.,* 2000; Park *et al.,* 2004). Most of the active ingredients are secondary metabolites secreted in plants as chemical defence against pest organisms. Certain anomalies in fumigant toxicity tests with plant essential oils components have been noted (Auger *et al.,* 1999).There have been numerous research studies conducted at the laboratory level on plant products as fumigants against household insect pests, besides toxicity tests, attention has been focused to elucidate their mode of action in insects(Ware, 2000).The purpose of this study was to evaluate the toxicity of the above herbal extracts as an organic formulations to control red imported fire ants *Solonepsis geminata.*

MATERIAL METHOD

Pauniis a tahsil place and aMunicipal Counsil in Bhandara District, located at 20.78°N 79.63°E.It has an average elevation of 226 metres (741 feet). The town is surrounded on three sides by a moat and earthen rampart, and the fourth side by the Wainganga River.In Pauni tahsil, different species of ant show significant diversity, but some species are vagrant, causing household disruptions as insect pests. The fresh leaves of the five plants *Azadirachtaindica* (Neem), *Ipomoea carnea*(Beshram/sadafuli),*Vitex negundo* (Nirgudi), *Tridax procumbens* (Kambarmodi) and *Pongamia glabra(Karanj)* were chopped in to small pieces with a knife and dried in shade (Fig. 1). These dried pieces were then grounded in grinder to make coarse powder. The 10 mg of each plant powder packed and processed in Soxhlet Apparatus using 100 ml methanolas stock solvent.The extracted methanolic plant extracts powderdissolved in methanol to prepare five formulations10%, 15%, 20 %, and 25% formulations as the workingformulation(Figure-1).The set of 50 adult life stages of the household pest, red fire ant, *Solonepsis geminata*collected in the separate glass containers to check the % mortality at interval of72 hours under Potter's Tower.Control sets were tested and compared with water and check sets were treated by conventional synthetic insecticideLindane powderas check in aqueous 0.05% formulation. The treated corporeal adults were also considered as dead.The observed mortality percentage was transformed to corrected mortality percentage as per Abbott's formula (1925).

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Figure 1 and 2 map of Pauni, District Bhandara

Results

In the present study, the methanolicleaf extractsusing five different plants viz., *Azadirachtaindica* (Neem), *Ipomoea carnea(*Beshram/sadafuli),*Vitex negundo* (Nirgudi), *Tridax procumbens* (Kambarmodi) and *Pongamia glabra(Karanj)* were collected from Pauni village andappliedin10%, 15%, 20 %, and 25% formulationsagainst red fire ant, *Solonepsis invicta*(Fig. 3 and 4).The corrected mortality obtained after treatment of methanolic extracts compared with the Check synthetic insecticides,0.05%Lindanepowder, with emphasis on their residual determination. The greenhouse trials revealed that these formulations act as stomach and contact toxins with higher anti-feedant and repellent activity, with a suppressive oviposition rate. The highest methanolic herbal extracts at 525 formulation of *Vitex negundo*(Nirgudi)show maximum toxicity and mortality rate followed by *Azadirachtaindica* (Neem)as compared to other plantleaf extracts (Table 1).So these extracts can provide a reasonable level of control against the population of household pests, the red fire ant, *Solenopsis geminata.*and also will work as a short-term repellent and feeding deterrent.

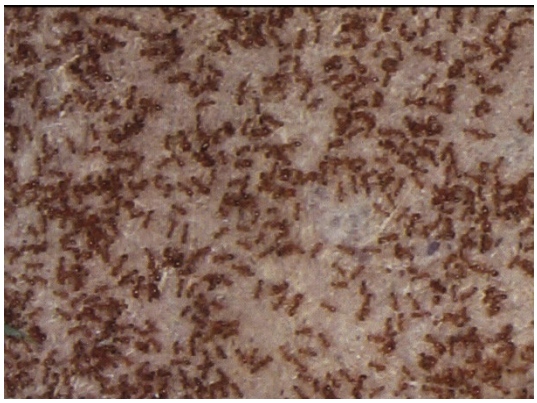

Figure 1- Showing *Solonepsis geminata* Ant colony.

Figure-2-Ethanol Extracts of Herbal Formulation of different Plants collected from Pauni

Table shows Plant extracts and Mortality rate at different % of Herbal Formulationscollected from Pauni, Bhandara

DISCUSSION AND CONCLUSION:

Pauniis situated on the bank of river Wainganga, known as the South Ganga. It is a center of market and trade for the surrounding smaller villages and connects the smaller villages to cities like Nagpur, Chandrapur, Bhandara and Gondia. In ancient times, Pauni was famous for the handloom textile industry. It is also a place of pilgrimage and boasts of many temples. Due to the high production of rice crop, fire ant, *Solenopsis* shows maximum population which is a large, cosmopolitan, and taxonomically difficult genus of mostly minute, monomorphic, wholly subterranean species. These minute species frequently attack on the rice crop as well as harvested crop in rice mills as thief ants within the colonies. Some New World species are larger and the workers are polymorphic. These species have colonies that can be very large and the workers are aggressive surface foragers. These ants are commonly referred to as "fire ants" because of the intense, burning sensation caused by their stings. The fire ants are important pest species(Wheeler, 1986). As a vital part of Integrated Pest Management (IPM) high percent of all poisoning cases occur due to use of pesticides in developing countries causing harmful effects on human health (Soomro *et al.,* 2008) and the non-target organisms and ultimately pollute the environment (UNDP, 2001). From the result analysis the higher % mortality rate revealed after 72 hour at 20 % in following order of *Vitex negundo* (Nirgudi), *Azadirachta indica* (Neem), *Ipomoea carnea* (Beshram or sadabahar), *Pongamia glabra* (Karanj), and *Tridax procumbens* (Kambarmodi) (Pande *et al.,* 1983; 1987 and Garrett, 2001) as the household herbal pesticides against household pest imported red fire ant, *Solonepsis*

S.no.	Plant Extracts	% Mortality/ hour			
		10%	15 %	20 %	25 %
1.	***Vitex negundo* (Nirgudi)**	**30.25**	**55.52**	**95.21**	**98.51**
2.	***Ipomoea carnea* (Beshram or sadabahar)**	**34.2**	**41.32**	**88.55**	**88.90**
3.	***Azadirachta indica* (Neem)**	**26.32**	**74.45**	**83.32**	**95.88**
4.	***Tridax procumbens* (Kambarmodi)**	**21.67**	**43.55**	**65.32**	**77.45**
5.	***Pongamia glabra* (Karanj)**	**22.22**	**22.35**	**52.51**	**66.22**
6.	**Check-I /Lindane**	**24.41**	**53.42**	**82.22**	**84.34**
7.	**Control**	**00**	**00**	**00**	**00**

geminata. The conventional insecticides have not only distressed the agro-ecosystem but also cause the chronic pesticide poisoning like disorder of immune functions, peripheral neuropathies and allergic reactions, principally of skin, which ultimately led to cancer risk (UNEP, 1993). Scientists and environmental toxicologists have investigated different groups of insecticides including*Boricpowder, BHC, Endosulfan* and *Lindane* to control the household pests so far, for their toxic end points which involved different health

related problems such as cardiovascular disorders and hypertension (Chandra *et al.*, 1992). The herbal pesticides, particularly with alcoholic groups affects adversely on the insect development and reproduction due to antifeedant as well as repellent activity,resulting into permanent control of the pest (Cutler, 1985; Faheem Akbar *etal.,* 2010). So the herbal extractions in rice mills in Pauni when applied in the significant doses it give promising results as compared to synthetic insecticide.

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