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DIVERSITY OF INVASIVE PLANT SPECIES IN TRISHNA WILDLIFE SANCTUARY, TRIPURA, NORTHEAST INDIA

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ABSTRACT:

The present investigation is an attempt to catalogue the alien species of Trishna wildlife sanctuary which is under serious hazard due to intentional invasion of exotic species. Our present study also deals with the implication and interferences of invasive alien flora of Trishna Wildlife Sanctuary of South District of Tripura. A total number of 115 alien species under 85 genera belonging to 42 families have been documented. Among these maximum of the species are originated from the American continent with rich herbaceous representative. Asteraceae and Cassia are the dominant invasive family and genus respectively in the study site. It is revealed that 94 species are used as various economic purposes and 18 species are used as medicines. It is also reported from the study area that, only 33 species were introduced intentionally, while remaining species were introduced in several unmannered trading ways. The present study could be used for the better planning for detection of the notorious species and to design management strategies for conservation of biodiversity of the Trishna sanctuary specifically the habitats of the Indian bison.

KEY WORDS: *Invasive Species, Diversity, Habitat Interferences, Wildlife Sanctuary, Trishna, India.*

INTRODUCTION:

Invasive alien species (IAP) are species those were earlier present in other place, but due to intentionally or unintentionally they are introduced in to any new ecosystem and may causes sound effects on that ecosystem. These plants in their new ecosystem are referred to as 'alien' or 'exotic' plants. They homogenize the world biota (Mooney and Hobbs 2000). They can widely distribute among the all habitat as well as diverse ecosystem throughout the world (Aravindhan and Rajendran 2014) and therefore they are considered as one of the severe threat to the biodiversity after the habitat destruction (Hobbs and Humphries 1995). Many of them are noxious and cause negative impact on ecosystem, environment, habitats, and native biodiversity and even on human health (Khanna 2009). Some of the species were also introduced for ornamentation, enhanced economic status and as a medicinal plants, but after a period few of them become invasive on local ecosystem, replace the native vegetation and hampered the ecological structure of naïve one. Numerous studies have been conducted to explore the alien floristic composition of a particular region of the India (Das 2013; Nagar *et al.* 2004; Tomar *et al.* 2008; Mcdougall *et al.* 2011; Khuroo *et al.* 2012; Boro and Sarma 2013; Udayakumar *et al.* 2014; Surendra *et al.* 2013; Negi and Hajra, 2007 and Debnath *et al*. 2015).

Tripura, the small state of North East India, is the extension of Eastern Himalayan region having moist deciduous vegetational landscape. This region is also infested with many alien invasive species which drastically threat the diversity of the resident species. Although, few selective invasive species uplift the socioeconomic status of the rural people as well as the state economic status, conserve the soil structure and transformed the landscape of the state. It is highly diversified zone in terms of flora and fauna which belongs to the Indo-Malayan and Indo-Burma biological regime dominated by moist and dry tropical deciduous tree, many species of bamboo, canes and large number of epiphytes. Trishna Wildlife Sanctuary is situated in extreme south western part of the state, which is also called West Hill due to its undulating topography. Peoples of many tribal communities like Tripura, Debbarma, Munda, Santal, Bhill and migrating Bengalis are residing within the Sanctuary as forest dwellers and daily extracting many plant resources as fuel wood, timber and medicinal plants and extracted huge bamboo in last three decade from the Sanctuary for their livelihood and introduced some species for ornamentation or healthier their economy and livelihood.

In Tripura, any studies on invasive species are missing except Debnath *et al.* 2015. Good number of exotics become naturalized and changes the vegetational patterns of the state. So, at present situation for the protection and management of biodiversity it is an apparent need of authentic database of Trishna

Wildlife sanctuary for monitoring the spread and effect on our resident biodiversity. Considering the above fact the present investigation was designed and conducted.

STUDY AREA:

Trishna Wildlife Sanctuary is located in the south western part of the State under the South Tripura District; is famous for its natural sights, high diversified flora and fauna and for conservation of natural habitat of Indian Gour (Bison). The wildlife Sanctuary was declared in November 1987 with about 194.71 sq. km of geographical area surrounded by plain land of Bangladesh from east, south and west and geographically located between 23°12′ to 23°26′ N and 91°15′to 91°31′ E. Topographically the whole area is undulating and middle area is high and slope to the east and west borders of the Bangladesh where seasonal streams are drained to the both direction (east and west) from the middle. The soil type is sandy loam to red lateritic and clayey in marshy patches in the extreme south. The climate of the area is tropical savanna type with moist and dry deciduous vegetation dominant. The average diurnal temperature ranges between 4° C to 39°Cin the cold and hot month of the year respectively and annual rainfall is around 1900-2100 mm.

MATERIALS AND METHODS:

Field survey and documentation:

Intensive field survey were conducted in planned manner in various seasons of the year to record maximum number of exotic plant species during Jan 2013- Feb 2015 from the various habitat in the Wildlife Sanctuary (Forest, agricultural land, roadside, stream bank and border lines of the Sanctuary). Plants were identified with the help of various floras [Deb D.B. 1981 & 1983, Kanjilal *et al.* (1934 - 1940), Chowdhury 2005] and various published literatures.

The nativities and modes of introduction of the exotic species were recorded from the published literatures [Sekar KC 2012, Khuroo *et al.* 2012; Arvind Singh 2012, Boro 2013, Boro and Sarma 2013; Das 2013; Udaya kumar *et al.* 2014; Surendra *et al.* 2013 and Negi and Hajra, 2007]. The recorded species were categories by life form (herb, shrub, grass, sedge, aquatic, climber and tree), various uses (ornamentation, economic purposes and medicines). Local peoples were consulted for the compilation of medicinal values. The exotic species are enumerated in tabular form as per their Botanical name alphabetically, family, life form, nativity and uses.

RESULTS AND DISCUSSION:

The present study was undertaken to identify the invasive alien species diversity within the Trishna Wildlife Sanctuary, South district of Tripura, Northeast India during Jan. 2013-Feb. 2015. A total of 115 species of alien invasive were compiled from the study area, which are occupied the study area belonging into 85 genera under 42 families. They were listed alphabetically in tabular form with author citation, followed by family, life form, nativity, uses and mode of introduction (Table 1). Out of these15 species are of monocots under 12 genera belonging to 6 families, whereas, dicotyledons are much more enthusiastically distributed in the area, representing 100 species, 73 genera and 36 families. All of the species reported from this study area were also reported as alien exotics by previous worker (Negi and Hajra 2007, Singh *et al.* 2010, Srivastava *et al.* 2014, Aravindhan and Rajendran 2014) from the various parts of the country.

Out of these 115 species, 82 were intruded unintentionally through the process of horizontal distribution of the species, and trade exchange like grains import and 33 species were introduced intentionally for the better livelihood improvement and ornamentation purposes. But out of the 82 unintentionally introduced species like- *Ageratum conyzoides, Alternanthera philoxeroides, Alternanthera sessilis, Amaranthus spinosus, Cassia tora, Cyperusiria, Cyperus difformis, Chromolaena odorata, Eichornia crassipes, Eclipta prostrata, Lantana camara, Mimosa pudica, Sida acuta and Vernonia cinerea* are highly interfering the local species diversity and hampering the almost all kinds of ecosystem, entering into the forest and become very noxious.

While from the intentionally introduced species, *Hevea brasiliensis* is highly cultivated within the Wild life Sanctuary area by the local peoples for the improvement of their socio-economic conditions. The species is so importance that its latex is called liquid gold in the state and not only uplifts the rural socioeconomic status of the forest dwellers but the state economy of Tripura. Mono cultivation of this species in the Sanctuary threats the indigenous diversity and creates the pressure on the habitat of Indian bison, those were used to graze and free within the whole sanctuary area. But now days due to high population pressure and human interference the sanctuary area is fragmented. Our study also showed that the habitat fragmentation and mono-culturing activity of the invasive species confine the bison into two small protected fringe of habitats, which highly reduces their wilderness and reproduction capacity.

Out of the alien flora of the Wildlife Sanctuary Asteraceae is the most dominant family having12 species followed by Caesalpiniaceae representing 10 species, Euphorbiaceae, Solanaceae and Malvaceae each having 7, Poaceae 6, Mimosaceae and Papilionaceaeeach having 5 species and 4 species by Convolvulaceae and Cyperaceae. These top ten families are altogether contributed 60% of the alien

species from the study site [(Plate 1 (A)] and 20 families' represents only one species (Table 1). Earlier report on invasive species diversity by various author (Rao and Murugan 2006, Huang *et al*. 2009, Khuroo *et al.* 2007 and Heywood 1989) showed that Asteraceae is the highest and most noxious groups of species in the various tropical to sub tropical part of the globe. Our result also support their findings that the asteraceae showing same tendencies within the Wildlife Sanctuary.In terms genus *Cassia* has highest frequency having 6 species followed by *Solanum* 4 and *Acacia, Cyprus and Ipomoea* each having 3 species [Plate 1 (B)]. Sixty six genera are representing only single species in the sanctuary (Table 1). Studies on habits of the invasive species are showed that herbs (37%) are dominant over the shrub (29%) invasive species diversity, followed by tree (21%), grass (5.2%), sedge and climbers (3.5%) and aquatic (1.7%) [Plate 1 (C)].

On the basis of the nativity of the species, a total of 16 geographical regions were recorded, from which, Tropical America shares 45 species out of 115 followed by South America 19, Tropical Africa 12, China 7 species, 5 species each from Australia and Europe, 3 species each represented by west indies, South East Tropical Asia, Mediterranean and Brazil. Two species are presented by Tropical West Asia, Pantropic, North America and Mexico and single species is represent by Malaysia and Myanmar.

The study also highlighted that a number of intentionally introduced species has high economic value like *H. brasiliensis, A. mengium and C. sinesnis* regulating the economy of the rural habitants. Although some of the species has notorious affects like- *Chromolaena odorata, Mimosa pudica, Lantana camara, Echinochloa crusgalli,Vernonia cinerea, Amaranthus spinosus, Eichornia crassipes, Euphorbia hirta and Crotalaria pallid* (Table 2) to the native environment but some of them *Amaranthus spinosus, Solanum torvam, Ipomoea aquatic, Chenopodium album* aredirectly taken as vegetables by the rural peoples. Some of the invasive species (Table 1) are domesticated and dominated in agro-ecosystem and agroforestry system as common vegetables. Some of the species mainly *L. camera, Cassia siamea,* and *Saccharum spontaneum* and most of the shrubs are used as rural fuel, 8 species are providing edible fruits and 22 species are cultivated as ornamental plants in garden (Table 1). Our investigation through the consultation with the local inhabitants, we also compiled the 18 important exotic medicinal plants (Table 3) from the study area those are used in various alignments for their primary health care. But some of the exotic species influence the paddy field and various native crops due to their allelopathic potentiality (Debnath *et al.* 2015) which minimizing the food production capacity and altering the natural habitats of the Wildlife Sanctuary.

CONCLUSION:

Plant invasion in a new area may alter the resident species diversity, make vulnerable to the native ecosystem and dangerous break down in food web and thus causes introduction of some new pest species those are invasive lover, resulting the breakthrough in biodiversity and ecological imbalance. For the better management of the Sanctuary, compiling of alien diversity, detection and reporting of impact of various alien exotic species are highly essential. Our investigation report can be utilized by the forest manager to take management decision for the protection of biodiversity of different ecosystem of Trishna Wildlife Sanctuary.

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Table 1: List of invasive plant species in Trishna Wildlife Sanctuary, South Tripura district of Tripura, NE India

Sl. No.	Scientific name	Family	LF	NA	Uses	MI
1	*Abelmoscheus esculentus* Moench.	Malvaceae	S	TAF	V, FT	UI
2	*Acacia auriculiformis* A. Cunn. Ex. Benth.	Mimosaceae	T	AU	TM	I
3	*Acacia farnesiana* (L.) Willd.	Mimosaceae	T	SAM	NK	UI
4	*Acacia mangium* Willd.	Mimosaceae	T	AU	TM	I
5	*Aeschynomene indica* L.	Papilionaceae	H	NAM	NK	UI
6	*Agave cantula* Roxb.	Agavaceae	S	TAM	O	UI
7	*Ageratum conyzoides* L.	Asteraceae	H	SAM	M	UI
8	*Alternanthera philoxeroides* Mart.	Amaranthaceae	H	BZ	NK	UI
9	*Alternanthera sessilis* (L.) DC.	Amaranthaceae	H	TAM	M	UI
10	*Amaranthus spinosus* L.	Amaranthaceae	H	TAM	V	UI
11	*Annona reticulate* L.	Annonaceae	T	TAM	FT	I
12	*Annonas quamosa* L.	Annonaceae	T	TAM	FT	I
13	*Araucaria excels* R. Br.	Araucariaceae	T	AU	O	I
14	*Borassus flabellifer* L.	Arecaceae	T	TAF	FT	UI
15	*Bougainvillea glabra* Choisy.	Nyctaginaceae	C	BZ	O	UI
16	*Brassica campestrs* L.	Brassicaceae	H	MDT	FD	I
17	*Brassica oleracea* L.	Brassicaceae	H	EU	FD	I
18	*Caesalpinia bonduc* (L.) Roxb.	Caesalpiniaceae	S	PAN	M	UI
19	*Caesalpinia pulcherrima* (L.)Sw.	Caesalpiniaceae	S	TAM	O	I
20	*Callistemon linearis* DC.	Myrtaceae	T	AU	O	I
21	*Calotropis gigantea* (L.) R. Brown	Asclepiadaceae	S	TAF	M	UI
22	*Camellia sinensis* (L.) Kuntze.	Theaceae	S	CH	D	I
23	*Capsicum annuum* L.	Solanaceae	S	TAM	FD	I
24	*Cassia alata* L.	Caesalpiniaceae	S	WI	M	UI

Sl. No.	Scientific name	Family	LF	NA	Uses	MI
25	*Cassia fistula* L.	Caesalpiniaceae	T	PAN	O, TM	I
26	*Cassia occidentalis* L.	Caesalpiniaceae	S	SAM	M	UI
27	*Cassia siamea* Lamk.	Caesalpiniaceae	T	SETA	FW, TM	I
28	*Cassia sophera* L.	Caesalpiniaceae	S	TAM	M	UI
29	*Cassia tora* L.	Caesalpiniaceae	S	SAM	M	UI
30	*Catharanthus roseus* (L.) G. Don.	Apocynaceae	H	TAM	O	UI
31	*Chenopodium ambrosioides* L.	Polygonaceae	H	TAM	M	UI
32	*Chenopodium album* L.	Chenopodiaceae	H	EU	V, M	UI
33	*Chromolaena odorata* L.	Asteraceae	S	SAM	M	UI
34	*Chrysanthemum coronarium* L.	Asteraceae	H	SETA	O	I
35	*Chrysanthemum indicum* L.	Asteraceae	H	SETA	O	I
36	*Cinnamomum camphora* (L.) Sieb.	Lauraceae	T	CH	SP	I
37	*Citrus maxima* (Burm.) Merr.	Rutaceae	T	ML	FT	UI
38	*Crotalaria pallid* Aiton.	Papilionaceae	S	TAF	M	UI
39	*Croton bonplandianum* Baill.	Euphorbiaceae	S	TAM	M	UI
40	*Cuscuta reflexa* Roxb.	Cusutaceae	C	MDT	M	UI
41	*Cynodon dactylon* (L.) Pers.	Poaceae	G	TAF	FO, M	I
42	*Cyperus cyperoides* L.	Cyperaceae	SE	TAM	NK	UI
43	*Cyperus difformis* L.	Cyperaceae	SE	TAM	NK	UI
44	*Cyperus iria* L.	Cyperaceae	SE	TAM	NK	UI
45	*Datura stramonium* L.	Solanaceae	S	SAM	M	UI
46	*Delonix regia* (Bojer ex Hook.) Raf.	Caesalpiniaceae	T	MDT	O	I
47	*Dendrocalamus longispathus* kurz.	Poaceae	G	MY	FW, HC	UI
48	*Dolichos lablab* L.	Papilionaceae	C	TAF	V	I
49	*Echinochloa colona* (L.) Link	Poaceae	G	TAM	FO	UI
50	*Echinochloa crusgalli* (L.) Beauv.	Poaceae	G	TAM	FO	UI
51	*Eclipta prostrata* (L.) L.	Asteraceae	H	TAM	NK	UI
52	*Eichornia crassipes* (Mart.) Solms-Laub	Pontederiaceae	AQ	SAM	NK	UI
53	*Erygium foetidum* L.	Apiaceae	H	SAM	FD	UI
54	*Eucalyptus maculate* Hk.	Myrtaceae	T	AU	TM	I
55	*Eupatorium adenophorum* Sprengel	Asteraceae	S	MEX	NK	UI
56	*Euphorbia hirta* L.	Euphorbiaceae	H	TAM	M	UI
57	*Evolvulus nummularius* (L.) L.	Convolvulaceae	H	TAM	NK	UI
58	*Fuirena ciliaris* (L.) Roxb.	Cyperaceae	SE	TAM		UI
59	*Gossypium hirsutum* L.	Malvaceae	S	TAM	FI	I
60	*Grangea maderaspatana* (L.) Pori.	Asteraceae	H	SAM	M	UI
61	*Helianthus annuus* L.	Asteraceae	H	TAM	O	I
62	*Hevea brassilensis* Muell. Arg.	Euphorbiaceae	T	BZ	LC,TM	I
63	*Hibiscus rosa-sinensis* L.	Malvaceae	S	CH	O	UI
64	*Hibiscus schizopetalus* (Masters) Hook. f.	Malvaceae	S	TAF	O	UI

Sl. No.	Scientific name	Family	LF	NA	Uses	MI
65	*Hyptis suaveolens* (L.) Poit.	Lamiaceae	H	TAM	NK	UI
66	*Imperata cylindrical* (L.) Raeusch.	Poaceae	G	TAM	R	UI
67	*Ipomoea alba* L.	Convolvulaceae	H	TAM	V	UI
68	*Ipomoea aquatic* Forsk.	Convolvulaceae	AQ	CH	V	UI
69	*Ipomoea quamoclit* L.	Convolvulaceae	H	TAM	O, M	UI
70	*Ixora coccinea* L.	Rubiaceae	S	CH	O	UI
71	*Jatropha curcas* L.	Euphorbiaceae	S	TAM	BF	I
72	*Jatropha gossypifolia* L.	Euphorbiaceae	S	TAM	BF	UI
73	*Justicia gendarussa* (L.) F.	Acanthaceae	S	TWA	M	UI
74	*Lagerstroemia indica* L.	Lythraceae	S	CH	TM	UI
75	*Lantana camara* L.	Verbenaceae	S	SAM	M, FW	UI
76	*Leucaena leucocephala* (Lam.) de Wit	Mimosaceae	T	TAM	FW	I
77	*Ludwigia octovalvis* (Jacq.) Raven	Onagraceae	H	TAF	NK	UI
78	*Ludwigia perennis* L.	Onagraceae	H	TAF	NK	UI
79	*Malvaviscus arboreus* Cav. var.*penduliflorus* (DC.) Schery.	Malvaceae	S	TAM	O	UI
80	*Manihot esculenta* Crantz.	Euphorbiaceae	T	TAM	NK	UI
81	*Mimosa pudica* L.	Mimosaceae	H	SAM	M	UI
82	*Mirabilis jalapa* L.	Nyctaginaceae	H	TAM	O	UI
83	*Monochoria vaginalis* (Burm. F.) C. Presl.	Pontederiaceae	H	TAM	M, V	UI
84	*Opuntia elatior* Miller	Cactaceae	S	SAM	HP	UI
85	*Opuntia vulgaris* Miller	Cactaceae	S	SAM	HP	UI
86	*Oxalis corniculata* L.	Oxalidaceae	H	EU	M, V	UI
87	*Phaseolis vulgaris* L.	Papilionaceae	C	TAM	FD	I
88	*Physalis minima* L.	Solanaceae	H	TAM	FT, M	UI
89	*Pilea microphylla* (L.) Liebm.	Urtiaceae	H	SAM	NK	UI
90	*Pistia stratiotes* L.	Araceae	H	TAM	NK	UI
91	*Pisum sativum* L.	Papilionaceae	H	EU	FD	I
92	*Plumeria alba* L.	Apocynaceae	T	TAM	O	UI
93	*Plumeria rubra* L.	Apocynaceae	T	MEX	O	UI
94	*Portulaca oleracea* L.	Portulacaceae	H	SAM	M	I
95	*Psidium guajava* L.	Myrtaceae	T	TAM	FT	UI
96	*Psidium guinensis* Swartz.	Myrtaceae	T	SAM	FT	UI
97	*Ricinus communis* L.	Euphorbiaceae	S	SAM	BF	UI
98	*Saccharum spontaneum* L.	Poaceae	G	TWA	FW	UI
99	*Scoparia dulcis* L.	Scrophulariaceae	H	TAM	M	UI
100	*Sida acuta* Burm. f.	Malvaceae	S	TAM	M, FI	UI
101	*Solanum myriacanthum* Dun.	Solanaceae	S	SAM	NK	UI
102	*Solanum nigrum* Sw.	Solanaceae	H	TAM	M, FT	UI
103	*Solanum torvum* Sw.	Solanaceae	S	WI	M, V	UI
104	*Solanum tuberosum* L.	Solanaceae	H	TAM	FD	UI
105	*Spinacia oleracea* L.	Chenopodiaceae	H	EU	V	I
106	*Synedrella nodiflora* (L.) Gaertn.	Asteraceae	H	WI	M	UI

Sl. No.	Scientific name	Family	LF	NA	Uses	MI
107	*Tamarindus indica* L.	Caesalpiniaceae	T	TAF	FT	I
108	*Thujao ccidentalis* Bailey	Cupressaceae	T	NAM	O	I
109	*Thuja orientalis* L.	Cupressaceae	T	CH	O	I
110	*Triumfetta pilosa* Roth.	Tiliaceae	H	TAF	NK	UI
111	*Triumfetta rhomboidea* Jacq.	Tiliaceae	H	TAM	NK	UI
112	*Urena lobata* L.	Malvaceae	S	TAF	NK	UI
113	*Vernonia cinerea* L.	Asteraceae	H	SAM	M	UI
114	*Xanthium strumarium* L. P. P.	Asteraceae	H	TAM	NK	UI
115	*Zinnia elegans* Jacq.	Asteraceae	H	TAM	O	I

LF, (Life form): AQ- Aquatic; H- Herb; S- Shrub; T- Tree, SE- Sedges; G- Grass; C- Climber.
NA, (Nativity): AU- Australia; NAM- North America; SAM- South America; TAM- Tropical America; TAF- Tropical Africa; WI- West Indies, CH- China;MEX- Mexico; SETA- South East Tropical Asia; MDT- Mediterranean; PAN- Pantropic; ML- Malaysia; BZ- Brazil;
Uses: V- Vegetables; FT- Fruit; NK- Not Known; BF- Bio fuel; FI- Fibre; O- Ornamental; FD- Food; HP- Hedge Plant; LC- Latex Collection; D- Drink; FW- Fuel wood; HC- House construction.
MI, (Mode of introduction): I- Intentionally; UI- Unintentionally.

Table 2: Most noxious and economically cultivated exotic plant in TWS

Noxious Plant	Economically cultivated plants
***Amaranthus spinosus* L.**	*Acacia mangium* Willd.
***Chromolaena odorata* L.**	*Brassica oleracea* L.
***Crotalaria pallid* Aiton.**	*Brassica campestrs* L.
***Echinochloa crusgalli* (L.) Beauv.**	*Camellia sinensis* (L.) Kuntze.
***Eichornia crassipes* (Mart.) Solms-Laub**	*Capsicum annuum* L.
***Euphorbia hirta* L.**	*Jatropha curcas* L.
***Lantana camara* L.**	*Hevea brassilensis* Muell. Arg.
***Mimosa pudica* L.**	
***Vernonia cinerea* L.**	

Table 3: List of important medicinally useful invasive species used by the local inhabitant of Wildlife Sanctuary

Sl. No.	Name of the plants	Part(s) used	Medicinal uses
1	*Ageratum conyzoides* L.	Leaves	Leaf juice of the plant used in wound healing and treating the skin diseases.
2	*Alternanthera sessilis* (L.) DC.	Whole plant	Plant used in snake bite and plant juice taken against the cough and diabetes.
3	*Amaranthus spinosus* L.	Whole plant	The plant taken as vegetable for curing the various disease and boiled juice of the plant is used to cure the stomach and kidney problem.
4	*Calotropis gigantean* (L.) R. Brown	Leaves	Plant used against Rheumatism and Asthma.
5	*Cassia alata* L.	Leaves	Leaf paste is used in ring worm and skin

Sl. No.	Name of the plants	Part(s) used	Medicinal uses
			disease.
6	*Cassia occidentals* L.	Leaves	Bitter leaf decoction is taken against diabetes and to cure skin disease.
7	*Cassia tora* L.	Leaves	The plant also have potentiality to work against ring worm like *C. alata*
8	*Chromolaen aodorata* L.	Leaves	Leaf pellet is used to prevent the bleeding.
9	*Croton bonplandianum* Baill.	Leaves	Leaf juice used to cure the stomach troubles and leaf pest also have anti- ring worm activity.
10	*Cuscuta reflexa* Roxb.	Whole plant	This parasitic plant juice is orally taken against the jaundice and treating the difficulty in urinating.
11	*Cynodon dactylon* (L.) Pers	Juvenile leaves	Leaf juice is taken to increase Hb in blood.
12	*Eclipta prostrate* (L.) L.	Leaves	Leaf juice taken to prevent the hair fall and to cure the ulcer and jaundice.
13	*Lantana camara* L.	Leaves	Leaf is used against snakebite. The leaf boil is used as an inhalant for respiratory troubles.
14	*Mimosa pudica* L.	Whole plant	Fresh root is used for the treatment of toothed, leaf and bark decoction also used against piles problem.
15	*Physalis minima* L.	Fruit and leaves	The fruit of the plant is used against the stomach problem and leaves also used to cure the urinary problems.
16	*Scoparia dulcis* L.	Stem and leaves	Stem used in toothache and leaf juice has anti-diabetic activity.
17	*Solanum nigrum* Sw.	Leaves	Leave juice is used to cure the ulcer
18	*Vernonia cinerea* L.	Leaves	Leaf paste is used into the wounds to stop the bleeding.

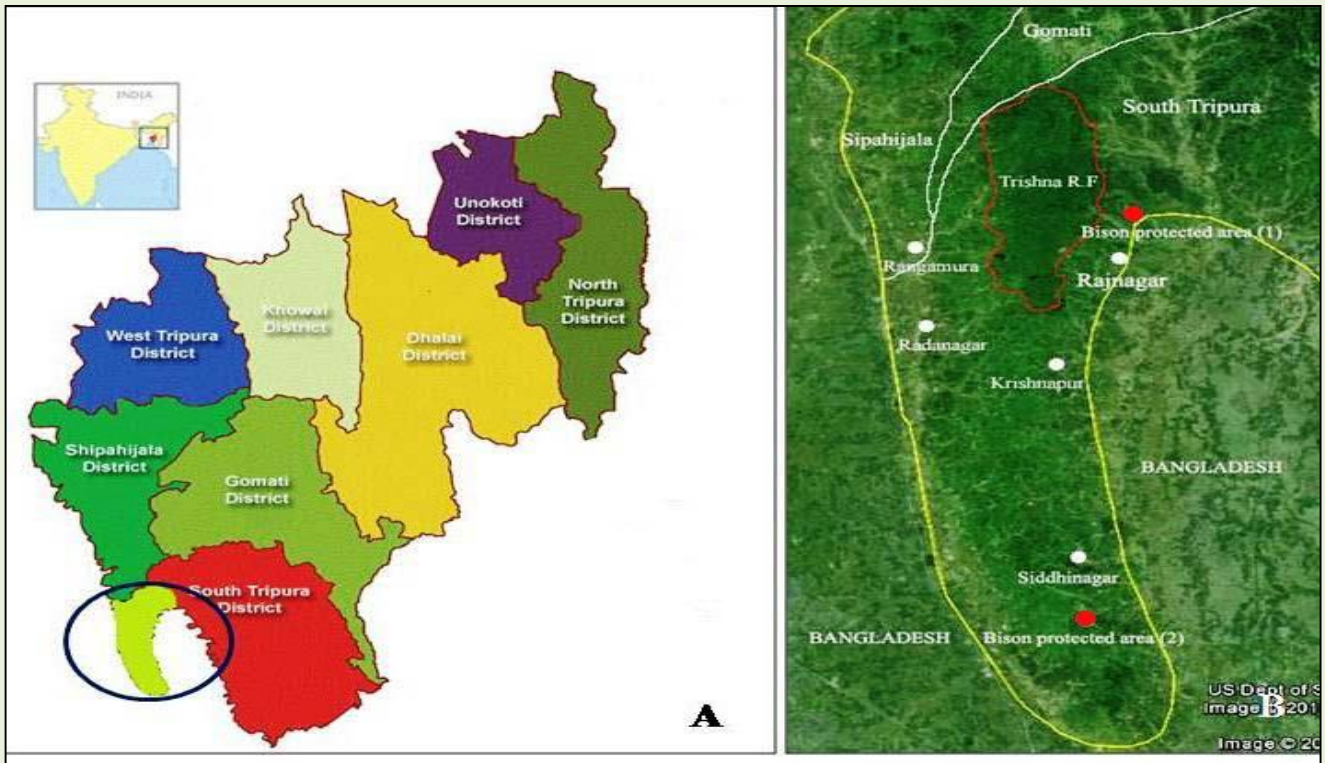

Figure 1: (A) Location of Trishna Wildlife Sanctuary within circle, Tripura Northeast India; (B) Showing Trishna R.F. with two Bison protected area.

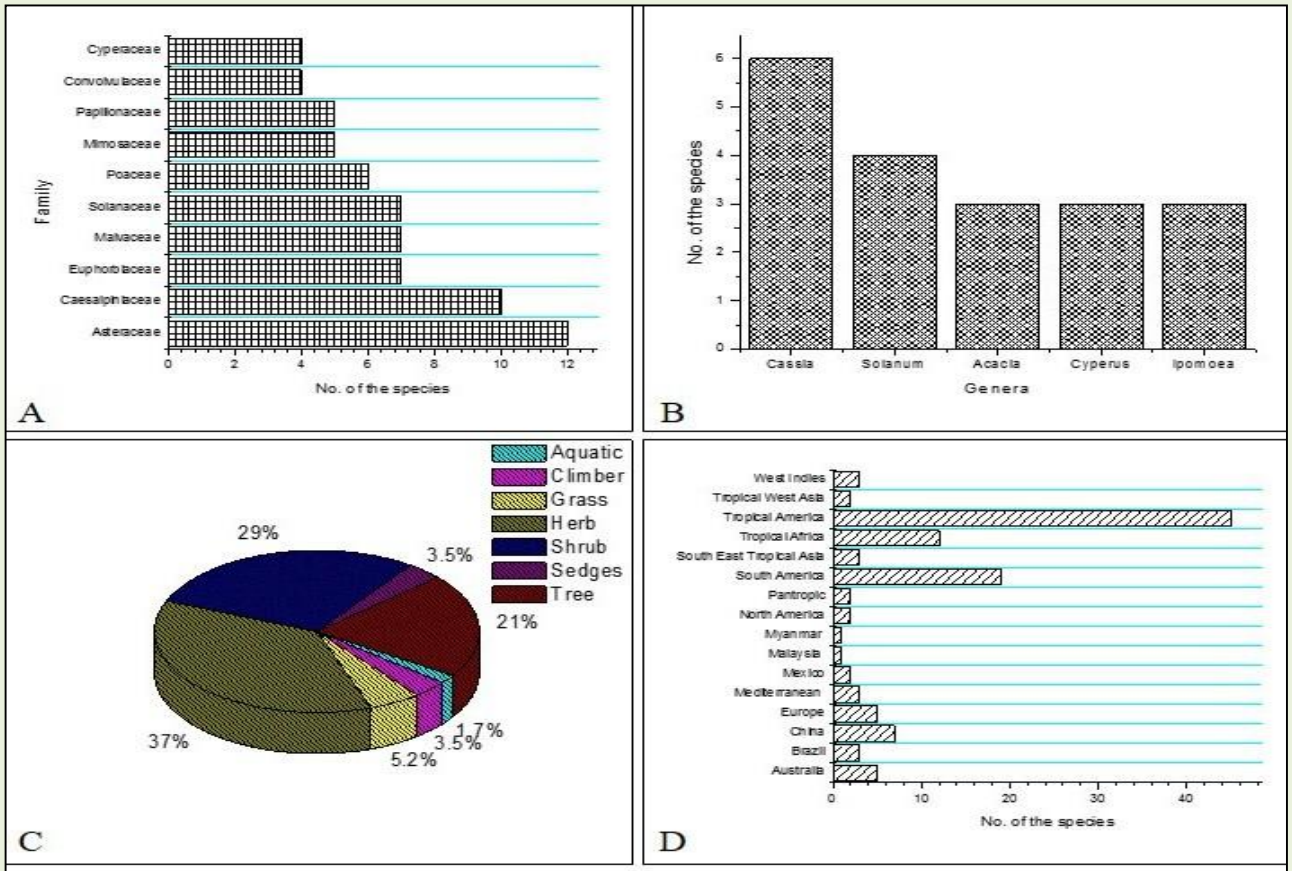

Plate 1: The figure showing (A) Ten dominant families, (B) Genera with three or more species, (C) Life forms and (D) Nativity of the invasive species found in the Trishna Wildlife sanctuary, Tripura, India.