International Journal of Sciences & Applied Research

www.ijsar.in

Prospects of Biological Control of Lantana (*Lantana camara*) in MP

Mahima Tripathi*, Ayesha Siddiqua, Sangeeta Sarkhel, Manjusha Pouranik and Rajni Gupta

Mata Gujri Mahila Mahavidyalaya, (Auto) Jabalpur.

Corresponding author: *Mahima Tripathi, Mata Gujri Mahila Mahavidyalaya, (Auto) Jabalpur.

Abstract

In Madhya Pradesh, a very large area of agricultural and forest land is thickly covered by noxious weed Lantana and the weed is still propagating. As analyzed by the experts Lantana possesses several qualities that could be of immense benefit to humans and animals. Mainly it is said that it can provide shelter to wild animals and plays a significant role in crop protection. Reviled as a nuisance and a menace worldwide, how could a weed is remotely thought of as being environmental friendly? Keeping above fact in mind, extensive survey was conducted in central zone of India during last two years for the assessment and collection of bio-control agents of lantana in the field. 21 species of phytophagous insects have been reported from lantana bushes. Half of the total species collected were Hemiptera, Coleoptera, with Tingidae, Chrysomelidae being the most important family. The present status of biological control of lantana in this region is reviewed together with the prospects of rearing some specific bio-control agents; Spilosoma obliqua and Euproctis subnotana (Walker) and pathogen spp Rhizopus and its effectiveness on lantana. As reported, these specific species are damaging the weed significantly in the field and prove to be a strenuous way for the entire eradication of this obnoxious weed from the environment.

Keywords: Biological control, Lantana camara, Spilosoma obliqua, Euproctis subnotana, Rhizopus spp.

INTRODUCTION

Lantana camara L. (Verbenaceae) and other species of Lantana are noxious perennial weed (Northern Territory Weeds Management Act 2001, declared under the Noxious Weeds Act, 1993) all over India, assuming serious proportions in Madhya Pradesh, Uttar Pradesh, Andhra Pradesh and Mysore where jungles of this woody shrub grow, making clearing operations difficult and expensive (Sharma and Raghubanshi 2007). Weeds are one of the major threats to the natural environment. They are destroying native habitats, threatening native plants and animals and choking our natural systems including rivers and forests. It reduces farm and forest productivity, invade crops, smother pastures and some can harm livestock. Infestations range from single flowering shrub to dense monocultures, replacing native vegetation or pasture species.

As reported in this period, the most widespread and damaging agents are Teleonemia scrupulosa ,Uroplata girardi,. Octotoma scabripennis. Ophiomyia lantanae

is very damaging to lantana seasonally but has a very limited distribution, been found at only in a few sites. Two agents, Leptobyrsa decora and Falconia intermedia previously reported, were not frequently found in the survey sites. Spilosoma obliqua and Euproctis subnotana was found to cause considerable defoliation to Lantana spp. Mishra et al. (2014) and (2019), and thus studied in detail for accessing its contribution in damaging lantana weed naturally. Despite the occurrence of these biocontrol agents, lantana is not under adequate control in the forest land. Forest areas are critical for conservation of biodiversity and for the maintenance of livelihood of people that inhabit these areas. Climate is probably the major factor that prevents populations of insects from being maintained at consistently high enough levels to control the weed. As reported in the study for effective biological control of Lantana camara through voracious feeder Insect sp ie Spilosoma oblique along with pathogen Rhizopus spp caused the complete decease of the weed plant and prove a positive way for entire eradication of weed from the environment.

MATERIAL AND METHODS

Survey was conducted for the collection of entomo fauna from the selected sites of Central India during the months from July to December 2012. Lantana rich sites of Seoni, Jabalpur, Mandla, Katni, Balaghat and Dindori Districts of Madhya Pradesh, India, were selected and visited frequently both in morning and evening time during the above described period of time. Data were recorded from twenty bushes at each site randomly. Abundance was recorded as the presence or absence of insect species out of twenty bushes and infestation was calculated as number of bushes was seen physically affected by the particular insect.

Also insects fauna was collected by suitable corresponding methods (Larvae and sucking insects were collected as whole infested twigs, butterflies and moths were collected using net, Coleopterans and other insects were collected by the hand picking and also with the net methods) and brought to the laboratory for their rearing, identification and study of biology under the laboratory conditions. Identification of the insect was done in collaboration with Tropical Forest Research Institute and Zoological Survey of India, Jabalpur Madhya Pradesh.

Lantana twigs affected with fungus were collected from the field and inoculated in PDA plates treated with antibacterial drugs. Fungus isolated from the leaves of affected lantana weed was identified as Rhizopus spp. Plates were Incubated for 72 hrs at 300C. Culture was purified by selecting the individual colonies and re-inoculating them. Finally 500 ml broth culture was prepared in Potato dextrose in conical flasks. After about 72 hours Broth culture of fungus was sprayed on treated plant using vacuum sprayer. Control pot was sprayed with broth only. Plants were watered every day up to 4 to 6 weeks.

RESULTS

During the survey, initially 21types of the insects were recorded (Table 1), three of them were identified as new report on Lantana (Spilosoma oblique, Euproctis subnotana and Othereis fullinica) and afterward two are under identification process at TFRI and ZSI Jabalpur which are damaging Lantana weed significantly in the field (Plate-I). Most of the insects surveyed were leaf defoliator or sap sucker but three insect (E. subnotana, an unidentified butterfly and S. oblique) were feeding on flower buds and fruits of all available (Red, Yellow, Orange, Blue and White florets) Lantana varieties and two (E. subnotana, and an unidentified butterfly) were feeding obligatory (obligation was tested under the experimental conditions) on flower buds and fruits. At randomly selected lantana rich

survey sites (Seoni, Jabalpur, Mandla, Katni, Balaghat and Dindori Districts of Madhya Pradesh, India), 86.39±11% abundance was recorded for an unidentified moth spp. whose larvae were feeding on average 94.28±5.34% (F(P<0.001) = 76.40, df = 108, SE(d)± = 3.03, LSD(P<0.05) = 6.02) Lantana bushes surveyed. Teleonemia scrupulosa which is ever been reported host specific biocontrol agent for the Lantana spp was found with 29.71±9.56% abundance and with 29.28±5.36% infestation in the field. Phenacoccus madeirensis was accounted for 15.85±9.52% abundance with 32.85±13.18% infestation in the field (Table 1 & 2). Defoliation caused by an unidentified moth was significantly higher than all other surveyed insects and further study of this insect is in progress. Evidence of conspicuous and damaging effect of Rhizopus spp on lantana indicates that the pathogen is able to infect a wider range of weedy clusters and is significantly more damaging to target plant (Plate II). Successful invasion has been obtained with the pathogen on already stunted weed infested with insect biocontrol agent which caused complete decay of the weed hence proved this fungi is highly host specific pathogen to lantana. As reported by experiment subsequently later within one month, all plants treated initially by insects and then sprayed by fungal spp. in the pots were found dry and dead except control set. No regeneration or revival was seen even after 2 months of observation.

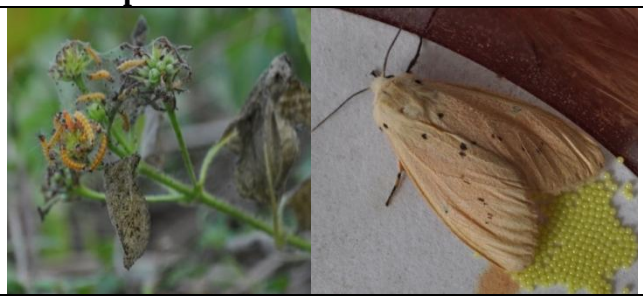
Table.1: Insect diversity on lantana in Madhya Pradesh.

S. No.	Insect (types/species)	Abundance (%)	Infestation (%)
1	*Phenacoccus madeirensis*	15.85±9.52	32.85±13.18
2	*Teleonemia scrupulosa,*	29.71±9.56	29.28±5.34
3	*Halyomorpha sps*	7.85±6.69	24.28±4.49
4	*Leaf footed bugs and squash bugs*	7.85±5.24	28.57±5.56
5	*Aphids*	9.28±6.48	15.71±6.07
6	*Pogonella minutes*	9.14±4.29	0.0
7	*Falconia intermedia*	1.85±1.67	26.42±4.75
8	*Leptobyrsa decora*	1±2.64	5.71±4.49
9	*Ophiomyia lantanae*	13±3.82	10.71±10.71
10	*Epinotia lantana*	8.14±5.33	18.57±11.07
11	*Uroplata girardi,*	21.28±7.54	2.42±6.67
12	*Charidotis spp*	12.71±6.39	5.11±2.12
13	*Octotoma scabripennis*	2.57±2.69	15.71±6.72
14	*Longitarsus spp.*	15±5.80	0.0
15	*Coccinella septempunctata*	17±7.61	0.0
16	*Praying mantis*	21.28±7.54	0.0
17	*Othereis fullonica (new record)*	3±2.70	2.85±2.67
18	*Euproctis subnotata (new record)*	12.71±6.39	21.42±6.90
19	*Unidentified moth*	86.36±11	94.28±5.34
20	*Unidentified butterfly*	11.07±2.47	1.428±2.43
21	*Spilosoma obliqua (new record)*	20±9	17.14±4.87

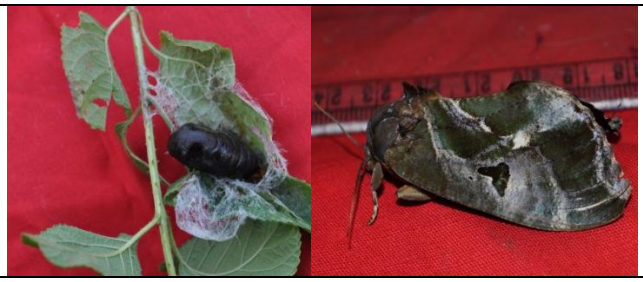
Table.2: Feeding Behavior of surveyed insects.

S. No.	Insect types/species	Feeding habit
1	*Phenacoccus madeirensis*	Leaf and stem sap sucker
2	*Teleonemia scrupulosa,*	Stem and leaf feeder
3	*Halyomorpha sps*	Sap sucker
4	*Leaf footed bugs and squash bugs*	Sap suckers
5	*Aphids*	Stem and leaf sap sucker
6	*Pogonella minutes*	Not known
7	*Falconia intermedia*	Leaf sap sucker
8	*Leptobyrsa decora*	Leaf sap sucker
9	*Ophiomyia lantanae*	Sap sucker
10	*Epinotia lantana*	Fruit damaging
11	*Octotoma scabripennis*	Leaf and twigs damaging
12	*Longitarsus spp.*	Not known
13	*Coccinella septempunctata*	No plant parts
14	*Charidotis spp*	
15	*Uroplata girardi,*	
16	*Praying mantis*	No plant parts
17	*Othereis fullonica (new record)*	Leaf feeder
18	*Euproctis subnotata (new record)*	Flower buds and fruits feeder
19	*Unidentified moth*	Leaf feeder
20	*Unidentified butterfly*	Flower buds and fruits feeder
21	*Spilosoma obliqua (new record)*	Leaf, shoot and fruits feeder

Figure 1 Plate-I :Important insects recorded from the *Lantana* in MP



a. *Spilosoma obliqua* (New record)



b. Othereis fullonica (New record)

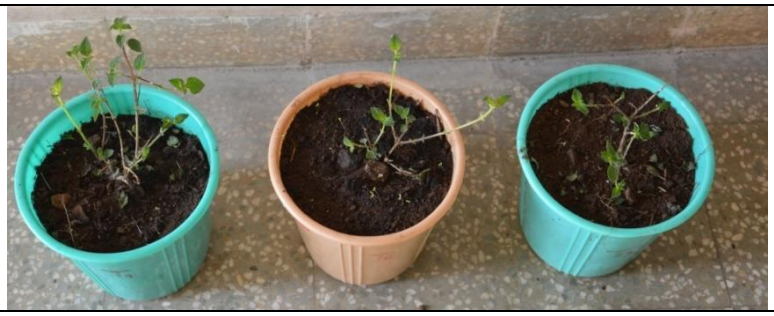
c. Euproctis subnotata (New record)

d. Unidentified moth

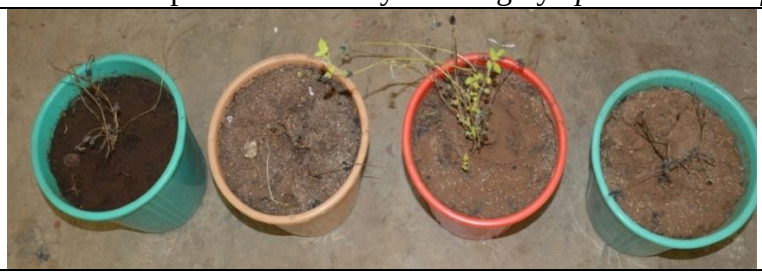
e. Unidentified butterfly

Figure 2 Plate - II. Biological control of *Lantana camara* through *Spilosoma oblique and Rhizopus* Species

a. Lantana pots 4 -5 weeks before treatment



b. Lantana pots after 2-3 days feeding by *Spilosoma oblique* larvae.



c. Pots one month after spraying *Rhizopus* spp. Culture

DISCUSSION

The new report of insects on Lantana is the positive indication towards the possibilities of biological control of Lantana under the integrated weed management program. S. oblique larvae were very efficient feeder on Lantana fruits, leaves and even on shoot which might be controlling the natural propagation of this weed. E. subnotata was strictly feeding on flower buds and fruits might be contributing to control in number of seed production of weed in the field. Feeding on fruits is a positive indication towards their potential as biological agents of this poisonous weed in the field. For almost a century, attempts have been made to control L. camara using insects (Swarbrick et al., 1995). Despite the efforts and time expended on Lantana biocontrol, results were variable. Sonya Broughton (2000) excellently reviewed the success of biological control agents in the field and evaluated the progress on biological control of Lantana worldwide. Recently, efforts have been made to control this weed biologically by natural enemies (Day et al., 2003). None of the over 40 agents tried till date to control the Lantana weed have resulted in total control but some have been partially successful including Teleonemia scrupulosa, Octotoma scabripennis, Uroplata girardi and Ophiomyia lantanae (Day et al., 2003). Teleonemia scrupulosa and Octotoma scabripennis were used in India and Australia for the biological control of Lantana (Lawson et al. 2010). Although the control of Lantana through indigenous insect pests was prospected very early at Central Plant Protection Training Institute, Hyderabad, Andhra Pradesh, India by Verma and Sadatulla (1969) but significant success is to be achieved and more insect plant relationships are still to be investigated for better management of this weed. Results came out of study, urged that this study must be extended for more exploitation of entomo fauna of Lantana and their use for its management.

CONLCUSION

So far, many control actions have been employed to curb Lantana camara infestations in India, but none have been able to completely restrict its incursion.

There is lot of scope for screening of various biological agents for safe and efficient control of weeds including Lantana spp. Application of Rhizobium spp. on already stunted weed infested with insect agents caused the complete decease of the weed plant and prove a positive way for entire eradication of weed from the environment. Further studies are required on the strategic and sustainable approach incorporating holistic process of control and management of this invasive species. Evaluation of risk based on several assumptions help to analyze direct, indirect, and cumulative effects on biodiversity and environment provide a significant knowledge to understand the actual status regarding its menace or how long could be a friend.

ACKNOWLEDGEMENT

Authors are thankful to University Grants Commission for providing financial assistance for this study via F.No.40-359/2011 (SR).

REFERENCES

Day, M. D., Jones, P. K., 2011. Life history and host range of Alagoasa extrema (Coleoptera: Chrysomelidae: Alticinae), a potential biological control agent of Lantana spp. (Verbenaceae) in Australia. Biocontrol Science and Technology, 21(10): 1177-91.

Day,M. D., Wiley, C. J., Playford, J., Zalucki, M. P., 2003. Lantana: Current Management Status and Future Prospects. ACIAR Monograph Series 102, Canberra. 128 p.

Lawson, B. E,, Day, M.D., Bowen, Mvan Klinken, R.D., Zalucki M.P., 2010. The effect of data sources and quality on the predictive capacity of CLIMEX models: An assessment of Teleonemia scrupulosa and Octotoma scabripennis for the biocontrol of Lantana camara in Australia. Biological Control, 52(1): 68-76.

Mishra Vinod Kumar, Tripathi Mahima, Kulkarni Nitin., 2014. Growth and development of Spinosoma oblique on lantana camara. Indian Journal of Entomology. 76(4), 299 – 302.

Mishra Vinod Kumar, Tripathi Mahima, Kulkarni Nitin., 2019. Euproctis subnotana (Walker), a new record on inflorescence of Lantana camara in Madhya Pradesh. Indian Forester, 145(4):404-405.

Sharma, G. P. and Raghubanshi, A. S. 2007. Effect of Lantana camara L. cover on local depletion of tree population in the Vindhyan Tropical Dry Deciduous forest of India. Applied Ecology and Environmental Research. 5(1):109-121

Sonya Broughton.,2000. Review and Evaluation of Lantana Biocontrol Programs. Biological Control, 17:272-286

Swarbrick, J. T., Willson, B.W., Hannan-Jhones, M. A.,1995. The biology of Australian Weeds 25. Lantana camara L. Plant Protecton Q, 10:82-95.

Verma, B. K.. and Sadatulla, M.D., 1969. Prospects of Biological Control of Lantana (Lantana camara L. Ver. Aculeata L). Indian Journal of Plant Protection,1(1): 8-15.