SPECIES

The exotic perennial invasive weed, *Lantana camara* L. (Verbenaceae), a potential source of nectar for butterflies

Solomon Raju AJ[1*], **Venkata Ramana K**[1], **Prasada Rao CH**[2]

To Cite:
Raju AJS, Ramana KV, Rao CHP. The exotic perennial invasive weed, *Lantana camara* L. (Verbenaceae), a potential source of nectar for butterflies. *Species* 2023; 24: e87s1601
doi: https://doi.org/10.54905/disssi.v24i74.e87s1601

Author Affiliation:
[1]Department of Environmental Sciences, Andhra University, Visakhapatnam 530 003, Andhra Pradesh, India
[2]Department of Botany, Andhra University, Visakhapatnam 530 003, Andhra Pradesh, India

[*]**Corresponding author**
Department of Environmental Sciences, Andhra University, Visakhapatnam 530 003, Andhra Pradesh, India
Email: solomonraju@gmail.com

ORCID List
Solomon Raju AJ 0000-0002-0028-2621
Venkata Ramana K 0000-0002-6921-6761
Prasada Rao CH 0000-0003-2232-6020

Peer-Review History
Received: 09 September 2023
Reviewed & Revised: 13/September/2023 to 10/November/2023
Accepted: 14 November 2023
Published: 18 November 2023

Peer-Review Model
External peer-review was done through double-blind method.

Species
pISSN 2319–5746; eISSN 2319–5754

DISCOVERY SCIENTIFIC SOCIETY

ABSTRACT

The exotic invasive weed, *Lantana camara*, has two natural varieties, yellow and white, in the study area. The two varieties bloom simultaneously, seasonally or year-long, depending on the availability of soil moisture. In both varieties, the aggregated flat-topped flowers display color changes in the corolla and remain in place for several days. Still nectar is available only in day one flower, while older flowers lack nectar and enhance the attraction of flowers to the intended flower foragers. Various butterflies visit flowers during the daytime and collect nectar only from day one flowers. The study indicated that this weed is a potential and critical source of nectar for butterflies in all areas of its distribution.

Keywords: Invasive weed, yellow variety, white variety, corolla color shift, butterflies.

1. INTRODUCTION

Lantana camara is an exotic perennial weed. It is a native of tropical Americas, but has become invasive and distributed throughout the tropical regions of the world (Solomon-Raju and Subba-Reddi, 1995). It has two natural varieties, yellow and white, of which the former is more common than the latter (Dronamraju, 1960). Butterflies have been reported as exclusive pollinators of this species in India by (Dronamraju and Spurway, 1960). Thrips are the pollinators of this species in Delhi (Mathur and Mohan-Ram, 1979). However, these authors have not mentioned whether butterflies or thrips act as pollinators for yellow and white varieties of *L. camara*. In Costa Rica, the yellow variety has been reported to be pollinated exclusively by butterflies, particularly the large ones which belong to the Papilionidae family (Barrows, 1976; Schemke, 1976).

Further, it is documented that both varieties of *L. camara* display floral color shifts, which have a role in enhanced attraction to butterflies to increase pollination rate (Solomon-Raju and Subba-Reddi, 1995). None of the studies so far reported provide any information on the role of *L. camara* in supporting and sustaining butterflies by providing nectar. It is in this context, that the present study has been contemplated to give the importance of *L. camara* as a critical nectar source for taxonomically diverse butterflies in habitats where this weed

grows seasonally or throughout the year depending on the soil moisture status, despite its serious menace in forest ecosystems, croplands and other habitats.

2. MATERIALS AND METHODS

Lantana camara thrives well and invades all habitats where native herbaceous flora appears seasonally in Visakhapatnam, Andhra Pradesh. It represents both yellow and white varieties here, of which the former is the common while the latter is relatively uncommon. This weed, with its widespread nature, replaces the original habitats of herbaceous taxa that grow during the wet season. In consequence, many local herb species have disappeared, and in their place, this weed is flourishing well by rapid colonization without any hindrance. The field study was conducted from June 2022 to July 2023 to list the butterflies utilizing *L. camara* as a nectar source. The flower color shifts during their lifespan have also been observed concerning their attraction to butterflies. The butterflies have been identified by using a field guide of butterflies of Peninsular India by (Kunte, 2000). The butterflies have been recorded separately for *yellow* and *white* varieties to know whether both varieties were equally important. The field photographs of butterflies visiting the flowers of both varieties of *L. camara* have also been taken.

3. OBSERVATIONS AND DISCUSSION

Lantana camara shows growth, flowering, and fruiting year-long in damp habitats, while it shows all these events in dry- and semi-dry habitats during the wet season. In this species, the yellow (Figure 1a) and white (Figure 2a) varieties form separate populations and, or grow together in the same habitats. The inflorescence is axillary in position and bears several flowers that mature centripetally and are present in an erect position. In both flower varieties, the nectar has been produced in minute volume in each flower. In the yellow variety, the corolla changes colors from yellow to orange to red. The centripetal presentation of flowers coupled with color shifts in the corolla makes the inflorescence present flowers with yellow in the center and orange and red color peripherally. The floral arrangement coupled with a small amount of nectar is advantageous for foragers to reduce search time and energy cost and hence is profitable for them energetically.

Figure 1 *Lantana camara* – Yellow variety: a. Flowers, b. *Pachliopta hector*, c. *Papilio polytes*, d. *Catopsilia pyranthe*, e. *Cepora nerissa*, f. *Anaphaeis aurota*, g. *Hypolimnas bolina*, h. *Melanitis leda*, i. *Tirumala limniace*, j. *Acraea violae*, k. *Ariadne ariadne*, l. *Precis iphita*, m. *Danaus chrysippus*, n. *Borbo cinnara*.

The flowers are flat-topped with narrow corolla tubes and provide an excellent platform for foragers. Faegri and van-der-Pijl, (1979) stated that butterfly flowers have a long narrow corolla tube and flat rim. The centripetal arrangement of flowers with flower

color shifts and small corolla tube in both varieties of *L. camara* facilitate the butterflies with varying lengths of proboscis to visit and collect nectar with great ease and obtain as much nectar as possible in a single visit. In the yellow flower variety, the entire corolla color changes to orange and red. In the white variety, the flowers are white with yellow colored corolla throat, which later changes to pink corolla with a slight orange corolla throat. In both varieties, the flowers remain in place for several days, amplifying attraction to butterfly foragers. Further, the butterflies visit flowers day one flowers of both varieties as they provide nectar and avoid older flowers as they do not offer nectar due to cessation of nectar secretion by the end of the first day. The older flowers appear to enhance the attraction to enable the foragers to visit the flowers.

In *Lantana camara*, both yellow and white flower varieties have been visited by butterflies throughout the day, with most of the visits made during 0800 to 1500 h. Most of the butterflies visiting the flowers were common to both varieties. A total of 33 species of butterflies belonging to Papilionidae, Pieridae, Nymphalidae, and Hesperiidae were recorded (Table 1). The Papilionidae has been represented by eight species, Pieridae by nine species, Nymphalidae by fifteen species and Hesperiidae by one species. The Papilionids included *Graphium doson*, *G. agamemnon*, *Pachliopta aristolochiae*, *P. hector* (Figure 1b), *Papilio Buddha* (Figure 2f), *P. demoleus* (Figure 2d), *P. polymnestor* (Figure 2e) and *P. polytes* (Figure 1c, 2b, c). The Pierids included *Anaphaeis aurota* (Figure 1f), *Catopsilia pomona* (Figure 2g), *C. pyranthe* (Figure 1d), *Cepora nerissa* (Figure 1e), *Colotis danae*, *C. eucharis*, *C. fausta*, *Eurema hecabe* (Figure 2h) and *Pareronia valeria.*

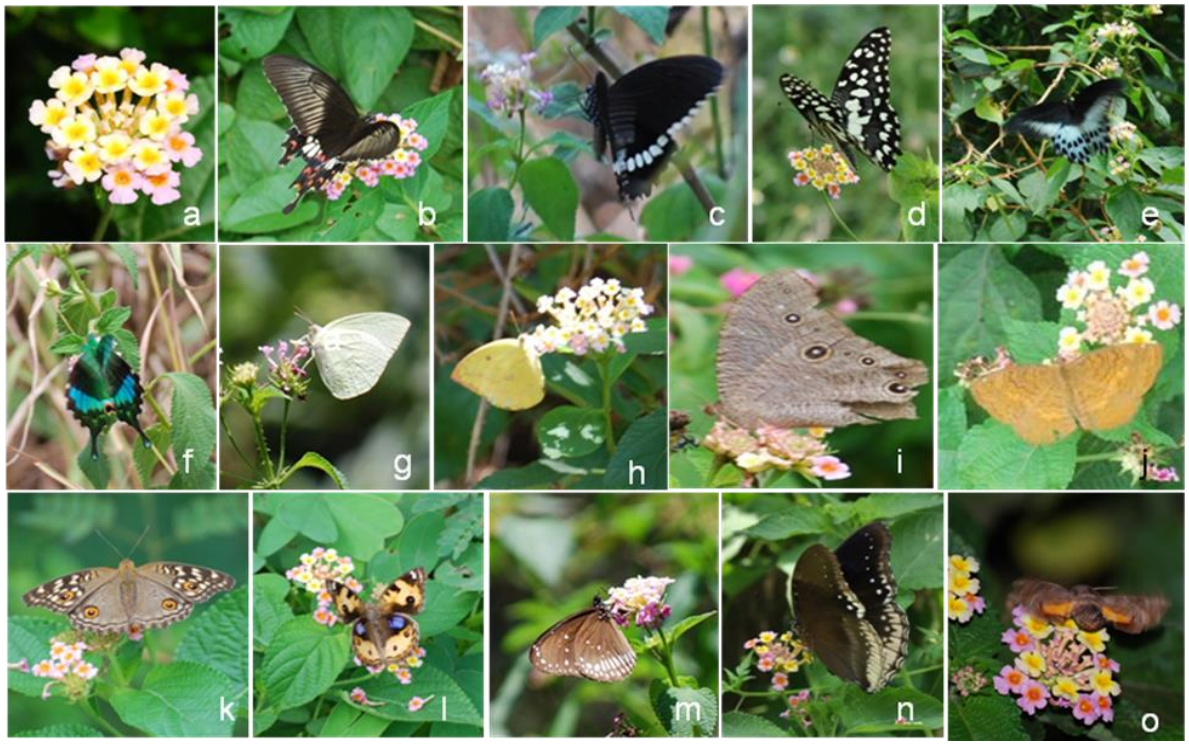

Figure 2 *Lantana camara* – White variety: a. Flowers, b. *Papilio polytes (female)*, c. *Papilio polytes (male)*, d. *Papilio demoleus*, e. *Papilio polymnestor*, f. *Papilio buddha*, g. *Catopsilia pomona*, h. *Eurema hecabe*, i. *Melanitis leda*, j. *Ariadne ariadne*, k. *Junonia lemonias*, l. *Junonia hierta*, m. *Euploea core*, n. *Hypolimnas bolina*, o. *Macroglossum gyrans.*

The Nymphalids included *Acraea violae* (Figure 1j), *Ariadne ariadne* (Figure 1k, 2j), *A. merione*, *Danaus chrysippus* (Figure 1m), *D. genutia*, *Euploea core* (Figure 2m), *Euthalia aconthea*, *Hypolimnas bolina* (Figure 1g, 2n), *H. misippus*, *Junonia almana*, *J. hierta* (Figure 2l), *J. lemonias* (Figure 2k), *J. orithya*, *Melanitis leda* (Figure 1h, 2i), *Precis iphita* (Figure 1l) and *Tirumala limniace* (Figure 1i). The Hesperiid included *Borbo cinnara* (Figure 1n). Additionally, the sphingid diurnal hawk moth, *Macroglossum gyrans* (Figure 2o), also visited the flowers of both flower varieties regularly during dawn and dusk hours (Table 1). It is a swift flier and collects nectar from numerous flowers within a few seconds. Among butterflies, nymphalids visited the flowers of both varieties frequently throughout the day. The study shows that both varieties of *L. camara* serve as a key nectar source for taxonomically diverse butterfly species seasonally during the wet season in semi-dry and dry habitats and throughout the year in damp habitats.

Table 1 List of nectar-feeding butterflies on *Lantana camara* (yellow and white variety)

Family	Species name	Common Name	*Lantana camara* flower varieties	
			Yellow	White
Papilionidae	*Graphium doson* C.& R. Felder	Common Jay	-	-
	G. agamemnon L.	Tailed Jay	+	+
	Pachliopta aristolochiae F.	Common Rose	+	+
	P. hector L.	Crimson Rose	+	+
	Papilio buddha Westwood	Malabar banded Peacock	-	+
	P. demoleus L.	Lime Butterfly	+	+
	P. polymnestor Cr.	Blue Mormon	+	+
	P. polytes L.	Common Mormon	+	+
Pieridae	*Anaphaeis aurota* F.	Pioneer (or) Caper white	+	+
	Catopsilia pomona F.	Common Emigrant	+	+
	C. pyranthe L.	Mottled Emigrant	+	+
	Cepora nerissa F.	Common Gull	+	+
	Colotis danae F.	Crimson Tip	+	+
	Colotis eucharis F.	Plain Orange Tip	+	+
	C. fausta C. & R. Felder	Large Salmon Arab	-	-
	Eurema hecabe L.	Common Grass Yellow	-	-
	Pareronia valeria Cr.	Common Wanderer	+	+
Nymphalidae	*Acraea violae* F.	Tawny Coster	+	+
	Ariadne ariadne L.	Angled Castor	+	+
	A. merione Cr.	Common Castor	+	+
	Danaus chrysippus L.	Plain Tiger	+	+
	D. genutia Cr.	Striped or Common Tiger	+	+
	Euploea core Cr.	Common Indian Crow	+	+
	Euthalia aconthea Cr.	Common Baron	-	-
	Hypolimnas bolina L.	Great Eggfly	+	+
	Hypolimnas misippus L.	Danaid Eggfly	+	+
	J. 4almana L.	Peacock Pansy	-	-
	Junonia hierta F.	Yellow Pansy		+
	Junonia lemonias L.	Lemon Pansy	+	+
	J. orithya L.	Blue Pansy	-	-
	Melanitis leda L.	Common Evening Brown	+	+
	Precis iphita Cr.	Chocolate Pansy	+	+
	Tirumala limniace Cramer	Blue Tiger	+	+
Hesperiidae	*Borbo cinnara* Wallace	Rice Swift	+	+
Sphingidae	*Macroglossum gyrans* Walker	Dark-bordered hummingbird hawk moth	-	+
-: Not present; +: Present				

4. CONCLUSIONS

L. camara has been circulated as a garden plant throughout tropical parts of the world due to its pretty flowers. Sadly, it has become an invasive pest, eliminating local biodiversity in forest and non-forest sites. Despite such a menace imposed by this weed, its colorful flowers are pretty attractive to most of the butterflies and also serve as provisioning posts for them. Therefore, this weed is a blessing for butterflies for their survival, especially when they cannot obtain nectar from other floral sources. The colorful flower mats of both varieties of *L. camara* visited by butterflies for nectar provide graceful joy to humankind and act as a primary nectar

host plant throughout its distribution range. Apart from this, this weed could be used as a potential source of biomass for wastelands.

Acknowledgement

We thank the Andhra University, Visakhapatnam, Andhra Pradesh, for providing physical facilities to carry out this piece of research work.

Author Contributions

All three authors contributed equally regarding manuscript work and production.

Ethical Approval

The ethical guidelines for plants & animals are followed in the study for species collection & identification.

Informed Consent

Not applicable

Conflicts of interests

The authors declare that there are no conflicts of interests.

Funding

The study has not received any external funding.

Data and materials availability

All data associated with this study are present in the paper.

REFERENCES AND NOTES

1. Barrows EM. Nectar robbing and pollination of *Lantana camara* (Verbenaceae). Biotropica 1976; 8:123-125.
2. Dronamraju KR, Spurway H. Constancy to horticultural varieties shown by butterflies and its possible evolutionary significance. J Bombay Nat Hist Soc 1960; 57:136-141.
3. Dronamraju KR. Selective visits of butterflies to flowers: a possible factor in sympatric speciation. Nature 1960; 186 (4719):178.
4. Faegri K, van-der-Pijl L. The Principles of Pollination Ecology. Pergamon Press, Oxford 1979.
5. Kunte K. Butterflies of peninsular India. Hyderabad: Universities Press 2000.
6. Mathur G, Mohan-Ram HY. Significance of petal colour in thrips-pollinated *Lantana camara* L. Ann Bot 1979; 42(182):147 3-1476.
7. Schemke DW. Pollinator specificity in *Lantana camara* and *L. trifolia* (Verbenaceae). Biotropica 1976; 8:260-264.
8. Solomon-Raju AJ, Subba-Reddi C. Flower colour shifts and pollination in *Lantana camara* L. (Verbenaceae). J Palynol 1995; 31:275-289.