



BioScientific Review (BSR)

Volume 2 Issue 4, 2020

ISSN_(P): 2663-4198 ISSN_(E): 2663-4201

Journal DOI: <https://doi.org/10.32350/BSR>

Issue DOI: <https://doi.org/10.32350/BSR.0204>

Homepage: <https://journals.umt.edu.pk/index.php/BSR>

Journal QR Code:



Article:

A Case Study of the Exotic Poisonous Plants found in Kottayam District, Kerala, India

Author(s):

Binu Thomas, Vrunda Vasudev

Article DOI:

<https://doi.org/10.32350/BSR.0204.01>

Article QR Code:



To cite this article:

Thomas B, Vasudev V. A case study of the exotic poisonous plants found in Kottayam district, Kerala, India. *BioSci Rev.* 2020;2(4):01–12.

[Crossref](#)



A publication of the
Department of Life Sciences, School of Science
University of Management and Technology, Lahore, Pakistan

A Case Study of the Exotic Poisonous Plants found in Kottayam District, Kerala, India

Binu Thomas^{1*}, Vrunda Vasudev²

¹Department of Botany, Centre for Post Graduate studies & Research, St. Joseph's College (Autonomous), Devagiri, Kerala, India

²PG Department of Botany, Deva Matha College, Kuravilangad, Kerala, India

*Corresponding author: binuthomasct@gmail.com

Abstract

Poisonous plants contain many harmful biological components which can be dangerous for living organisms upon contact or due to ingestion. The current study is based on extensive field observations aimed to find out the various exotic poisonous plants in the Meenachil Taluk of Kottayam District, Kerala. A total of 19 exotic plants belonging to 10 families and 18 genera were documented. Among these, Apocynaceae and Euphorbiaceae were dominant in terms of the number of species with 5 species each. Moreover, the authors also verified the nativity of these plants. The various plant part(s) such as bark, stem, leaves, fruits, latex, and tuber were found to have different types of poisonous compounds. The severity of the 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.

Keywords: exotic poisonous plants, natural poisons, plant poisoning, poisonous compounds, toxicity

1. Introduction

Plants have developed several means of protection from herbivory. Some have toxins while others have developed physical defences such as thorns. The physiologically active toxins of the plants have the ability to damage livestock and humans, equally [1]. Alkaloids, terpenes, tannins, phenolics and essential oils are examples of the chemical toxins produced by plants [2]. Toxicity is mainly based on the dosage of the poisonous components ingested or the degree of external contact of the plant with the skin. Since the number of toxicity studies is quite small, scientists are always searching for toxic plants in order to kill malignant cells or to defeat diseases. A great number of drugs are

based on natural compounds obtained from the poisonous plants. However, the problems experienced in controlling the adverse effects of plant poisoning have not been fully explored yet and need further investigation [3, 4].

Toxicological studies of medicinal herbs on animal models have shown that some of these plants, such as daouri and juniper tar that are typically used to treat chronic eczema and other skin diseases, may have nephrotoxicity or hepatotoxicity. It shows that the use of these plants, particularly in children, should be reevaluated [5,6].

The effect of these toxins can be mild, although in severe cases they may cause death. A poisonous plant can be defined as the one producing chemical

substances which, when taken in a small or moderate amount, can cause a harmful reaction in the bodies of the animals and human beings [7].

Natural poisons are toxic chemical substances produced by various species of fungi, bacteria, protists, plants, and animals. Many of these species produce chemicals which are harmful for the human body. 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 [8]. The current study is mainly intended to document exotic poisonous plants found in the Meenachil Taluk of Kottayam District, Kerala.

2. Methodology

An extensive survey supported by field observations during 2014-2015 was carried out in an attempt to find and collect various poisonous plants from the area under study.

The documentation of samples was mainly based on field observations, discussions with the local people and the literature review. The taxonomical identification of the collected samples was carried out with the help of the available floras and literature [9, 10]. The nomenclature of each specie was authenticated as per the rules specified in the International Code of Nomenclature (ICN).

Herbarium specimens were produced during the field visits by collecting the plants at different reproductive stages and processing them according to the standard protocol [11]. The voucher specimens were deposited in the Herbaria of the PG Department of Botany, Deva Matha

College Kuravilangad, Kottayam for future reference.

2.1. Study Area

The area selected for the survey lies in the Meenachil Taluk which is situated in the north-eastern region of the district Kottayam (9.36° N and 76.17° E), Kerala. This is an area of diverse habitats ranging from hills and hillocks to lush paddy fields. It is home to the plantations of multiple crops. Due to its tropical climate, humidity rises upto 90% in the rainy season. Besides, it also receives heavy rainfall, upto 3600 mm/year, during the two monsoon seasons. These include the south-west monsoon season (June-September) and the north-east monsoon season (October-November). From March to May, the area receives rainfall with thunder and lightning from pre-monsoon rains. The highest rainfall other than the monsoon is in December. March, April and May are warmer months, while January and February are comparatively cooler. The average temperature ranges between 38.5°C and 15°C. The mainstream population depends on cash crops such as rubber and black pepper to generate an income. Besides these crops, food crops including paddy and tapioca are also cultivated [12].

3. Results

The current study documented 19 exotic plants belonging to 10 families and 18 genera. Among the 10 families represented, Apocynaceae and Euphorbiaceae were the dominant ones in terms of the number of species with 5 species each. The other dominant family included Verbenaceae with 2 species, while the rest were represented by a single species only. The nativity of the documented plants revealed that they were introduced from the various parts

of the world including Tropical America (7 species), South America (3 Species), Central America (3 species), Madagascar (2 species), Malaysia (2 species), Brazil (1 species) and the Mediterranean region (1 species). The various plant part(s) such as bark, stem, leaves, fruits, latex, and tuber contain different types of poisonous compounds (Tables 1-3).

4. Discussion

Toxic plants are the plants when touched or ingested in a sufficient quantity, can be harmful or fatal to human beings and other animals. When used in small amounts and in correct proportions, products from these plants can be utilized as drugs and toxins. The beauty of these plants hides the toxicity within

them. The toxicity may differ from plant to plant and it depends on several factors, especially on the different chemicals that characterize it. Moreover, it depends on the part of the plant ingested with respect to its concentration and stage of growth.

Mwine and Damme [13] reviewed the Euphorbiaceae family and its medicinal features. According to them, Euphorbiaceae is among the large flowering plant families consisting of a wide variety of vegetative forms, some of which are plants of great importance. Its classification and chemistry have of late been the subject of interest possibly because of the wide variety of the chemical composition of its members, many of which are poisonous and at the same time useful.

Table 1. List of Exotic Poisonous Plants with Respect to Nativity

Sl.	Name	Family	Nativity
1.	<i>Allamanda cathartica</i> L.	Apocyanaceae	Tropical America
2.	<i>Anacardium occidentale</i> L.	Anacardiaceae	South America
3.	<i>Annona squamosa</i> L.	Annonaceae	Central America
4.	<i>Brugmansia suaveolens</i> Bercht. & Presl	Solanaceae	Tropical America
5.	<i>Caladium bicolor</i> Vent.,	Araceae	South America
6.	<i>Catharanthus roseus</i> (L.) G. Don.	Apocyanaceae	Madagascar
7.	<i>Cryptostegia grandiflora</i> R. Br.	Periplocaceae	Madagascar
8.	<i>Duranta erecta</i> L.	Verbenaceae	Central America
9.	<i>Ficus elastica</i> Roxb. ex Hornem	Moraceae	Malaysia
10.	<i>Hevea braziliensis</i> (Willd. ex A. Juss.) Muell.-Arg,	Euphorbiaceae	Brazil
11.	<i>Jatropha curcas</i> L.	Euphorbiaceae	Tropical America
12.	<i>Jatropha gossypifolia</i> L.	Euphorbiaceae	South America
13.	<i>Lantana camera</i> L.	Verbenaceae	Tropical America
14.	<i>Manihot esculenta</i> Crantz.	Euphorbiaceae	Brazil
15.	<i>Mimosa diplotricha</i> C. Wight ex Sanvalle	Mimosaceae	Tropical America
16.	<i>Nerium oleander</i> L.	Apocyanaceae	Medeterranean through Persia
17.	<i>Parthenium hysterophorus</i> L.	Asteraceae	Central America
18.	<i>Ricinus communis</i> L.	Euphorbiaceae	Tropical America
19.	<i>Thevetia nerifolia</i> L.	Apocyanaceae	Tropical America

Sanjoy [14] revealed that *Parthenium hysterophorus* is one of the world's seven most devastating and hazardous weeds. *Parthenium* population is rapidly increasing in the agricultural fields. The people working in those fields suffer from several diseases including asthma, fever, skin rashes, and eczema. The current research is an attempt to protect the people and the environment from these toxic weeds. It also attempts to use this weed for the alternative purpose of human benefit.

A review of some poisonous plants and their medicinal values was performed by Narayanswamy et al. [15]. It provided a report on the poisonous medicinal plants currently used in various treatments. Such plants are used for treating various ailments because of their antidiabetic, anticancer, antibacterial, antifungal, and

cytogenetic effects, respectively. The nativity of these poisonous plants revealed that they were introduced from Tropical America, South America, Central America, Malaysia, Brazil, and Madagascar. With the passage of time, they naturalized and became well established in India.

The best way to minimize accidental intoxication with toxic plants is to create awareness about them. In the case of accidental ingestion, the remaining plant should be removed immediately from the mouth, which should be rinsed with water. The plant must be stored for identification, so that the most appropriate treatment can be administered. It is important to avoid inducing vomiting, as it may cause the blockage of the glottis and lead to suffocation.

Table 2. List of Exotic Plants and their Poisonous Plant Part(s)

SI.	Name	Family	Plant part(s)
1.	<i>Allamanda cathartica</i> L.	Apocyanaceae	Latex from bark, seeds
2.	<i>Anacardium occidentale</i> L.	Anacardiaceae	Bark, latex from the pod
3.	<i>Annona squamosa</i> L.	Annonaceae	Seed, leaf, root bark, immature fruit
4.	<i>Brugmansia suaveolens</i> Bercht. & Presl	Solanaceae	All parts in the younger stage
5.	<i>Caladium bicolor</i> Vent.,	Araceae	Sap from the plant parts
6.	<i>Catharanthus roseus</i> (L.) G. Don.	Apocyanaceae	Leaves
7.	<i>Cryptostegia grandiflora</i> R. Br.	Periplocaceae	Latex
8.	<i>Duranta erecta</i> L.	Verbenaceae	Stem, Fruit
9.	<i>Ficus elastica</i> Roxb. ex Hornem	Moraceae	Sap (leaves, fruit, other parts)
10.	<i>Hevea brasiliensis</i> (Willd. ex A. Juss.) Muell.-Arg,	Euphorbiaceae	Seed oil, latex
11.	<i>Jatropha curcas</i> L.	Euphorbiaceae	Latex, seed
12.	<i>Jatropha gossypifolia</i> L.	Euphorbiaceae	Latex, seed

SI.	Name	Family	Plant part(s)
13.	<i>Lantana camera</i> L.	Verbenaceae	Leaves, immature fruit
14.	<i>Manihot esculenta</i> Crantz.	Euphorbiaceae	Leaf, tuber, seed
15.	<i>Mimosa diplotricha</i> C. Wight <i>ex</i> Sanvalle	Mimosaceae	Stem, leaves
16.	<i>Nerium oleander</i> L.	Apocyanaceae	Latex from the stem, leaves
17.	<i>Parthenium hysterophorus</i> L.	Asteraceae	Leaves, flower, seed, rhizome, bark
18.	<i>Ricinus communis</i> L.	Euphorbiaceae	Stem, leaves, seed oil
19.	<i>Thevetia nerifolia</i> L.	Apocyanaceae	Fruit, latex, bark, leaf, root

Table 3. Poisonous Plants with Respect to The Principle of Poisonous Properties

SI.	Name	Family	Poisonous properties
1.	<i>Allamanda cathartica</i> L.	Apocyanaceae	The plant contains toxic glycosides such as apocyanamarin, cymarin, and apocynein as well as toxic alkaloids such as conessidine, lettocine, and echitamine. It causes gastrointestinal irritations including diarrhoea and vomiting if ingested [16].
2.	<i>Anacardium occidentale</i> L.	Anacardiaceae	The latex produced from the bark of cashew nuts causes burns and inflammations in the mouth and intestines. Its increased concentration reduces blood pressure. The bark of the nut contains a blakish oil which contains phenolic compounds such as cardol and glucosides such as anacardic acid, cagine, galic acid and cagidine [17].
3.	<i>Annona squamosa</i> L.	Annonaceae	The seeds and bark of the fruit contain the compound annonin. Similarly, the leaves and roots contain aporphine and coryeline [18].
4.	<i>Brugmansia suaveolens</i> Bercht. & Presl	Solanaceae	Terpinene, theaspiranes, and megastigmatrienones are the alkaloids present in the flower. Apotropine and 3 α -tigloil-oxitropane are present in the leaves. The consumption of this plant's parts causes blurred vision, salivation suppression, vasodilation, increased cardiac rate, mouth dryness, thirst,

Sl.	Name	Family	Poisonous properties
			diarrhea, confusion, hallucinations, ataxia, and convulsions [19].
5.	<i>Caladium bicolor</i> Vent.	Araceae	It mainly causes intense burning to the mouth, vomiting and other gastrointestinal irritations through ingestion. The contact of its sap with the eyes causes temporary blindness. The substance that causes irritation is calcium oxalate crystal [20].
6.	<i>Catharanthus roseus</i> (L.) G. Don.	Apocyanaceae	Diarrhoea is its most adverse effect due to the imbalance in the secretory mechanism in the gastrointestinal system. The main alkaloids present in the leaves are leurocitrine (vincristine) and vincalucoblastine [21].
7.	<i>Cryptostegia grandiflora</i> R. Br.	Periplocaceae	Cardiac glycosides such as oleandrigenin and cryptostigminl-IV along with two cardenolides are the main components of this plant. Its effect is characterized by gastrointestinal and neurological disorders in the later stage. In the early stages, however, it causes nausea, vomiting, and anorexia. [22].
8.	<i>Duranta erecta</i> L.	Verbenaceae	Durantosides I, II, III, duranterectoside A and lamiidoside are the isolated constituents of the stem. 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 irritations. [23].
9.	<i>Ficus elastica</i> Roxb. ex Hornem	Moraceae	Ingestion of latex may cause various stomach problems and high doses may cause the death of an organism [24].
10.	<i>Hevea braziliensis</i> (Willd. ex A. Juss.) Muell.-Arg,	Euphorbiaceae	The main constituent of latex is resins and the seed oil contains linamarin. 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 [25]
11.	<i>Jatropha curcas</i> L.	Euphorbiaceae	The seed contains 30% - 40% oil (curcus oil). It is composed of the glycerides of stearic, palmitic, miristic, oleic and linolic acids and also contains a toxic albumin

Sl.	Name	Family	Poisonous properties
			called curcin which is a ribosome inactivating protein. Curcin damages the blood vessels. The consumption of the fruit causes burning to the mouth and stomach and it also causes vomiting, nausea, diarrhea, and abdominal pain [26].
12.	<i>Jatropha gossypifolia</i> L.	Euphorbiaceae	The seed contains 30% - 40% oil (curcus oil). It is composed of the glycerides of stearic, palmitic, miristic, oleic, and linolic acids and also contains a toxic albumin called curcin which is a ribosome inactivating protein. Curcin damages the blood vessels. The consumption of the fruit causes burning to the mouth and stomach and it also causes vomiting, nausea, diarrhea, and abdominal pain [27].
13.	<i>Lantana camera</i> L.	Verbenaceae	The plant produces toxic pentacyclic triterpenes—lantadene A, B, & C, that primarily produces a syndrome of chronic cholestasis in grazing animals [28].
14.	<i>Manihot esculenta</i> Crantz.	Euphorbiaceae	The tuber contains cyanogenic glucosides which produce hydrocyanic acid during hydrolysis. The higher concentration of this acid causes severe diarrhea and affects the liver. The leaves contain a compound called linamarin [29].
15.	<i>Mimosa diplotricha</i> C. Wight ex Sanvalle	Mimosaceae	The plant contains the toxic alkaloid mimosine which was found to have antiproliferative and apoptotic effects [30].
16.	<i>Nerium oleander</i> L.	Apocyanaceae	The latex contains the compound oleandrin which has deadly effects on the heart and the nervous system [31].
17.	<i>Parthenium hysterophorus</i> L.	Asteraceae	Contact with the plant causes dermatitis and respiratory malfunction in human beings and dermatitis in cattle and domestic animals. The main substance responsible is parthenin, which is dangerously toxic. It is also responsible for the bitter milk disease in livestock when their fodder is polluted with <i>Parthenium</i> leaves [32].

Sl.	Name	Family	Poisonous properties
18.	<i>Ricinus communis</i> L.	Euphorbiaceae	The seed contains the glycoproteins known as ricin and ricinin (more poisonous) which are soluble in water. Ricinin is present in seedcoat, leaf, and stem. The oil extracted from the seed is less poisonous. The seed contains glycerides and ricinolic acid. The consumption of seed causes a burning sensation in the throat and the mouth at first and later on the person experiences fatigue, thirst, dizziness, and an increasing heartbeat. It eventually leads to unconsciousness. The oil cake contains more ricin and cannot be used for animal feed. Death occurs suddenly if the oil is injected directly into the blood. The powder of the seeds also causes allergic reactions [33].
19.	<i>Thevetia nerifolia</i> L.	Apocyanaceae	The main poisonous part is the fruit. Its chewing causes the drying of the tongue and throat and leads to muscle fatigue as well as the dialation of the iris. The heart beat varies and death occurs due to reduction in the blood flow. The poisonous substances (glucosides) present in the seeds are thevetin and theveresin (which is similar to digitalin) and some crystal particles such as phytosterolin, ahoenin, and cocilphin which are cardiotoxic [34].

4.1. Selected Plant Images



Figure 1. *Caladium bicolor* Vent.



Figure 2. *Cryptostegia grandiflora* R. Br.



Figure 3. *Brugmansia suaveolens* Bercht. & Presl



Figure 4. *Ficus elastica* Roxb. ex Hornem



Figure 5. *Mimosa diplotricha* C. Wight ex Sanvalle



Figure 6. *Thevetia nerifolia* L.

5. Conclusion

The current study on exotic poisonous plants distributed in the Meenachil Taluk of Kottayam District, Kerala revealed that there are about 19 exotic plants that were introduced from Tropical America, South America, Central America, Malaysia, Brazil, and Madagascar into India. However, with the passage of time they were naturalized and became well established. The various plant part(s) such as the bark, stem, leaves, fruits, latex, and tuber have different types of poisonous compounds. The severity of the illness caused due to these plants mainly depends on the dose which the affected organisms have ingested or on the intensity of the external contact via skin. Plant poisoning is considered as a public health problem. A considerable challenge for the future is to educate and

raise awareness among the general population about these poisonous plants and their respective parts.

References

- [1] White RH. Occurrence of S-methyl thioesters in urines of humans after they have eaten asparagus. *Sci.* 1975;18(5):810–811.
- [2] Kellerman TS. Poisonous plants. *Onderstepoort J Veter Res.* 2009;76:19–23.
- [3] Shashikala AS, Sonali I, Vikrant D. *Cryptostegia grandiflora* toxicity manifesting as hyperkalemia, complete heart block and thrombocytopenia. *J Asso Physicians Ind.* 2015;63:79–81.
- [4] Gonzalo JD. Toxicosis by plant alkaloids in humans and animals in

- Colombia. *Toxins*. 2015;7(12): 5408–5416.
- [5] Etorh MS, Agbere S, Osei-Safo D, et al. Toxicological screening of daouri, a polyherbal formulation used in children in the central region of Togo. *J Ethnopharmacol*. 2015;164: 30–4. <https://doi.org/10.1016/j.jep.2015.01.045>
- [6] Achour S, Abourazzak S, Mokhtari A, et al. Juniper tar (Cade oil) poisoning in new born after a cutaneous application. *BMJ Case Rep*. 2011;20:14-27.
- [7] Anju A, Mary J. A survey on Poisonous plants in Nilambur, Kerala, India. *Int J Curr Microbiol App Sci*. 2014;3(11):957–963.
- [8] Narayanaswamy T, Thirunavukkarasu T, Prabakar S, et al. A review on some poisonous plants and their medicinal values. *J Acute Disease*. 2014;3(2):85–89. [https://doi.org/10.1016/S2221-6189\(14\)60022-6](https://doi.org/10.1016/S2221-6189(14)60022-6)
- [9] Gamble JS, Fischer CEC. *The Flora of the Presidency of Madras*. Adlard & Son Ltd., London. 1915-1936.
- [10] Sasidharan N. *Biodiversity documentation for Kerala. Part-6: Flowering Plants*. Kerala Forest Research Institute, Peechi, Thrissur. 2004.
- [11] Santapau H, Henry A. *A dictionary of flowering plants in India*. CSIR Publications & Information Directorate. New Delhi. 1973.
- [12] Scaria R, Thomas B. Potential medicinal plants utilized by local inhabitants of meenachil taluk of Kottayam District, Kerala. *St Stephen's J Multidiscip Studies Res*. 2014:1-15.
- [13] Mwine J, Van Damme P. *Euphorbia tirucalli* L. (Euphorbiaceae) The miracle tree: Current status of available knowledge. *Sci Res Essays*. 2011 Oct 31;6(23):4905-14. <https://doi.org/10.5897/SRE10.1143>
- [14] Sanjoy D. Parthenium hysterophorus: a cursed weed for society- a case study English bazar block, Malda, West Bengal, India. *Int J App Res*. 2015;1(8):63–66.
- [15] Tamilselvan N, Thirumalai T, Shyamala P, et al. A review on some poisonous plants and their medicinal values. *Journal of Acute Disease*. 2014 Jan 1;3(2):85-9. [https://doi.org/10.1016/S22216189\(14\)60022-6](https://doi.org/10.1016/S22216189(14)60022-6)
- [16] Prabhadevi V, Sahaya SS, Johnson M, Venkatramani B, Janakiraman N. Phytochemical studies on *Allamanda cathartica* L. using GC–MS. *Asian Pacific J Tropic Biomed*. 2012 Feb 1;2(2):S550-S554. [https://doi.org/10.1016/S22-211691\(12\)60272-X](https://doi.org/10.1016/S22-211691(12)60272-X)
- [17] Akinhanmi TF, Atasié VN, Akintokun PO. Chemical composition and physicochemical properties of cashew nut (*Anacardium occidentale*) oil and cashew nut shell liquid. *J Agri Food Environ Sci*. 2008; 2(1):1-10.
- [18] Neha P. Dushyant B. Phytochemical and pharmacological review on *Annona squamosa* Linn. *Int J Res Pharm Biomed Sci*. 2011;2(4):1404–1412.
- [19] Diaz GJ. Toxicosis by plant alkaloids in humans and animals in Colombia. *Toxins*. 2015 Dec;7(12):5408-16. <https://doi.org/10.3390/toxins7124892>

- [20] Maria FA, Patrícia FF, Jose MB. Synopsis of the plants known as medicinal and poisonous in Northeast of Brazil. *Braz J Pharma*. 2007;17(1):114–140. <https://doi.org/10.1590/S0102695X2007000100021>
- [21] Kevin LY, Hussin AH, Zhari I, et al. Sub-acute oral toxicity study of methanol leaf extract of *Catharanthus roseus* in rats. *J Acute Disease*, 2012;12:38-48.
- [22] Jenny PC, Yanet CO, Luis AF, In vivo and in vitro anti inflammatory activity of *Cryptostegia grandiflora* Roxb. ex R.Br. Leaves. *Biol Res*. 2014;47(32):1–8. <http://dx.doi.org/10.1186/0717-6287-47-32>
- [23] Nikkon F, Habib RM, Karim MR, et al. Antishigellosis and Cytotoxic Potency of Crude Extracts and Isolated Constituents from *Duranta Repens* *J Mycobiol*. 2008;36(3):17–177.
- [24] Leonard T, Paul DD, Theophile D, et al. Acute and sub chronic toxicity of *Anacardium occidentale* Linn. (Anacardiaceae) leaves hexane extract in Mice. *Afr J Complement Trad Altern Med*. 2007;4(2):140-147.
- [25] George UU, Andy JA, Joseph A. Biochemical and phyto-chemical characteristics of rubber latex (*Hevea Brasiliensis*) obtained from a tropical environment in Nigeria. *Int J Sci Tech Res*. 2014;3(8):377–380.
- [26] Adolf W, Opferkuch HJ, Hecker E. Irritant phobol derivatives from four *Jatropha* species. *Phytochem*. 1984;23:129-132. [https://doi.org/10.1016/00319422\(84\)83091-5](https://doi.org/10.1016/00319422(84)83091-5)
- [27] Ahmed F, Amin RS, Shahid IZ, et al. Antibacterial, cytotoxic and neuropharmacological activities of *Cerbera odollam* seeds. *J Oriental Pharm Expt Med*. 2008;8(4):323-328. <https://doi.org/10.3742/OPEM.2008.8.4.323>
- [28] Sharma S, Dhamija KH, Parashar B. *Jatropha curcus*: Areview. *Asian J Res Pharm Sci*. 2012;2(3):107–111.
- [29] Cereda MP, Mattos MC. Linamarin-the toxic compound of Cassava. *J Venom Anim Toxins*. 1996;2(1):501-505. <https://doi.org/10.1590/S010-479301996000100002>
- [30] Bashar MA, Jumat S. Toxicity study of Malaysian rubber (*Hevea brasiliensis*) seed oil as rats and shrimps tests. *Asian J Biochem*. 2010;5(1):33-39.
- [31] Praveen US, Gowtham MD, Yogaraje-Gowda CV, et al. Detection of residues of cardenolides of *Nerium oleander* by high-performance thin-layer chromatography in autopsy samples. *Int J Med Toxicol Forensic Med*. 2012;2:135-142.
- [32] Alexander J, Auðunsson GA, Benford D, et al. Glucosinolates as undesirable substances in animal feed Scientific Panel on Contaminants in the Food Chain. *EFSA J*. 2008 Nov;6(1):2-76.
- [33] Pingale SS. Toxicity Study of *Ricinus communis*. *J Current Pharma Res*. 2019;9(2):2734-42.
- [34] Nussy EA, Lizzy TM. Detection and Quantification of cardiotoxic drug peravaside using HPTLC from *Thevetia neriifolia*, Juss seed extract. *Int J Pharm Sci Invent*. 2014;3(4):11-16.