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A STUDY ON THE DIVERSITY OF ENTOMOFAUNA OF *PARTHENIUM HYSTEROPHORUS* (LINNAEUS, 1753) : AN INVASIVE PLANT OCCURRING ON VARIOUS HABITATS IN NORTH 24 DISTRICT OF WEST BENGAL, INDIA

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ABSTRACT : The study emphasizes the diversity of insect population on the harmful invasive plant, *Parthenium hysterophorus* in four different habitats of North 24-Paraganas during January, 2018 to April, 2018.

Key words : *Parthenium hysterophorus*, insects, species, weeds.

INTRODUCTION

An invasive species is a non-native species to a specific location (introduced species) is likely to cause economic or environmental harm or damage to human, animal or plant health. "An Invasive Alien Species (IAS) is a species that is established outside of its natural past or present distribution, whose introduction and/or spread threaten biological diversity" Convention of biological diversity. In the executive summary of the National Invasive Species Management Plan (NISMP), the term invasive species is further clarified and defined – "a species that is non-native to the ecosystem under consideration and whose introduction causes or is likely to cause economic or environmental harm or harm to human health". Alien species often extend over a new range in a very time (Hengeveld, 1989 and Weber, 1998) and are a major driver of biodiversity loss. *Parthenium hysterophorus* (Linnaeus, 1753) is an invasive weed of semiarid, subtropical, tropical and warmer temperate regions of the world. This annual herb was introduced to India in 1956 with contaminated food grains from its native places (Central & South America) and spread to large areas of farm and wasteland and now covers 35 million hectares across India including West Bengal and become an invasive plant species of India. It is a species of family Asteraceae. The weed has light weight seeds facilitating easy dispersal through air and even it has remarkable adaptability to all kinds of soils and climatic conditions. Since, it is exotic, *Parthenium* does not have natural pests or pathogens, even avoided by herbivore which helped its unhindered growth. More than 50years of its presence in different Indian ecosystems, it must have been utilized by many micro and macro consumers and insects in particular.

Harmful and beneficial aspects of *Parthenium hysterophorus*

Harmful Effects

Commonly known as Congress grass or carrot weed in India. It is considered as one of the worst weeds responsible for causing health problems of animals and humans, loss of agriculture and ecosystem. This weed causes health hazards, which have now reached epidemic proportions. It affects food and fodder crops, since the pollen and dust of the weed elicit allergic contact dermatitis in human (Priyadarshi, 2008). Dermatitis is a T cell-mediated immune injury and disease manifests as itchy erythematous papules and papulovesicular lesions on exposed areas of the body. These effects have been related to cytotoxicity of the sesquiterpene lactone parthenin.

Types of dermatitis	Body parts affected
Air Borne Contact Dermatitis (ABCD)	Face, eyelids, chest, neck, popliteal fossae
Chronic Actinic Dermatits (CAD)	Forehead, cheeks, nape of neck, rim of ears, forearm, hands, under surface of chin, depth of skin folds
Mixed pattern of CAD and ABCD	Scattered infiltrated scaly papules over exposed parts, such as eyelids, neck.
Photosensitive Lichenoid eruption pattern	Violaceous papules –plaques over cheek, forehead, ears, upper chest, back, dorsal of hands (Kaur *et al.* 2014)

Prolonged exposure manifests the symptoms of skin inflammation, eczema, asthma, allergic rhinitis, hay fever, black spots, burning blisters around eyes, allergic bronchitis, diarrhoea, severe popular erythematous eruptions, breathlessness and choking. It is a serious invasive weed of pasture systems, reducing pasture productivity 90% (Evans, 1997). It squeezes grasslands and pastures, reducing fodder supply. The invasive capacity and allelopathic properties have rendered it with the potential to disrupt natural ecosystem. Very sparse or sometimes no other vegetation can be seen in *P. hysterophorus*dominated areas. It has been reported to cause total habitat change in native Australian grasslands, river banks, open woodlands and flood plains (Lakshmi and Srinivas, 2007). The 'kolines' released by *Cassia uniflora* interfere with germination and growth rate of only *Parthenium* (Mahadevappa, 1999).

Benefits

The decoction of *P. hysterophorus* has been used in traditional medicine to treat fever, diarrhoea, neurologic disorders, urinary tract infections, dysentery,malaria & as emmenagogue. Ethnobotanically, it is used by some tribes as remedy for inflammation, eczema, skin rashes, herpes, rheumatic pain, cold, heart trouble and gynaecological ailments. It has been found to be pharmacologically active as analgesic in muscular rheumatism, therapeutic for neuralgia and as vermifuge. This weed is also reported as promising remedy against hepatic amoebiasis. Parthenin, the major constituent of the plant, exhibits significant medicinal attributes including anticancer property. The methanol extract of the flowers showed significant antitumour activity and parthenin exhibited cytotoxic properties against T cell leukaemia, HL-60 and Hela cancer cell lines. Previously, Ramos *et al* (2002) had established the antitumour potential of *Parthenium* extracts in vitro and in vivo with positive results in terms of tumour size reduction and overall survival cell lines.

MATERIALS AND METHODS

Insects were collected randomly from different parts of *Parthenium* plant body following conventional methods and were duly preserved. Identifications were done in the laboratory of Zoological Survey of India.

Site of work

The study was done in the adjacent areas of north 24 Parganas mainly day time between the months of January and April, 2018 in the following habitats.

1)Site A : Rail line adjacent areas

2) Site B : Waste land

3) Site C : Road side

4) Site D : In the vicinity of aquatic body

OBSERVATION

Site A

Table 1 : Distribution of insects on *Parthenium* sp.

Order	Number
Diptera	2
Lepidoptera	2
Hymenoptera	3
Odonata	0
Coleoptera	1
Hemiptera	2
Orthoptera	0
Total	**10**

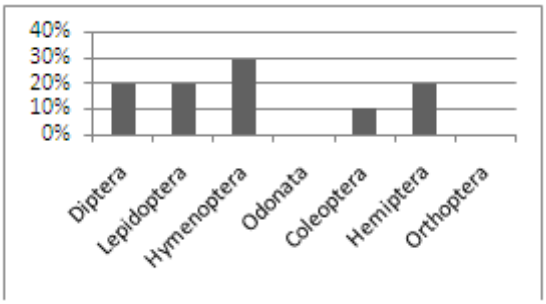

Fig. 1 : Percentage of Insect orders found in Site A on *Parthenium* sp.

Site B

Table 2 : Distribution of insects on *Parthenium* sp.

Order	Number
Diptera	2
Lepidoptera	2
Hymenoptera	2
Odonata	1
Coleoptera	1
Hemiptera	4
Orthoptera	0
Total	12

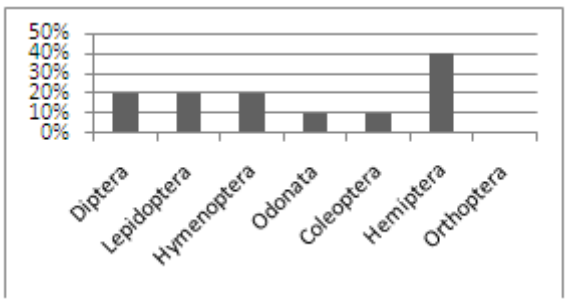

Fig. 2 : Percentage of insect orders found in Site B on *Parthenium* sp.

Site C

Table 3 : Distribution of insects on *Parthenium* sp.

Order	Number
Diptera	5
Lepidoptera	2
Hymenoptera	3
Odonata	1
Coleoptera	2
Hemiptera	1
Orthoptera	0
Total	14

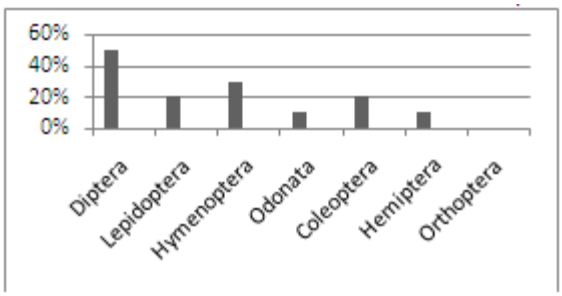

Fig 3 : Percentage of insect orders found in site C on *Parthenium* sp.

Site D

Table 4 : Distribution of insects on *Parthenium* sp.

Order	Number
Diptera	3
Lepidoptera	4
Hymenoptera	2
Odonata	0
Coleoptera	0
Hemiptera	2
Orthoptera	1
Total	12

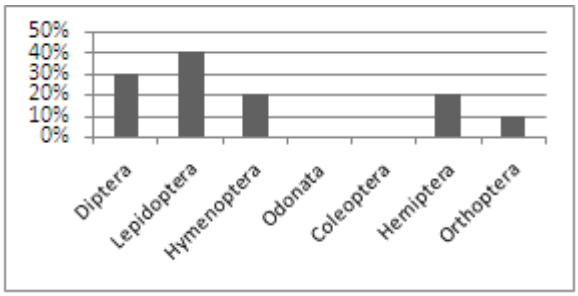

Fig. 4 : Percentage of insect orders found in Site D on *Parthenium* sp.

Total insect orders reported = 7 and families reported = 19

RESULTS AND DISCUSSION

The present contribution is the result of the the studies on the insectfaunal distribution on a specific invasive plant, *Parthenium hysterophorus* in four different habitats

Fig. 5 : Abundance of the insect families order-wise in 4 Sites (A,B,C,D).

(A)

(B)

(A) and **(B)** : *Parthenium hysterophorus* adjacent to roadside areas where the insects were highly abundant throughout the survey period.

in North 24-Parganas. Presence of different insects are observed from 10 am to 1pm once in a week during these four months.

The numerical occurrence on insects on different plant parts of *Parthenium* has been shown in Table 6.

Altogether 162 examples were collected from the *Parthenium* of four different sites (A,B,C,D) during this survey. Among them, Site C shared maximum number of examples (55), followed by site D and B (39 and 36, respectively). Site A was represented with 32 examples. From the above analysis, it can be said that number of individuals was almost similar on *Parthenium* of four sites.

Considering the microhabitats of *Parthenium*, leaf

Table 5 :

Site	Orders reported	Families reported	Maximum No. of families shared by orders	Maximum No. of individuals in order	Minimum No. of individuals in order
A	5	10	Hymenoptera (3)	Hymenoptera Diptera Lepidoptera	Hemiotera Coleoptera Odonata Orthoptera
B	6	12	Hemiptera (4)	Hemiptera Diptera Hymenoptera	Lepidoptera Coleoptera Odonata Orthoptera
C	6	14	Diptera (5) Hymenoptera (3)	Diptera Hymenoptera Coleoptera Lepidoptera	Hemiptera Odonata Orthoptera
D	5	12	Lepidoptera (4)	Lepidoptera Hemiptera Diptera	Hymenoptera Coleoptera Odonata Orthoptera

Table 6 : List of insect orders and families reported in *Parthenium.*

	Orders		Families
1	Diptera	1	Muscidae
		2	Calliphoridae
		3	Syrphidae
2	Lepidoptera	4	Nymphalidae
		5	Hesperidae
		6	Papilionidae
		7	Lycaenidae
		8	Erebidae
3	Coleoptera	9	Coccinellidae
		10	Chrysomelidae
		11	Cerambycidae
4	Hemiptera	12	Pentatomidae
		13	Pyrrhocoridae
		14	Reduviidae
		15	Membracidae
5	Hymenoptera	16	Formicidae
		17	Vespidae
6	Odonata	18	Libellulidae
7	Orthoptera	19	Acrididae

(65 examples) of the *Parthenium* was found as most preferable place of the insect visitors, followed by stem (50), flower (30) and buds (17). Therefore, it can be said that most of the insect visitors may be phytophagous in nature.

Abundance(%) of insect family

Insects and plants have a 2 way relationship; plant species depend on insects for their pollination, while insects are dependent on plants for their food and habitat. Therefore, there can be different effects of invasive plant species on insects. Due to a greater diversity of resources, the insect diversity increases with the increase of plant diversity. Especially the diversity of phytophagous specialists increases with the increase of plant species richness. This study supported the above observations that Diptera and Hymenoptera as phytophagous were the dominant groups on *Parthenium* among all the sites. Hymenoptera was dominated only with ants. Lepidoptera and Hemiptera were the second dominant groups in all sites. On very few occasions, Coleoptera, Odonata and Orthoptera were encountered on *Parthenium* in four sites. The abundance of chewing insects, primarily grasshoppers, is most strongly and positively related to plant biomass. Though the biomass of *Parthenium* is not much, so, Orthoptera were not observed during this study. It is also observed that the area (Site C) near roadside was the most preferable area of insect visit than other sites where *Parthenium* grown.

Table 7 : Distribution of insects on different microhabitats of *Parthenium.*

Different habitats	Number of insects from different plant parts of different habitats				Total number of insects
	Bud	Stem	Leaf	Flower	
Site A : Rail line adjacent areas	4	7	12	9	32
Site B : Waste land	3	20	8	5	36
Site C : Road side	6	5	34	10	55
Site D : In the vicinity of aquatic body	4	18	11	6	39
Total	17	50	65	30	162

List of identified species

Order	Family	Species
Diptera	Muscidae	*Musca domestica*
	Calliphoridae	*Chrysomya megacephala*
	Syrphidae	*Eristalis tenax*
Lepidoptera	Nymphalidae	*Jujonia almanae*
	Arctidae	*Amata* sp.
	Papilionidae	*Papilio demoleus*
	Lyceanidae	*Pseudozizeeria maha*
Hymenoptera	Formicidae	*Camponotus compressus*
		Monomorium minimum
	Vespidae	*Polistes* sp.
Odonata	Libellulidae	*Brachythemis contaminate*
Coleoptera	Coccinellidae	*Menochilus sexmaculatus*
		Micraspis sp.
	Chrysomelidae	*Aulachophora* sp.
	Cerambycidae	*Stromatium barbatum*
Hemiptera	Pentatomidae	*Clytia crossota*
		Eysarcoris montivagus
		Eysarcoris guttiger
	Coreidae	*Leptocorisa acuta*
		Cletus bipunctatus
	Pyrrhocoridae	*Disdercus* sp.
	Membracidae	*Coccosterphus decoloratus*
Orthoptera	Acrididae	*Atractomorpha crenulata*

CONCLUSION

Thus, the alien species can compete with native species, by changing the environment for native species. Alien species can also become invasive when they share traits of native species or when they possess different traits and therefore, can occupy empty niches (Mack, 1997; Levine and D'Antonio, 1999). Alien species can respond differently to various environmental conditions i.e. same species can have different impacts on different communities (Sakai *et al*, 2001). It is known that exotic invasive species have a huge effect on the plant species richness and communities where they occur (Ellington and Andersen, 2002). The result should be seen as an indication of the effect because the sample size is small and time of observation was also very minimum. Further indepth works will definitely tell us how much this invasive species will impact on our environment and the insect community.

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