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SURVEY OF POISONOUS PLANTS IN ACHARYA JAGADISH CHANDRA BOSE INDIAN BOTANIC GARDEN (AJCBIBG), HOWRAH, WEST BENGAL, INDIA

S.P. Panda[1]*, Arjun S.K.[2], M.U. Sharief[3] and S. S. Hameed[3]
[1]Botanical Survey of India, Deccan Regional Centre, Hyderabad- 5000001, India
[2]National Orchidarium cum Experimental Garden, Yercaud, BSI, SRC, Tamil Nadu, India
[3]BSI, Southern Regional Centre, TNAU Campus, Coimbatore- 641003, Tamil Nadu, India
*Corresponding author E-mail: situ.1979@gmail.com
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ABSTRACT

Plants being beneficial for human in every aspect they also contain many harmful biological components which can be dangerous for living organisms upon contact or due to ingestion. The present study is based on extensive field survey and observations aimed to find out the various poisonous plants dwelling in the Acharya Jagadish Chandra Bose Indian Botanic Garden (AJCBIBG), Howrah. A total of 41 plants belonging to 20 families and 34 genera were documented during this study. Among these, Apocynaceae (08) and Euphorbiaceae (10) were dominant families in terms of the number of species. The various plant part(s) such as bark, stem, leaves, fruits and tuber were found to have different types of poisonous compounds. The severity of illness caused due to these plants and their respective parts depends on the dose in which the organisms ingest their components or the extent to which they make contact with them. People should be aware about such poisonous plants for avoiding various complications. Taking it into account the present communication dealt with an enumeration of plants having poisonous properties along with their correct name, family, phenology etc. Concurrently their toxic effects, economic uses and host species are also provided in brief.

Keywords **:** Survey, Enumeration, Poisonous plants, AJCBIBG, Conservation.

Introduction

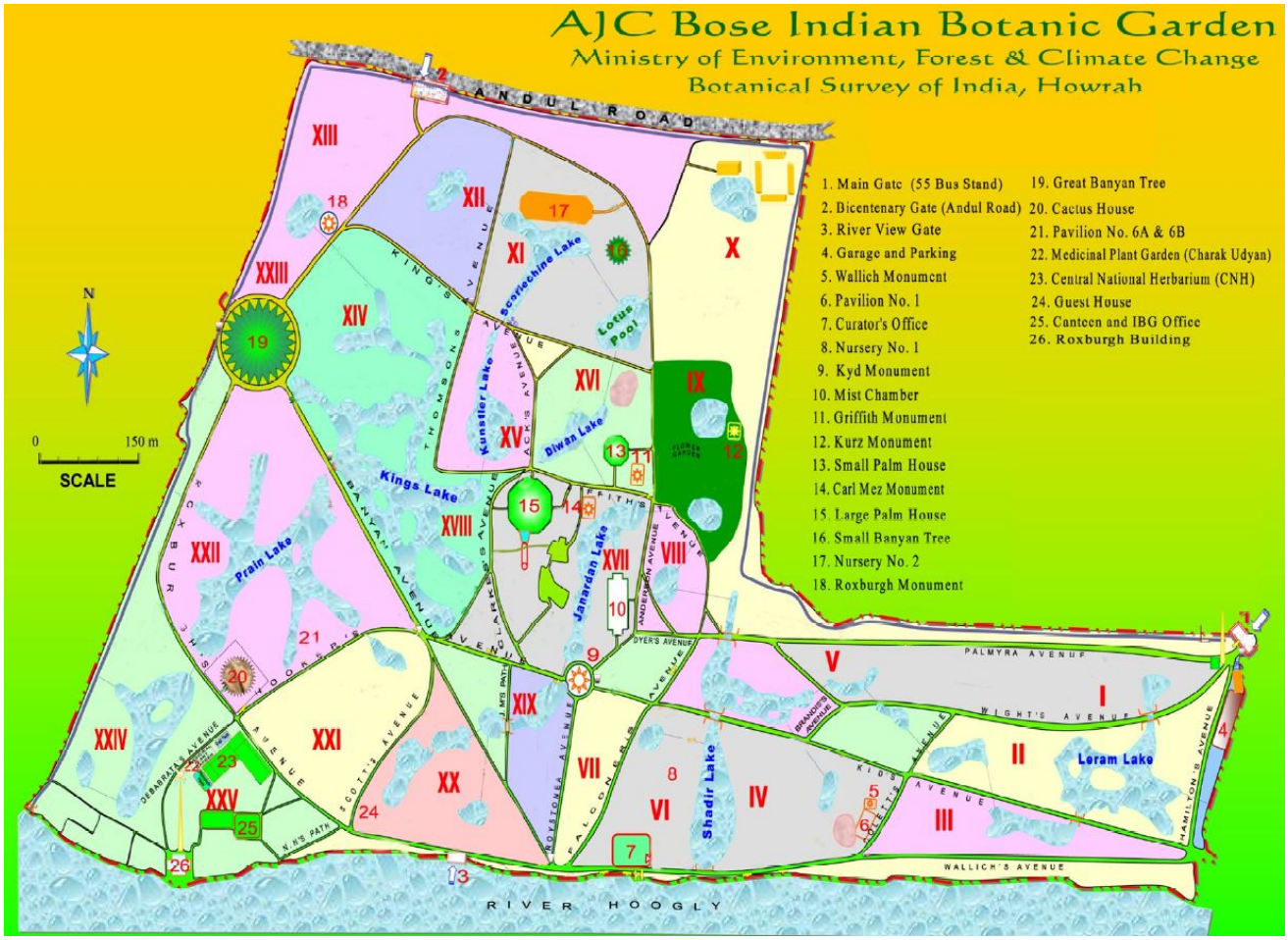
Plants are so amazing and beneficial for living beings in great aspect since the time immemorial. Without plants life is not possible or even beyond imagination on earth. The diversity of medicinal plants and their uses are astounding. But, Paracelcus (1993-1541) has well said that all substances are poisonous, there is none which has no poison. Right dose differentiated a poison from remedy. Hence some plants can be poisonous to human being (Gotefode *et al.*, 2022). Toxicity of plants depend upon specific plant part or whole plant, to particular organ or whole body, immediately or after accumulative effects, to one species or whole genera and many times also depend upon concentration of particular toxic component. Many times the incorrect identification or climatic conditions and state of plants also determine toxicity (Gotefode *et al.*, l.c). With the knowledge of poisonous properties plant can develop marvellous therapeutic technique as well as prevention precaution from these Botanical weapons (Bamini *et al.*, 2019). There are more than 4000 species of medicinal plants growing as herbs, shrubs, and trees in India, many of which are poisonous when administered in large doses (Bamini *et al*., l.c). One source of poisoning is through external contact, which causes irritation. The ingestion of poison leads to internal poisoning. Other ways include absorption through skin and inhalation via the respiratory system The current study is mainly intended to document exotic poisonous plants found in the AJCBIBG, Howrah, West Bengal.In India, there is a chain of botanic gardens established in almost every

region of the country, of which the AJCBIBG, Howrah, is one of the most celebrated botanic gardens not only in this continent but in the whole world. Established in 1787 by Col. Robert Kyd under the East India Company's patronage, the "Company Bagan" (present day Acharya Jagadish Chandra Bose Indian Botanic Garden) covers an area of about 273 acres situated on the west bank of the river Ganga (Hooghly) (22.5587° N, 88.2911° E). Its unique landscaping was initiated by Sir George King. At present, the garden is divided into 25 divisions, encompassing many sections of different plant groups, each specified for growing different types of plants (Map. 1). There are 24 artificial lakes in the Garden which are interconnected with underground pipes and connected with the river Ganga through sluice gates for the regular inlet and outlet of water. The Garden is the living repository of more than 12,000 trees, shrubs and climbers representing over 1400 species together with large numbers of wild and planted herbs.

Considering this, throughout this documentation, an effort has been made to provide a glimpse into freshly discovered plants having poisonous properties and may be effective in the treatment and the invention of new pharmaceuticals.

Materials and Methods

The present work is an extensive division wise survey of medicinal plants having poisonous properties of AJCBIBG, Howrah. Since its inception no one has made any attempt to survey these plants having poisonous properties. In order to address these issues, exhaustive division-wise field surveys were undertaken in AJCBIBG (Map. 1) to document the plants having great role in poisoning. The information includes poisonous plants with their local names and parts. The plants were identified in consultation with modern floras and monographs. An attempt has been made to collate the information available in literature. The plants are arranged alphabetically along with their family. The list is compiled based on Textual data, References and Cross-references and websites. The plants list is presented in table 1, with local name, botanical name, family name, parts used, also mentioned their habit, phenology, targeted animal and economic importance.



Map 1 : Map of AJC Bose Indian Botanic Garden

Results and Discussion

The list is compiled on the basis of (i) Textual data (ii) References and Cross-references (iii) Internet and web-sites. The plants having poisonous properties described in different literature are listed in Table 1 with local name, botanical name, family name, parts used, also mentioned their habit, phenology, targeted animal and economic importance.

In AJCBIBG, 41 poisonous plant species distributed in 34 genera belonging to 20 families have been found. For each species botanical name, family, local name, poisonous parts, habit, phenology, targeted animal and economic important of those plants are provided. Shrub (20 species) were found to be the most used plants (Figure. 1) followed by trees (17 species) and climbers (2 species), Herbs (1 species) in descending order.

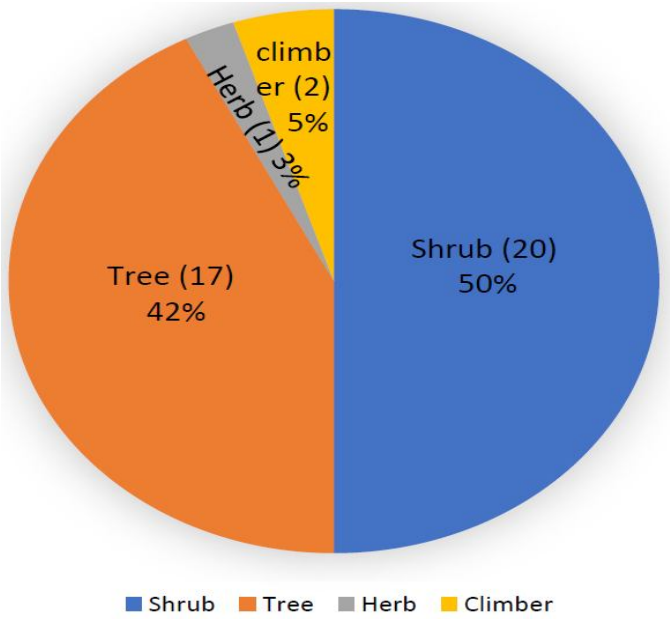


Fig. 1 : Habit wise distribution of Poisonous plant

Of these, 41 species of poisonous plants, the most dominant families in the study were Euphorbiaceae (10 species) (Figure 2), Apocynaceae (08 species), Ancardiaceae, Asperagaceae, Fabaceae, Moraceae Verbenaceae (02 species) whereas 13 families (Asphodelaceae, Annonaceae, Arecaceae, Poaceae, Calophyllaceae, Phyllanthaceae,, Solanaceae, Convulvulaceaa, Meliaceae, Myristicaceae, Cactaceae, Pandanaceae, Loganiaceae) have single species.

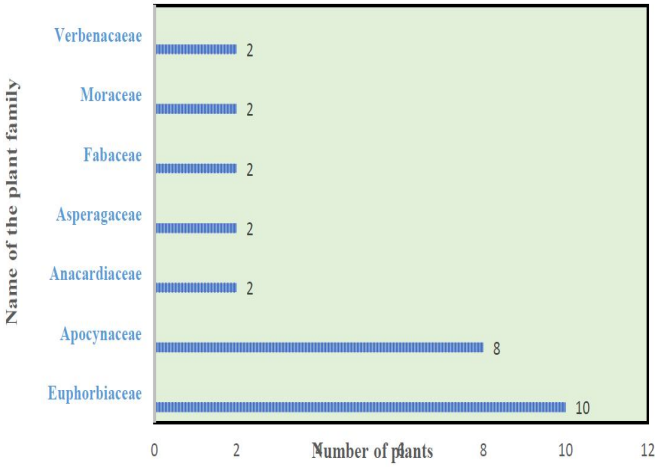


Fig. 2 : Family wise distribution of Poisonous plant

Mostly leaves are having maximum poisonous property followed by fruit, seeds (Figure 3). Rest of the parts having poisonous properties are in following order roots>Bark>Tuber>All parts.

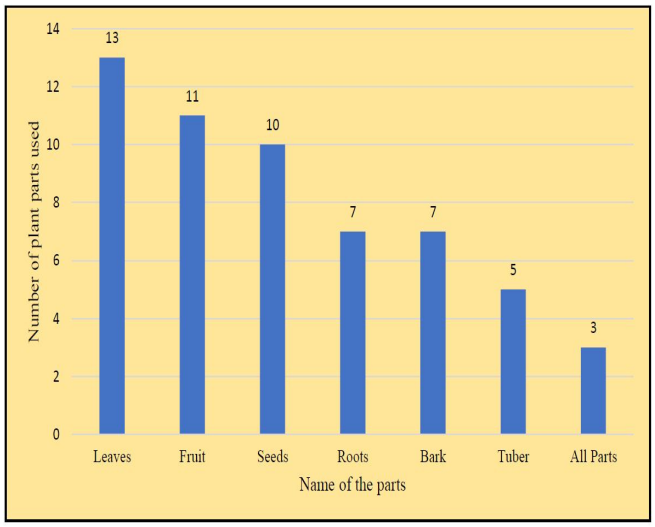
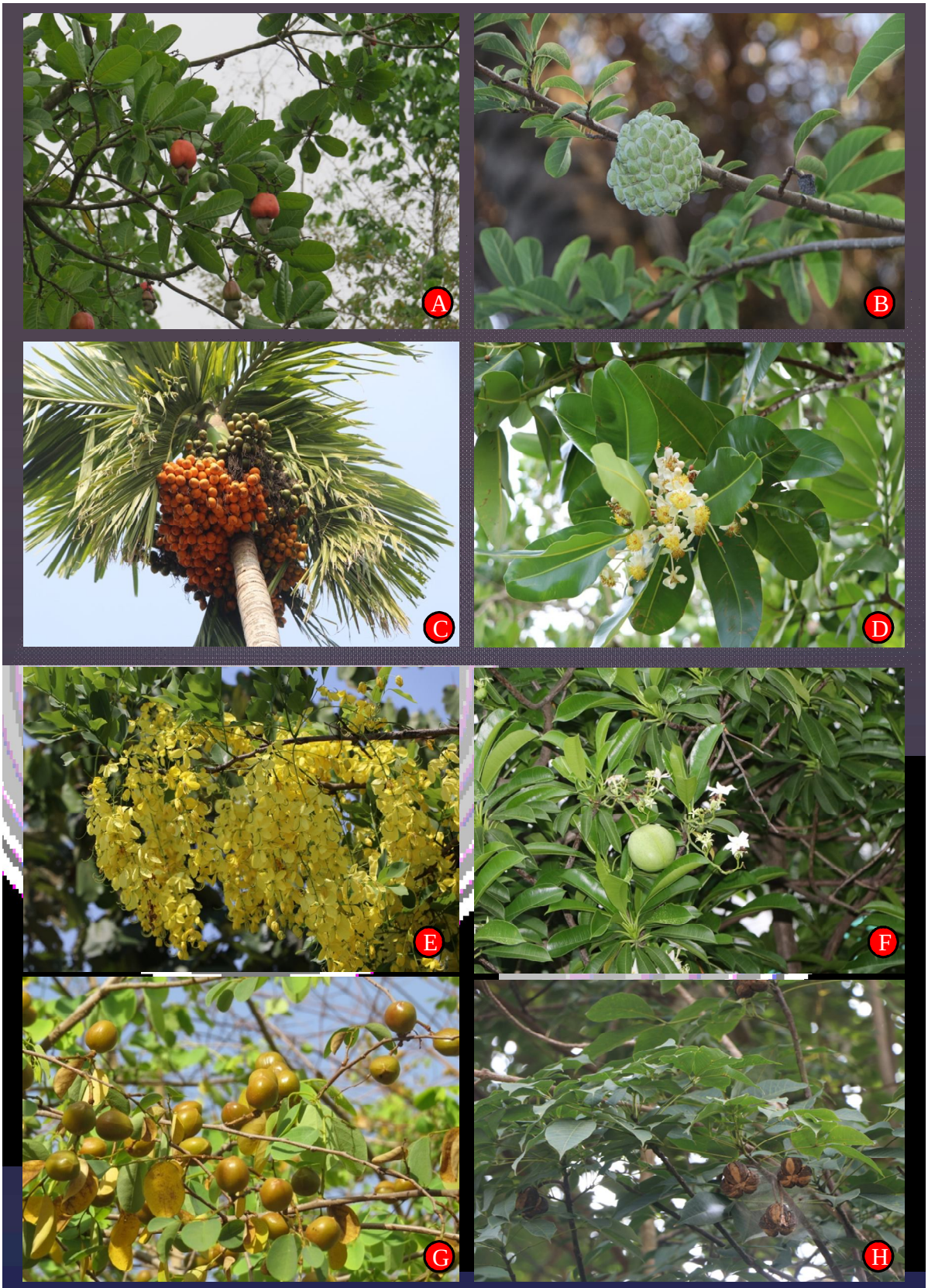


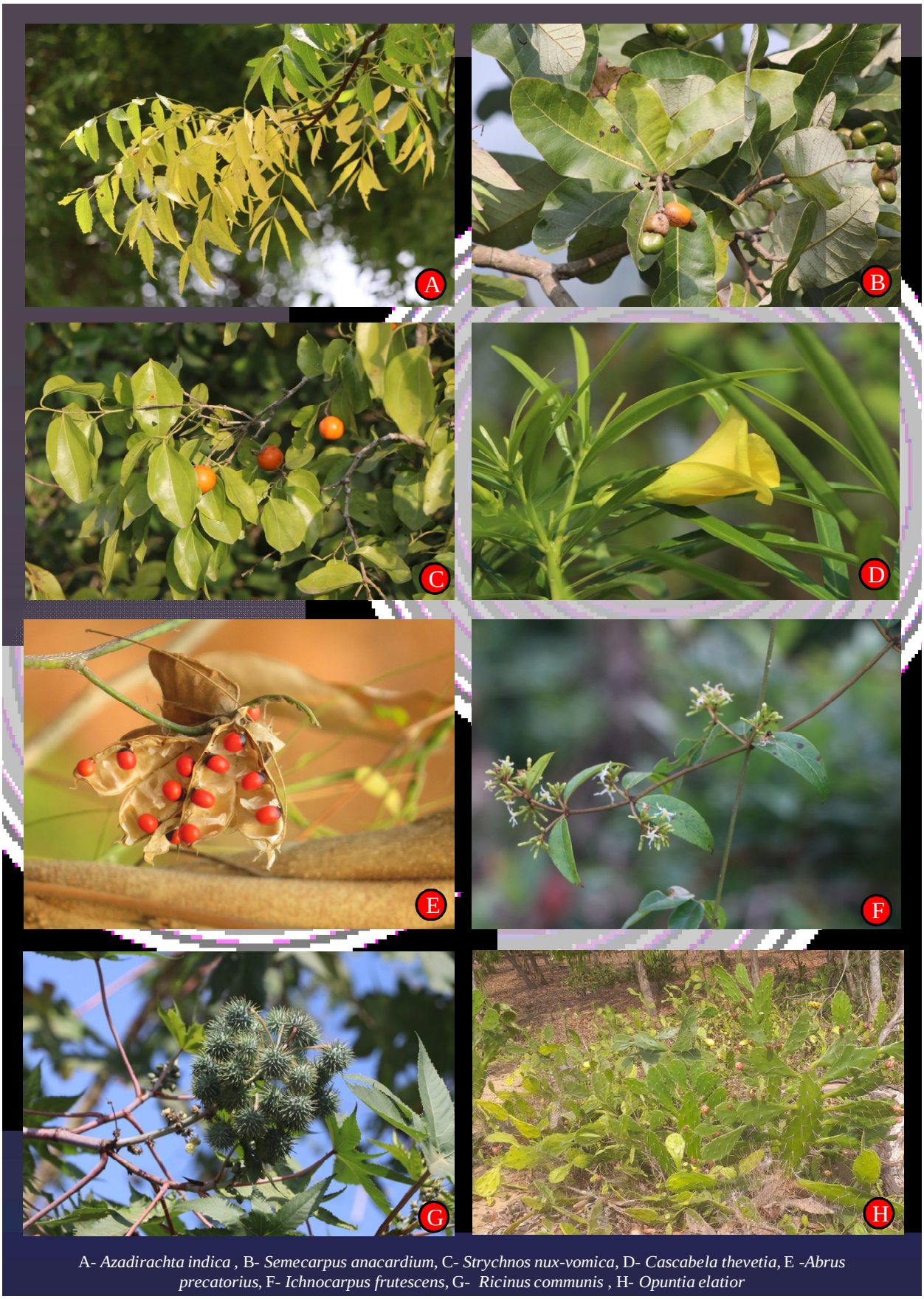
Fig. 3 : Distribution of plant parts having poisonous properties

PLATE-1



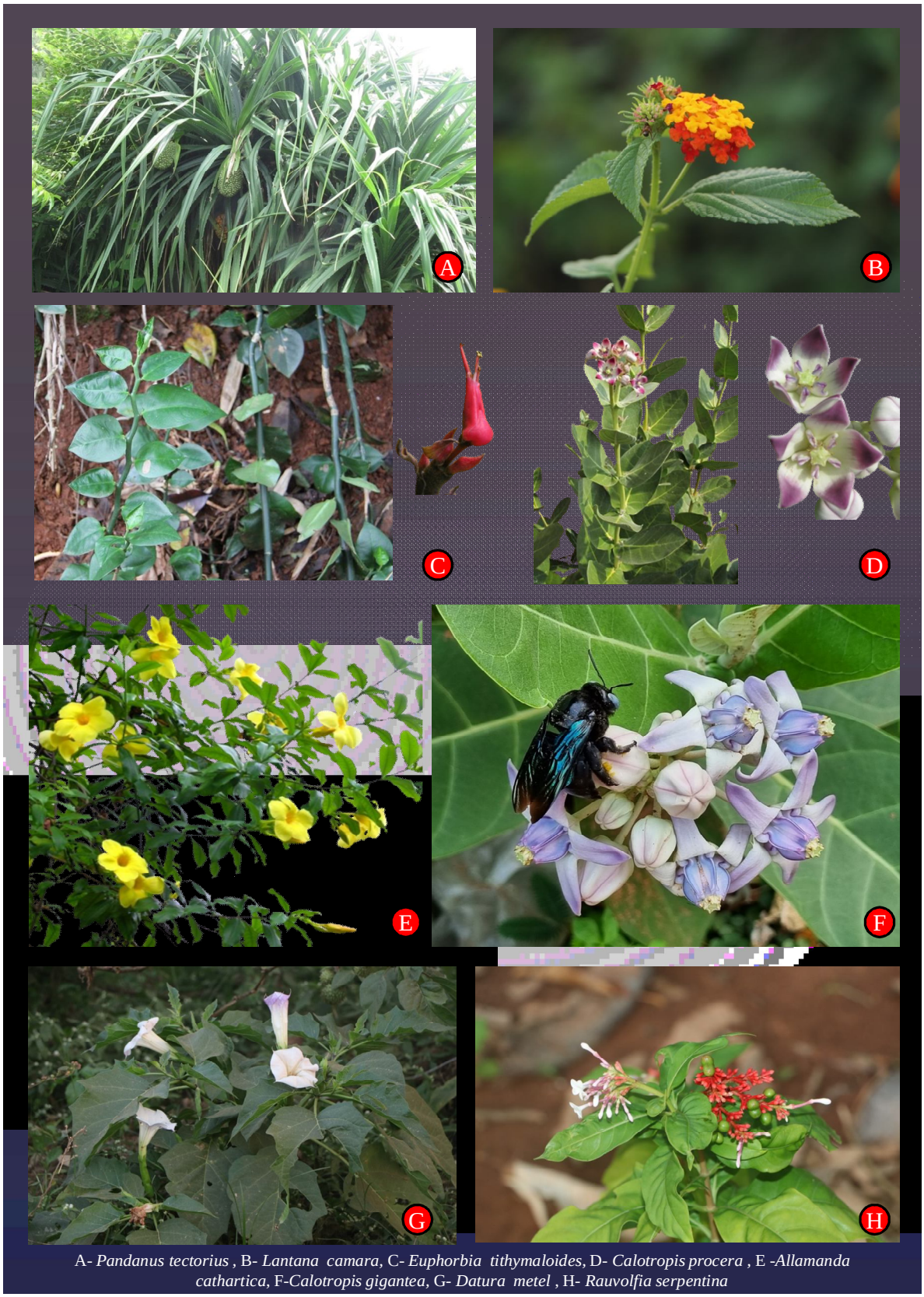
A- *Anacardium occidentale* , B- *Annona squamosa,* C- *Areca catechu,* D- *Calophyllum inophyllum* , E -*Cassia fistula,* F- *Cerbera odollam,* G- *Cleistanthus collinus,* H- *Hevea brasiliensis*

PLATE-2



A- *Azadirachta indica* , B- *Semecarpus anacardium*, C- *Strychnos nux-vomica*, D- *Cascabela thevetia*, E -*Abrus precatorius*, F- *Ichnocarpus frutescens*, G- *Ricinus communis* , H- *Opuntia elatior*

PLATE-3



A- *Pandanus tectorius* , B- *Lantana camara*, C- *Euphorbia tithymaloides*, D- *Calotropis procera* , E -*Allamanda cathartica*, F-*Calotropis gigantea*, G- *Datura metel* , H- *Rauvolfia serpentina*

Table 1 : Details of Poisonous Plants of AJCBIBG

Sl. No.	Scientific Name of the plant	Family	Common name in English	Habit	Phenology of Flowering & Fruiting	Poisonous parts	Target Animals if any	Toxic Effect	Economic use, if any
	Abrus precatorius L.	Fabaceae	Rosary Pea	Climber	September - December	Roots, seeds, leaves	Cattle (horses, goats and dogs)	Diarrhea	Handicrafts
	Agave americana L.	Asparagaceae	Century plant	Herb	January - June	Sap	Human	Acute contact dermatitis, burning, blistering lasting several weeks and itching. If ingested, the agave plant can have seriousconsequences including kidney and liver damage.	Leaves are used as a fodder during scarcity.
	Agave sisalana Perrine	Asparagaceae	Sisal Agave	Shrub	March - May	leaves	Human	Contact with the sap of Blue Agave may cause burning, pain, swelling, and rash. A more common symptom of exposure to agave plants is skin irritation, itching, or dermatitis	The sisal fibre is used for rope, twine, paper, cloth, bags, dartboards, footwear, and carpets.
	Allamanda cathartica L.	Apocynaceae	Golden Trumpet Vine,	Shrub	July - November.	All parts	Livestock and human	Diarrhoea and vomiting. Skin contact may cause dermatitis.	Used as ornamental purpose
	Aloe vera (L.) Burm.f. (=*Aloe barbadensis* Mill.)	Asphodelaceae	Aloe vera	Shrub	March - May	Juice	Humans, dogs, cats and rabbits	Sap of leaf ingestion may cause minor symptoms such as rash, vomiting or diarrhea. Ingestion in large amounts can cause serious effects.	Medicinal value(high Blood pressure, headache and skin rash.)
6.	*Anacardium occidentale* L.	Anacardiaceae	Cashew apple	Tree	March - April	Raw Kernel Plant sap	Humans and ants	Skin irritant, can induce kidney stone formation	Edible fruits
7.	*Annona squamosa* L	Annonaceae	Sugar Apple	Tree	March-May August-January.	Seed, leaf, root bark, immature fruit	Humans	Keratoconjunctivitis can be developed within 6-12 hrs of ocular exposure to the seeds of this plant	Edible fruits
8.	*Antiaris toxicaria* (J.F.Gmel.) Lesch.	Moraceae	Upas Tree	Tree	January-April	Leaves, Bark	Animals and Humans	Cancer, Leukaemia spleenomegaly	Timber is commonly used for vinner.
9.	*Areca catechu* L.	Arecaceae	Areca or betel nut, supari	Tree	Throughout the year	Leaf and nut	Humans	Oral squamous cell carcinoma, cholinergic and carcinogenic, bronchoconstrictor and can cause exacerbation of bronchospasm, Mouth cancer.	Trunks and leaves used in local construction, in making of weapons, and as a source of wax.
10.	*Bambusa balcooa* Roxb.	Poaceae	Golden bamboo	Shrub	After rains	Shoot	Humans, Rats, Horses.		Construction purpose
11.	*Calophyllum inophyllum* L.	Calophyllaceae	Alexandrian laurel	Tree	April to June	Every parts Milky juice, fruit unrefined	Humans, Rat Fish, Cats	The leaves contain compounds that are poisonous to fish and can be used as fish poison.The sap of the	Paint preparation

						oil		tree is poisonous and is used to make poison arrows in Samoa. The mature fruit is poisonous enough to use as rat bait.	
12.	*Calotropis gigantea* (L.) W.T.Aiton	Apocyanaceae	Crown Flower	Shrub	Throughout the year	Root juice, Milky sap	Humans, Dogs, Frogs	It contains chemicals that can interfere with heart function. High doses of oral consumption causesserious side effects including vomiting, diarrhea, slow heartbeat, convulsions, and death.	Medicinal
13.	*Calotropis procera* (Aiton) W.T.Aiton	Apocynaceae	Madar, Akdo, Milk weed	Shrub	Throughout the year	Latex	Humans	Burning sensation, vomiting, inflammatory reaction. Hoarseness, dysphonia, and dysphagia, redness of skin, swelling, and vesication, contact with eyes results in conjunctivitis.	Biofuel
14.	*Cassia fistula* L.	Fabaceae	Amaltas	Tree	April—June and December - April	Sticky fruit pulp, leaves and bark	Humans	Nausea, vomiting, abdominal cramping, diarrhea, and dehydration. Emodin can also cause benign discoloration of the urine	Ornamental purposes
15.	*Cerbera odollam* Gaertn.	Apocynaceae	Suicide Tree	Tree	July-November	Seed and kernel of the fruit	Humans	Blocks cardiac calcium ion channels	Ornamental purposes
16.	*Cleistanthus collinus* (Roxb.) Benth. ex Hook.f.	Phyllanthaceae	Toxic Gooseberry, Herbicide tree	Tree	December-November	Leaves Bark	Humans, Cattle, Fish	Renal injury, Cardiac toxicity	Hedges
17.	*Cryptostegia grandiflora* Roxb. ex R.Br.	Apocynaceae	Rubber vine	Shrub	Throughout the year	Latex	Humans	Its effect is characterized by gastrointestinal and neurological disorders in the later stage. In the early stages, however, it causes nausea, vomiting, and anorexia	Hedges
18.	*Datura metel* L.	Solanaceae	Datura Blackcurrant Swirl	Shrub	March-December	All parts Seeds Fruit	Humans	Consumption of little amount can cause flushed skin, headaches, hallucinations, and potentially convulsions or even a coma.	Ornamental plant
19.	*Duranta erecta* L.	Verbenaceae	Sky flower	Shrub	Throughout the year	Leaves, Berries	Children, Dogs, Cats.	The consumption of the fruit causes irritation in the mouth and stomach. Poisoning also increases body temperature, mydriasis, tachycardia, edema of lips and eyelids, convulsions, and gastrointestinal	Hegdes

								irritations.	
20.	*Euphorbia antiquorum* L.	Euphorbiaceae	Triangular Spurge	Tree	December-March	Milky Sap, spine	Humans	Dermatites, Keratoconjunctivitis, blindness in severe cases, vomiting, diarrhoea, dizziness, muscle twitching, coma.	Hedges
21.	*Euphorbia pulcherrima* Willd. ex Klotzsch	Euphorbiaceae	Poinsettia	Shrub	January – March	Sap latex	Humans, Children	Allergic reactions, irritating to the skin or stomach, diarrhea and vomiting, sap causes temporary blindness.	Hedges
22.	*Excoecaria agallocha* L.	Euphorbiaceae	Blinding Tree	Tree	November-February	Milky latex	Human, Fish	The milky latex discharged from the bark is poisonous and may cause temporary blindness and blistering of the skin.	They also function as natural nutrient filters and recyclers, protect coastal areas from seawater intrusion, and also helps in floodwater mitigation.
23.	*Ficus elastica* Roxb. ex Hornem.	Moraceae	Indian Rubber Tree	Tree	All the year round	The sap of the plant	Humans	Exposure to the sap from the plant or leaves may produce contact dermatitis.	Rubber industry
24.	*Hevea brasiliensis* (Willd. ex A.Juss.) Müll. Arg.	Euphorbiaceae	Para Rubber Tree	Tree	July to September	Latex	Humans	The intake of a high concentration of latex may cause behavioural changes and convulsions. It may affect the central nervous system. Contact with the skin may also cause irritations.	Commercial rubber production
25.	*Ichnocarpus frutescens* (L.) W.T. Aiton	Apocynaceae	Black Creeper	Climber	August-March	Leaves, Roots	Humans		
26.	*Ipomoea carnea* Jacq.	Convolvulaceae	Pink Morning Glory	Shrub	Throughout the year	Leaves, plant sap	Children, Human beings, Cattle	Abnormal endocrine and gastrointestinal functions, alteration of the immune system, and abnormal embryogenesis.	Fire wood
27.	*Jatropha curcas* L.	Euphorbiaceae	Purging nut	Shrub	May to August	Seeds, leaf , flower, roots, nuts	Humans, Goats, Guinea pigs, all animals	Nausea, vomiting, diarrhea, abdominal cramp, inflammation twitching of muscles	Used as biodiesel
28.	*Jatropha gossypiifolia* L.	Euphorbiaceae	Bellyache bush	Shrub	Throughout the year	Seeds	Humans	The consumption of the fruit causes burning to the mouth and stomach and it also causes vomiting, nausea, diarrhea, and abdominal pain	Biodiesel
29.	*Jatropha multifida* L.	Euphorbiaceae	French physic Nut, Badi Danti	Shrub	August-November	Seeds, Fruits	Humans	Nausea, vomiting, diarrhea, abdominal cramp, inflammation,	Ornamental flowers

								twitching of muscles, tachycardia.	
30.	*Lantana camara* L.	Verbenaceae	Lantana	Shrub	Throughout the year	(Fruit) berry Leaves	Humans, Sheep, Cattles, Horses, Children	Gastrointestinal, including nausea, vomiting, abdominal cramping, and diarrhea. Severe toxicity may cause weakness, lethargy, large pupils, and respiratory depression	Fire wood
31.	*Manihot esculenta* Crantz	Euphorbiaceae	Cassava, tapioca	Shrub	July-December & September-March	Leaves, Tubers	Humans	The tuber contains cyanogenic glucosides which produce hydrocyanic acid during hydrolysis. The higher concentration of this acid causes severe diarrhea and affects the liver.	Cosmetic industry.
32.	*Azadirachta indica* A.Juss.	Meliaceae	Neem	Tree	March - April	Fruits, Bark, flowers	Insects/ Lower Animals	Leaves and fruits are taken for skin infection and stomach worming	Cosmetic industry.
33.	*Myristica fragrans* Houtt.	Myristicaceae	Nutmeg	Tree	March-October & December-May	Seeds	Humans	Chest pain, Double vision, dry mouth, eye irritation, nausea, headache.	Used as traditional spice to enrich food with a specific aroma in the cuisines of every region.
34.	*Opuntia elatior* Mill.	Cactaceae	Cactus pear	Shrub	December - May	Thorns	Human		Hedges
35.	*Pandanus tectorius* Parkinson	Pandanaceae	Screw pine	Shrub	Through out the year	Spines	Humans		Hedges
36.	*Euphorbia tithymaloides* L.	Euphorbiaceae	Slipper plant	Shrub	August-March	Milkysap Roots, Stem, leaves	Humans, Snake	Intake of juice causes nausea, vomiting. Topical application causes skin irritation, inflammation, and even blisters.	Ornamental purposes
37.	*Rauvolfia serpentina* (L.) Benth. ex Kurz	Apocynaceae	Indian Snakeroot	Under shrub	May-November	Roots			Ornamental purposes
38.	*Ricinus communis* L.	Euphorbiaceae	Castor bean, Arandi	Shrub	Throughout the year	Entire plant especially seeds	Humans, Pigs, Rabbits, Dogs, Sheep etc.	Allergic dermatitis, rhinitis, and asthma, burning sensation, colicky abdominal pain, vomiting, diarrhea, haemorrhagic gastritis, dehydration, haematuria and acute renal and hepatic failure.	Oil
39.	*Semecarpus anacardium* L.f.	Anacardiaceae	Marking nut Andbhilawa (Hindi)	Tree	February - June	Juice, Nut and Bark	Humans	Allergic reactions like rash, itching and swelling. Renal failure due to hemodynamic effect.	Wood suitable for cheap and light furniture, packing boxes, and splints.
40.	*Strychnos*	Loganiaceae	Nux	Tree	March –	Stem bark,	Human	Spinal poison , can	Medicinal

	nux-vomica L.		Vomica		May; December	Dried ripe seeds	beings, Cats, Dogs, Horses	cause convulsion, and even death	
41.	*Cascabela thevetia* (L.) Lippold	Apocynaceae	Yellow oleander and pila kaner	Tree	July - October	All parts especially leaves and fruit Seeds Milk	Humans	Sinus bradycardia, premature ventricular contractions, Atrioventricular conduction defects.	Garden ornamental purposes.

Conclusion

From the study, in Acharya Jagadish Chandra Bose Indian Botanic Garden, Howrah, West Bengal, a total of 41 plant species have been identified as poisonous/ toxic to human beings and other animals. There is a need to keep such plants away from children, senior citizens and visitors of this Garden. Further poisonous plants should be kept away from indoor decorations. Besides toxicity, as certain poisonous plants have medicinal importance and other economic values, those need to be conserved and used sustainably. The proper identification of the poisonous plants which help to prevent the accidental poisoning and it improve the discovery of proper purification process from the texts to prepare the Medicines for different kinds of aliments.

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