

Plant Poisoning: An Increasing relevance, problem of public and Livestock Health

¹Vrunda Vasudev and ²Binu Thomas*

¹PG Department of Botany, Deva Matha College, Kuravilangad, Kottayam - 686633, Kerala, India.

²Department of Botany, Centre for Post Graduate studies & Research, St. Joseph's College (Autonomous), Devagiri, Kozhikode - 673008, Kerala, India.

Received: 21.09.2017

Abstract

Revised and Accepted: 22.10.2017

The present study on poisonous plant parts and their effects on human as well as live stock reveals that, there are about 36 plants were identified as poisonous, in which latex (sap) from the different plant parts like fruits, leaves, bark and seeds are adversely affects the animal and human lives.

Key Words: *Plant poisoning, Latex, Sap, Humans, Live stock*

Introduction

Since ancient times humanity has depended on the diversity of plant resources for food, shelter, clothing and traditional medicines. Plant cannot be move to escape their predators, they may produce toxins as a part of their self defence mechanism. Such poisonous substances harmfully affect on both humans and other organisms (Kumar *et al.*, 2007). Natural poisons are produced by species of bacteria, fungi, protists, plants as well as animals. There are several species which are poisonous or injurious to human body and can be found in the gardens and other places. Poisoning can be by contact to cause irritation, ingestion to cause internal poisoning, absorption (skin) and inhalation (in the respiratory systems) (Anju and Mary, 2014).

In many cases, we identify that the plant is poisonous only after infection. Commonly children are affected by plant poisoning while playing in garden because they are very curious about nature and

they have the tendency to taste or eat it and they get poisoned. Animals are very selective in their feed. Some animals do not eat certain plants or even touch them (Ahmed and Adam, 1979). Toxicology is the fundamental science of poisons. A poison is generally considered to be any substance that can cause severe injury or death as a result of a physicochemical interaction with living tissue. Based on the duration of exposure, toxicity can be acute, sub-acute and chronic (Chanda *et al.*, 2015).

Toxicological studies help to decide whether a new drug should be adopted for clinical use or not. Acute toxicity studies are to identify a single dose causing major adverse effects, which often involves an estimation of the minimum dose causing lethality (Narayanaswamy *et al.*, 2014). Sub-acute toxicity studies are used to determine effect of drug on biochemical and hematological parameters of blood as well as to determine histopathological changes. Chronic toxicity studies are also helps to determine carcinogenic and

*Corresponding author

E-mail: binuthomasct@gmail.com

mutagenic potential of drug produced by the plant (Kellerman, 2009).

The commonest and adverse toxins are cardiac glycosides, alkaloids, terpenes (diterpenes and triterpenes), cyanogenic glycosides, glucosinolates, oxalates, nitrates, resins, some proteins, amino acids etc. And they can cause harmful effects. Even though they cause harm, the significance of wild poisonous plants for economical, toxicological and therapeutically value cannot be overrated (Choudhury *et al.*, 2011).

Materials and Methods

Study area: Meenachil Taluk of Kottayam District, Kerala (Figs. 1, 2 & 3)

Meenachil Taluk of Kottayam district, Kerala, lies in the North-Eastern region of Kottayam district, which is located at 9.36° N latitude and 76.32° E longitude and situated in South - Central Kerala. Kottayam district is in near Meenachil River and Vembanad Back waters, which offers amazing opportunities to enjoy nature at its best.

The area is blessed with diversified habitats such as lush paddy fields, hills and hillocks, highlands and different crop plantations.

It has a tropical climate. The humidity is high and rises to about 90% during the rainy season. This area gets rain from two monsoon seasons, the south-west monsoon and the north-east monsoon. The average rainfall is around 3600 mm per year. The South-West monsoon starts in June and ends in September. The North-East monsoon season is from October to November. Pre-monsoon rains during March to May are accompanied by thunder and lightning; the highest rainfall during this period in December. January and February are cooler, while March, April and May are warmer. The temperature ranges between 38.5 °C and 15 °C. Though food crops like paddy and tapioca are cultivated, majority of the population depends on cash crops like rubber and black pepper for income (Aparna Prasad and Binu Thomas, 2015).



Fig. 1: Map of India showing Kerala State

Kottayam District

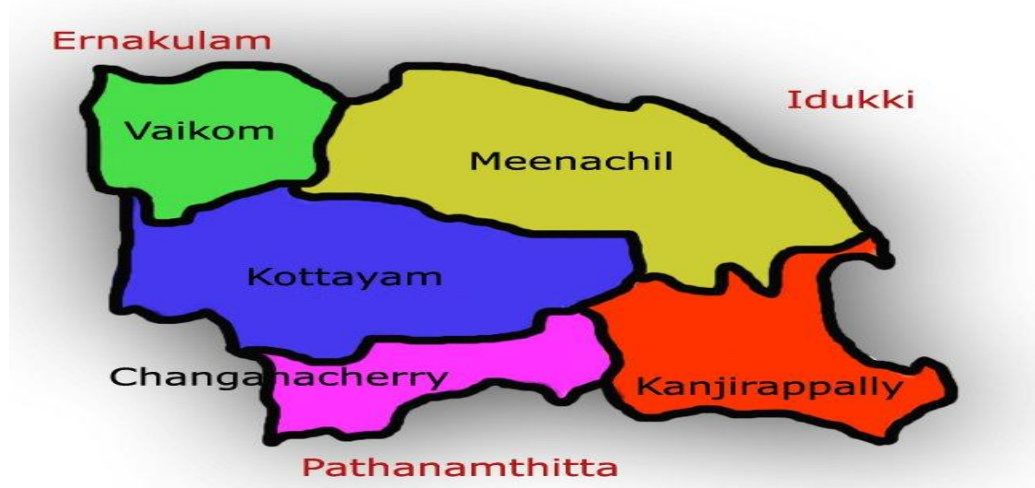


Fig. 2: Map of Kottayam District showing Meenachil Taluk



Fig.3: View of Study area showing Meenachil River

Documentation of Poisonous Plant parts

The present study was based on an extensive survey and field observations during the year 2015 – 2016. In this study an attempts were made to find out different poisonous plants and their poisonous parts as latex (sap) from fruits, leaves, seeds and bark. The obtained informations were gathered by discussions with elder and local people as well as from the literature reviews. During field visit,

the plant specimens were collected at vegetative or different reproductive stages to prepare Herbarium. The authentication of their identity was done with the help of available Floras and literatures (Gamble and Fischer, 1915-1936; Sasidharan, 2004). The voucher specimens were deposited in the Herbaria of Department of Botany, Deva Matha College, Kuravilangadu, Kottayam, Kerala India for future references.

Result and Discussion

In the present study, 36 poisonous plants were identified in which latex from the different plant parts like fruits, leaves, bark and seeds are mainly affects the animal and human lives (Table-1). They belongs to 19 families and 33 genera and were collected from Meenachil Thaluk, Kottayam district, Kerala. The

latex (sap) from different poisonous plant parts will adversely affects the livestock as well as humans. It also reveals that, out of 20 families represented, Euphorbiaceae is the first dominant family with 8 species. Apocyanaceae is the second dominant family with 7 species. All other families are with 2 and 1 species respectively (Figs.4&5)

Table – 1: List Poisonous Plant parts and their Effects.

Sl. No	Botanical Name	Family	Poisonous Plant part(s)	Poisonous Effects
1.	<i>Abrus precatorius</i> L. Vernacular Name: "Kunni"	Fabaceae	Latex from seeds	The toxin is not released unless the seed is chewed and digested or the seed coat is otherwise broken. The toxin is mixes with blood and its components are directly affected when it enter through a wound. It leads colour change in skin and cause anaemia. The toxin causes primary damage to the gastrointestinal tract and includes violent gastroenteritis followed by weakness and death.
2.	<i>Allamanda cathartica</i> L. Vernacular Name: "Manja kolambi, Golden trumpet"	Apocyanaceae	Latex from bark, seeds	It will cause gastrointestinal irritations including diarrhoea, vomiting etc. by their ingestion.
3.	<i>Anacardium occidentale</i> L. Vernacular Name: "Kasumavu, Cashew Apple"	Anacardiaceae	Bark, latex from the pod	The latex produced from the bark of cashew nut causes burns and inflammations in mouth, and intestines. Its more concentrations reduce the blood pressure.



4.	<i>Annona squamosa</i> L. Vernacular Name: "Seethapazham, Custard apple"	Annonaceae	Seed, leaf, root bark, immature fruit	The ingestion of seeds causes inflammation in cells lined in intestinal tract.
5.	<i>Areca catechu</i> L. Vernacular Name: "Adakka Pakku, Areca palm"	Arecaceae	Fruit	It mainly causes acute oral toxicity. It causes burns in the mouth. Over dose of toxin leads to diarrhoea, vomiting and faint, degradation of enamel and it may leads to oral cancer. Internal organs were damaged due to acute toxicity.
6.	<i>Asparagus racemosus</i> Willd. Vernacular Name: "Sathavari"	Liliaceae	Berry (fruit)	The intake of larger amount of the ripe berries may cause vomiting and abdominal pain. It also causes allergic reaction and inflammation of skin, eyes etc.
7.	<i>Baliospermum montanum</i> (Willd) Muell. Vernacular Name: "Nagadanthi"	Euphorbiaceae	Seed, root, stem, leaf	Ingestion of more amount of poison causes severe diarrhoea burning sensation to the skin and sometimes gets fainted.
8.	<i>Brugmansia suaveolans</i> (Humb) Willd. Vernacular Name: "Angle's Trumpet"	Solanaceae	All parts in young stage	The consumption of this plant parts causes blurred vision, salivation suppression, vasodilation, increased cardiac rate, mouth dryness, thirst, diarrhoea, confusion, hallucinations, ataxia, convulsions etc.
9.	<i>Caladium bicolor</i> (Ait) Vent. Vernacular Name: "Varnachembu"	Araceae	Sap from the plant parts	It mainly causes intense burning to mouth, vomiting and other gastrointestinal irritations by their ingestion. The contact of sap with eyes causes temporary blindness.

10.	<i>Calotropis gigantea</i> L. Vernacular Name: "Yerikku"	Asclepiadaceae	Latex from the plant parts	The latex on skin causes redness, inflammation and burning. Poisonous effect is in slow process. Consumption of latex, leaf or root causes itching of mouth, vomiting, head ache etc. Absorption of poison by blood will affect the brain and spinal cord. Latex also has the capacity to abort foetus.
11.	<i>Catharanthus roseus</i> (L.) R. Br. Vernacular Name: "Nithyakalyani, Savamnaripoovu"	Apocyanaceae	Leaves	Diarrhoea is the most adverse effect due to the imbalance in the secretor mechanism in gastrointestinal system.
12.	<i>Cerbera odollum</i> , Gaertn. Vernacular Name: "Othalam"	Apocyanaceae	Fruit, latex, leaf, bark	Consumption of any plant parts like leaf, bark and latex are capable of producing vomiting. The main symptoms produced by the ingestion of fruit are fatigue, reduced vision difficulty in breathing and leads to death by heart attack.
13.	<i>Cryptostegia grandiflora</i> R. Br. Vernacular Name: "Purple allamanda"	Apocyanaceae	Latex	Its effect is characterized by gastrointestinal, neurological disorders in the later stage. In the early stages after the consumption of any part of the plant, causes nausea, vomiting, anorexia etc.
14.	<i>Cycas circinalis</i> L. Vernacular Name: "Eenth"	Cycadaceae	Seed, leaves, unprocessed seed flour	Ingestion of large amounts produces nausea, vomiting, diarrhoea and abdominal cramping.
15.	<i>Datura stramonium</i> L. Vernacular Name: "Ummam"	Solanaceae	Whole plant including roots	The consumption of the seeds causes burning sensation to the mouth



				along with severe head ache and fever, vomiting, increase in blood pressure, it may affects the central nervous system, ultimately it may causes the death.
16.	<i>Duranta erecta</i> L. Vernacular Name: "Golden dew drop"	Verbenaceae	Stem, Fruit	The consumption of the fruit causes irritations in mouth and stomach. Poisoning also increases body temperature, mydriasis, and tachycardia, edema of lips and eyelids, convulsions, gastrointestinal irritations etc.
17.	<i>Euphorbia nivulia</i> Buch. Vernacular Name: "Kallipala, Elakkalli"	Euphorbiaceae	Latex	Intake of more amount of latex from leaf and stem causes inflammation in tissues, shivering, diarrhoea and vomiting, it also causes inflammation of eyes and it leads to the loss of vision. The consumption of 15 ml of milky latex leads to death within 3 days.
18.	<i>E. thirucalli</i> L. Vernacular Name: "Thirukkalli"	Euphorbiaceae	Latex	The consumption of latex causes inflammation to the throat and stomach and it leads to vomiting. When it comes to contact with eyes, the ability of vision may be lost.
19.	<i>Ficus benjamina</i> L. Vernacular Name: "Vellal, Golden fig"	Moraceae	Fruit	The ingestion of leaves can damage liver. The toxicant enters the body through gastrointestinal system, and after toxicant absorbed is carried by the portal vein to the liver.
20.	<i>F. elastica</i> Roxb. Vernacular Name: "Indian rubber tree"	Moraceae	Sap(leaves, fruit, other parts)	Exposure to the sap from the plant or leaves may produce contact dermatitis.

21.	<i>Hevea brasiliensis</i> (Willd.) Muell. Vernacular Name: "Rubber"	Euphorbiaceae	Seed oil, latex	The intake of high concentration of latex may causes behavioral changes, convulsions etc. It may affects central nervous system. Contact with skin may also cause irritations.
22.	<i>Jatropha curcas</i> L. Vernacular Name: "Kadalavanaku, Physic nut"	Euphorbiaceae	Latex, seed	The consumption of the fruit causes burning to the mouth and stomach and it also causes vomiting, nausea, diarrhea and abdominal pain. It also affects on ribosome functioning and damages blood vessels.
23.	<i>J. gossipyfolia</i> L. Vernacular Name: "Chuvanna kadalavanakku, Puppet seed plant"	Euphorbiaceae	Latex, seed	The consumption of the fruit causes burning to the mouth and stomach and it also causes vomiting, nausea, diarrhea and abdominal pain.
24.	<i>Lantana camera</i> L. Vernacular Name: "Kongini, Wild sage"	Verbenaceae	Leaves, immature fruit	Effects are most commonly gastrointestinal, including nausea, vomiting, abdominal cramping, and diarrhoea. Severe toxicity may cause weakness, lethargy, large pupils, and respiratory depression. Reports of animal toxicity are more common
25.	<i>Laportea crenulata</i> (L.) Chew. Gard Vernacular Name: "Anachoriyanam"	Urticaceae	Bark, latex and, hairs from the nut pod	Itching is the main symptom when its hair touches with our skin. It may be last for several years. The toxin stimulates the central nervous system and leads to death within 24 hours at its high doses.



26.	<i>Manihot esculenta</i> Crantz. Vernacular Name: "Kappa, Cassava"	Euphorbiaceae	Leaf, tuber, seed	The more concentration of this acid cause severe diarrhea and it will affect the liver.
27.	<i>Melia azedarach</i> L. Vernacular Name: "Kattuveppu"	Meliaceae	Fruit, bark	It mainly causes severe diarrhoea, vomiting, faint and badly affects central nervous system.
28.	<i>Mimosa diplotricha</i> (L.) Mart. Vernacular Name: "Anathottavadi, Giant sensitive plant"	Mimosaceae	Stem, leaves	It shows cytotoxic activities. Ingestion of these plant parts causes vomiting, diarrhoea and other gastro intestinal problems.
29.	<i>Nerium oleander</i> L. Vernacular Name: "Arali, Oleander"	Apocyanaceae	Latex from stem, leaves	The poisonous effects especially in heart health also in nervous system.
30.	<i>Parthenium hysterophorus</i> L. Vernacular Name: "Congress pacha, Carrot Grass"	Asteraceae	Leaves, flower, seed, rhizome, bark	<i>Parthenium</i> toxicity involves alopecia and dermatitis of the face, muzzle, neck, eyes, thorax, and abdomen and brisket region and causes salivation, anorexia, diarrhoea and death in extreme cases.
31.	<i>Ricinus communis</i> L. Vernacular Name: "Avanakku, Castorbean"	Euphorbiaceae	Stem, leaves, seed oil	The consumption of more amounts of seed causes burning sensation in throat and mouth at first and later experiences fatigue, thirst, dizziness, increasing heartbeat and the person become unconscious. The death occurs suddenly if the oil is directly injected to blood. The powder of seed also causes allergic reactions.
32.	<i>Sapindus trifolius</i> L.	Sapindaceae	Fruits	When it reaches the mouth more saliva is secreted. The ingestion of saponin causes nausea, vomiting,

	Vernacular Name: "Soap-nut tree, Soapinkaimaram"			diarrhoea and burns due to their alkaline nature. It is also used as fish poison. Its effects are neurological, behavioral and mortality.
33.	<i>Semecarpus anacardium</i> L. f. Vernacular Name: "Alakku cheru, Oriental cashew"	Anacardiaceae	Latex from bark	The black latex when contact with skin, it will cause burns severely and it becomes a large wound. The ingestion of seed oil will cause diarrhoea, burns, inflammation and pain. It will increase heart beat.
34.	<i>Strychnos nux-vomica</i> L. ("Poison nut Kanjiram")	Loganiaceae	All parts	Higher doses cause anxiety, dyspnoea, tonic convulsions, which lead (because of an excessive and continuous muscle activity) to hyperthermia, acidosis and rhabdomyolysis and finally to complete muscle paralysis. It inhibits the cell growth by the ingestion of seeds.
35.	<i>Tabernaemontana alternifolia</i> L. ("Kunan pala")	Apocyanaceae	Fruit, latex, bark, leaf	Fruit is more poisonous and its consumption causes irritation in throat and mouth. It also causes head ache, fever, diarrhea and the increase in blood pressure, it badly affects the nervous system and leads to death of the patient.
36.	<i>Thevetia nerifolia</i> L. ("Manja arali")	Apocyanaceae	Fruit, latex, bark, leaf, root	Its chewing causes drying of tongue and throat and leads to muscle fatigue, dilation of iris. Heart beat varies and death occurs due to reduction in the blood flow.

Selected Plant Images



A) *Annona squamosa* L.



B) *Melia azedarach* L.



C) *Anacardium occidentale* L.



D) *Semecarpus anacardium* L.



E) *Abrus precatorius* L.



F) *Mimosa diplotricha* (L.) Mart.



G) *Cerbera odollum* L.



H) *Cryptostegia grandiflora* R. Br.



I) *Nerium oleander* L.



J) *Tabernaemontana alternifolia* L.



K) *Thevetia peruviana* (Pers.) Merr.



L) *Calotropis gigantea* L.



M) *Jatropha gossypifolia* L.



N) *Ficus elastica* Roxb.



O) *Caladium bicolor* (Ait.) Vent.



P) *Cucas circinalis* L.

Toxicity is mainly due to the ingestion of poisonous plant parts and thereby intake of latex. So that the toxins present in the latex or sap is directly diffuses in the blood and causes gasrtrointestinal, neurological or behavioral symptoms or it may leads to lethality in higher dosage (Maria *et al.*, 2007). Gastrointestinal symptoms includes vomiting, diarrhoea, nausea, inflammation on the organs etc. Neurological symptoms are associated with a neurodegenerative disorder that is similar to amyotrophic lateral sclerosis and Alzheimer's disease (Tran, *et al.*, 1991). The contact of sap with eyes causes temporary blindness. Some poison compounds directly stimulate the central nervous system and leads to paralysis (Nelson *et al.*, 2007).

It should noted that; if you suspect that someone has eaten a poisonous plant or plant parts, do not try to make them sick, a glass of water or milk may be helpful and a spoonful of ice cream may help to relieve irritation inside the mouth. When skin contact with sap from an irritant or allergenic plant, immediately wash the affected area with warm, soapy water or cover the affected area with light clothing. If eye contact with sap, rinse it immediately with clean water for 10-15 minutes if there is irritation. If symptoms develop, or you are at all concerned, seek medical advice or attention along with this also note the name of the plant, if possible collect a sample, including leaves, flowers and fruit if it is available for further diagnosis.

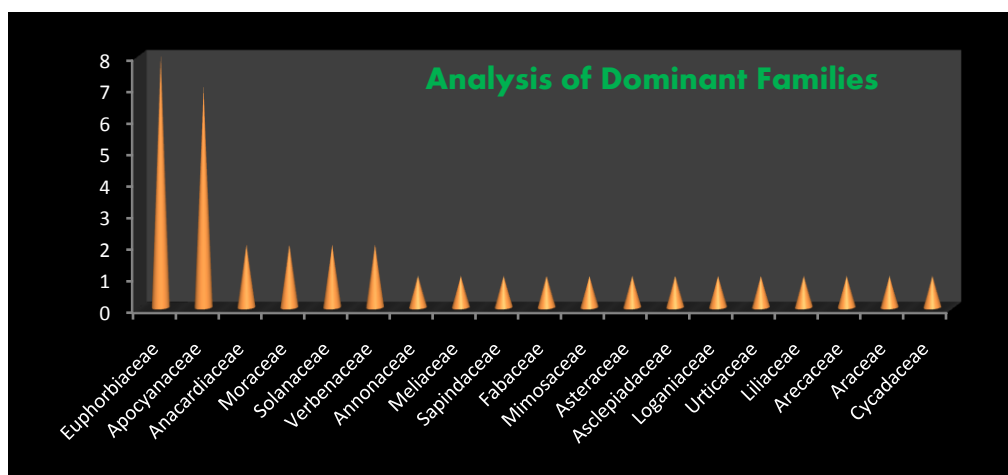


Fig. 4: Analysis of Dominant Poisonous plant Families

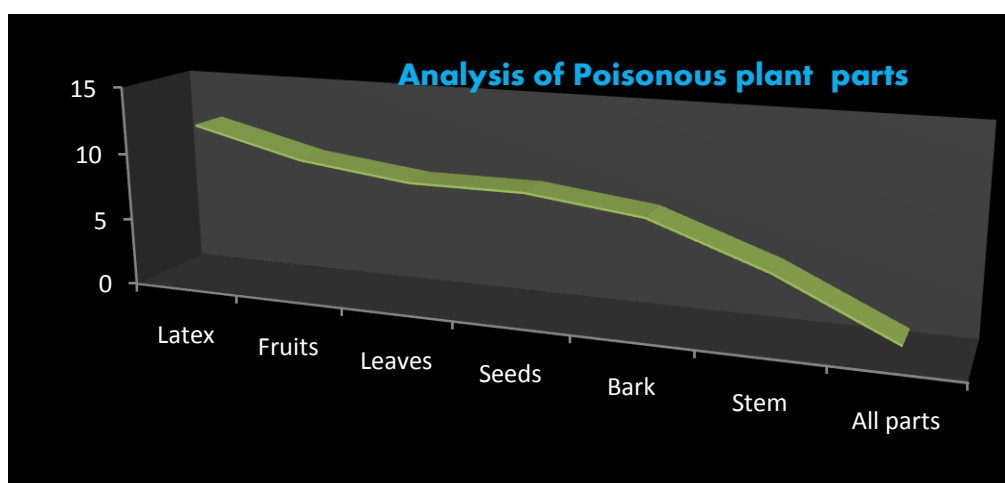


Fig.5: Analysis of Poisonous plant parts

Conclusion

Poisonous plants are injurious to humans and animal lives and can be found in the garden or planted by the forest department as a roadsides with or without the knowledge about their toxic effects. The various plant parts of plants like latex from bark, leaves, fruits, seeds etc. are poisonous to both animals and humans in varying proportions. Besides these, in some plants, root, root bark, tubers bulbs and sometimes the whole plant can be

poisonous. Some poisonous substances may be moderately dangerous, those that do not cause serious health problems and some can be used as medicinal when the toxic substance must be removed from it. This process is called as unadulteration. The toxicity of various plants and their respective parts are mainly based on the dosage of poisonous components which are ingested or it may contact externally to the body of organisms.

Future aspects of this Study

Even if the plant kingdom can provide a large number of toxic compounds, some of which very dangerous for the human health, nevertheless toxic plants are also extremely important because a great number of drugs are from natural compounds obtained from such plants. Scientists are always searching for toxic plants, in order to kill malignant cells or to defeat a disease. The botanical, toxicological and

pathological aspects have been studied and in many the active principles have been isolated and characterized. The most immediate challenge facing researchers today is the control and prevention of plant poisonings in the field. The problems experienced in the control of adverse effects of plant poisonings were has not yet been fully exploited and should be further investigated

References

- Ahmed, O.M. and Adam, S.E. (1979). Toxicity of *Jatropha curcas* in sheep and goats. *Res.J. Vet. Sci.*, **27**: 89-96.
- Aparna Prasad and Binu Thomas (2015). Potential ornamental plants from Meenachil Taluk of Kottayam District, Kerala, India. *European J. Environ. Ecol.*, **2(1)**: 29-46 (ISSN: 2393-9672).
- Anju, A. and Mary J. (2014). A survey on Poisonous plants in Nilambur, Kerala, India. *Int. J. Curr. Microbiol. App. Sci.*, **3(11)**: 957 – 963.
- Chanda, S., Parekh, J., Vaghasiya, Y., Dave, R., Baravalia, Y. and Nair, R. (2015). Medicinal plants – from traditional use to toxicity assessment: a review. *Int. J. Pharma. Sci. Res.*, **6(7)**: 2652 – 2670.
- Choudhury, M.H., Mohammad, R.K., Farhana, R. and Mohammad, M.M. (2011). Phytochemical screening and antioxidant activity studies of *Cerbera odollam* Gaertn. *Int. J. Pharma. Bio. Sci.*, **2(1)**: 413 – 418.
- Gamble J.S. and Fischer, C.E.C. (1915-1936). *The Flora of Presidency of Madras*. Part 1- 11 (Part 1-7 by Gamble and 8- 11 by Fischer) Adlard and Sons Ltd., London. (Repr. ed. Vols. 1-3. 1957).
- Kellerman, T. S. (2009). Poisonous plants of onderstepoort. *J. Veter. Res.*, **76**: 19-23.
- Kumar, G., Banu, G.S., Murugesan, A.G. and Pandian, M.R. (2007). Preliminary toxicity and phytochemical studies of aqueous bark extract of *Helicteres isora* L. *Int. J. Pharmacol.*, **3**: 96-100.
- Maria, F.A., Patrícia, F.F. and Jose, M.B. (2007). Synopsis of the plants known as medicinal and poisonous in Northeast of Brazil. *Braz. J. Pharma.*, **17(1)**: 114 – 140.
- Narayanaswamy, T., Thirunavukkarasu, T., Prabakar, S. and Ernest, D. (2014). A review on some poisonous plants and their medicinal values. *J. Acute. Disease.*, **12**: 85 – 89.
- Nelson, S. L., Shih, D. R and Balik, J. M. (2007). Handbook of Poisonous

and Injurious Plants: Second edition. *The New York Botanical Garden.*, 2: 1 - 339.

Sasidharan, N. (2004). *Biodiversity documentation for Kerala, Part-6: Flowering plants.* Kerala Forest Research Institute (KFRI), Peechi.

Tran, T.H., Navaro, D and Tran, V. (1991). Toxicity and effects on the central nervous system of *Cerbera odollam* leaf extract. *J. Ethnopharmacol.*, 34(2- 3): 201-206.