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# A Comprehensive Review on the Toxic Phytochemicals of the World's Most Poisonous Plants

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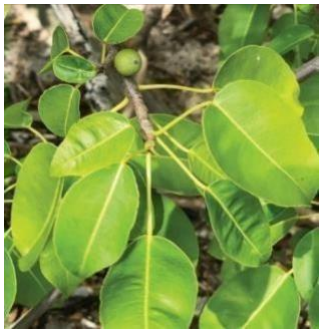
**ABSTRACT :**

Despite its bright and innocuous appearance, the Manchineel tree is among the most dangerous trees in the world. Its milky sap can irritate eyes severely and cause painful blisters. Doctors treated 19 patients who unintentionally got the sap in their eyes between 1985 and 1990; the majority of them recovered rapidly and eventually regained normal vision. Another lovely but lethal plant is Nerium oleander. Traditional medicine has long used its vibrant flowers, but if handled carelessly, every part of the plant is extremely toxic. Nevertheless, its natural components might serve as inspiration for new medications. Congress grass (Parthenium) is a rapidly spreading weed that drastically lowers crop yields while causing allergies, skin problems, and DNA damage.

## INTRODUCTION:

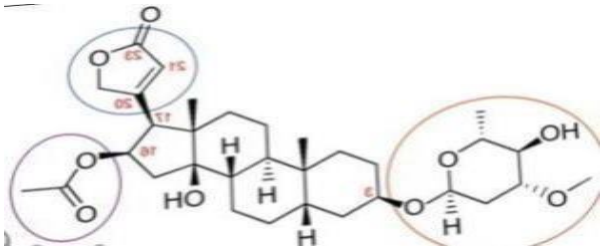
Natural resources are abundant in the majority of developing countries worldwide, especially when it comes to medicinal plants. Indigenous peoples have been using this priceless legacy for decades, centuries, and even millennia. They have used these natural products as common health remedies, perfumes, flavourings, sweeteners, and even natural pest repellents. [1] Nerium oleander L., the sole species in the genus Nerium and a member of the Apocynaceae family, has long been used in
traditional medicine to treat a range of illnesses.[2]
Due to the presence of several toxic substances known as cardiac glycosides, every part of the plant is toxic. These contain toxic substances that affect the heart, including neriin, oleandrin, cardenolides, gentiobiosyl, and odoroside.[2] A combination of extremely toxic cardiac glycosides found in nerium oleander can cause poisoning by interfering with the sodium-potassium (Na/K) pumps in the membranes of heart cells.[3] Numerous natural substances, including alkaloids, terpenoids, steroids, flavonoids, glycosides, phenols, lactones, and hydrocarbons, have been found to be abundant in members of the Apocynaceae family.[4,5] The majority of the more than 2,000 species in the Apocynaceae family live in tropical regions. The plants have been documented in 63 volumes of the Flora of China to date.[6] Congress grass is a weed that spreads quickly and is found in almost every area. It has not yet been found to have any noteworthy economic value. [7] In the countries where it has been introduced, parthenium is regarded as one of the most problematic weeds. It has the potential to significantly reduce crop yields; in India, for example, it has been reported to cause an agricultural output decline of up to 40%.[8] Asthma, hay fever, dermatitis, diarrhoea, and allergic reactions affecting the skin, eyes, nose, and mouth are just a few of the health problems caused by congress grass and its pollen. It is considered a major health risk due to these negative effects on human health.[9] The West Indies, Central America, the Bahamas, portions of South America, and the west coast of Africa are among the regions where the Manchineel tree grows.[10] The poisonous properties of the Manchineel tree have long been known to the locals. The hostile Caribs, who replaced the more tranquil Arawaks in the Caribbean Islands, were well aware of the tree's deadly potential.[11]It is frequently referred to as the most toxic tree
in all of northern America.[12] Although the Manchineel tree's detrimental effects on eyes have been recognised for hundreds of years in the areas where it grows.[13] Fig:1




**MACHINEEL TREE P.HYSTEROPHORUS OLEANDER PLANT**

**KEYWORD :**
Parthenium hysterophorus Dermatitis Impact on Biodiversity , Economic intraocular inflammation ASPECTS :
Species Nerium oleandrin :

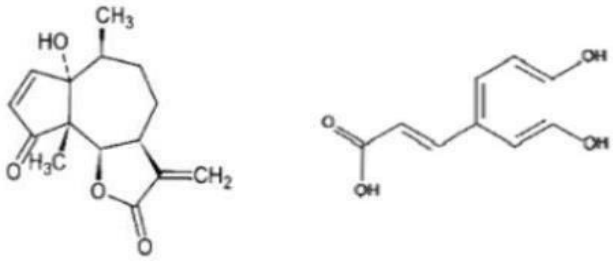
The first tests conducted on the plant indicated that the plant has numerous natural compounds ranging from alkaloids, flavonoids, carbohydrates, tannins, phenolics, saponins, cardenolides, cardiac glycosides, pregnanes, triterpenoids, triterpenes, and steroids.[14,15] The plant contains cardenolide heterosides in every part of it. The primary glycosides present in the leaves are
oleandrin and neriin, followed by other chemicals such as cardenolides, gentiobiosyl, and odoroside.[16] The seeds are rich in glucosides like oleandrine, odorosides, and adigoside. The bark also
contains glucosides, such as rosaginoside, nerioside, and corteneroside. While the roots hold steroid compounds.[17] Fig : 2



**Molecular structure of oleandrin.**

## PARTHENIUM HYSTEROPHORUS. L :

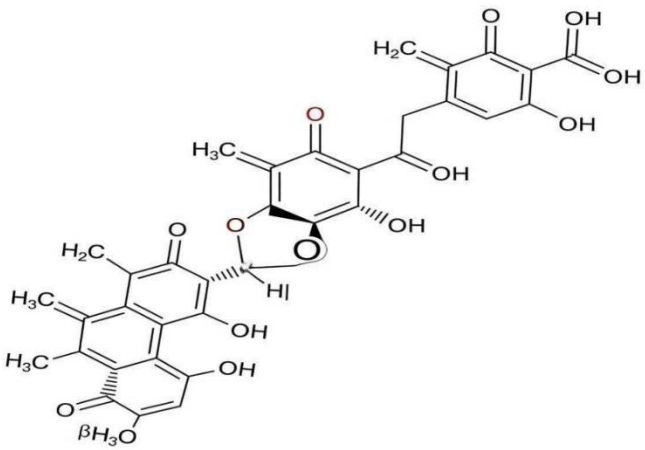
Research indicates that every component of Congress grass encompassing its trichomes and pollen— harbors toxic substances referred to as sesquiterpene lactones (SQL).[18] Several chemical compounds, including tetraneurin, parthenin, hymenin, coronopilin, dihydroisoparthenin, hysterin, and hysterophorin, have been found in congress grass collected from different geographic locations.[19] Congress grass contains a number of phytotoxic substances known as allelochemicals, including hysterin, ambrosin, and flavonoids like ferullic acid, vanillic acid, caffeic acid, and panisic acid.[20] Fig : 3



**parthenin caffeic acid**

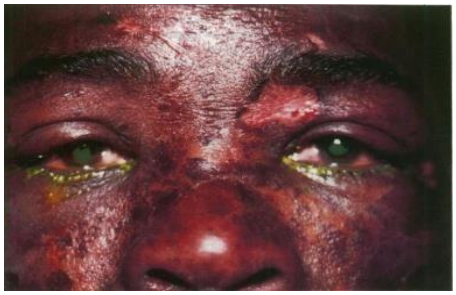
***MANCHINEEL PLANT :***

Because it produces a variety of potent chemicals, the manchineel tree is very toxic. One of the primary offenders is a class of chemicals known as phorbol esters, which can cause severe irritation to the body by interfering with cell communication, particularly by overstimulating a protein known as PKC. Strong inflammation is brought on by this. Additionally, the tree contains other dangerous substances like furocoumarins, sapogenins, and hippomanins, which when combined can result in excruciating blisters, inflammation, and severe skin irritation even from brief contact.
Fig:4hippomanin



## IMPACT OF MANCHINEEL TREE :

Consumption of manchineel fruit will make an individual experience severe stomach cramps, a burning sensation in the mouth and throat, and bring painful muscle
contractions to the pipe carrying food (esophagus).[22] Some case reports indicate that consumption of the fruit can induce a hyperactive response in the nervous system of the body — akin to an overactive "rest and digest" reaction — presumably due to some poisonous chemicals that interfere with nerve function.[23,24,25] Some euphorbia plants are notorious for irritating the skin. Most often, this is because their milk sap has toxins that will directly irritate the skin, or latex-like compounds that may cause an allergic reaction in individuals.[26,27] The crew encountered a mysterious tree that gave sharp burns to the skin and eyes of whoever would touch it [28] Fig: 5

**(a) (b)**

### *IMPACT ON PARTHENIUM HYSTEROPHORUS. L :*

The highly invasive parthenium weed poses a serious threat to agriculture in many parts of the world and can damage a wide variety of crops, particularly cereals like sorghum, rice, wheat, maize, and teff.[ 29,30] Parthenium weed also exerts significant indirect impacts on agricultural output [31This plant is toxic to cattle, and consuming large amounts of it over the course of about 30 days may eventually cause death.[32] Antihistamines can be used to treat conditions like dermatitis, hay fever, asthma, and bronchitis brought on by the plant[33]

### *IMPACT OF NERIUM OLEANDER :*

The severity of N. oleander poisoning depends on the amount of toxin in the portion of the plant that was consumed, as well as the individual's age and overall health. [34, 35] The most poisonous is the one with red flowers. The leaves remain toxic even after they have dried. A child can die if they consume just one oleander leaf. [36] Oleandrin is the main toxic ingredient in oleander.
Despite making up only about 0.08% of all the cardenolides in the plant, it is very dangerous because the body absorbs about 30% of it when it is consumed.[37] People may be poisoned by N. oleander if they accidentally consume it, intentionally consume it because they think it has therapeutic value, or are purposefully poisoned by someone else.[38]

## MECHANISM OF ACTION :

### *MECHANISM OF NERIUM OLEANDER :*

They mainly affect an enzyme called the Na+/K+ ATPase pump, which is essentially a tiny device in your heart cells that pumps potassium (K+) into the cell and sodium (Na+) out. When those medications block that pump, potassium cannot enter the cells as it would normally, and sodium starts to build up inside.
The sodium-calcium exchange is now hampered by the cell's excess sodium. Normally, calcium is expelled and sodium enters. However, calcium becomes trapped and starts to build up when there is already too much sodium inside. And there you have it. Heart cells that have more calcium in them contract more forcefully, making the heart beat more forcefully. A stronger heartbeat—also known as a positive inotropic effect—is exactly the intended therapeutic outcome. However, there's a catch. Potassium starts to build up in the blood because it isn't getting into the cells as it should. And this leads to hyperkalemia, which is another name for high blood potassium levels.Additionally, elevated potassium can be a dangerous sign in cases of acute poisoning, such as when a drug overdose occurs. In fact, the toxicity increases with potassium levels.[37]

### *MECHANISM OF MANCHINEEL TREE :*

Although the manchineel tree's sap is extremely toxic, no single chemical has been found to be the cause of the severe skin reaction. Instead, it seems to be a mixture of harmful compounds. A class of toxins known as **phorbol esters** is also known to weaken skin cells by upsetting the pH balance, which ultimately results in the death of keratinocytes, the cells that make up your skin's outer layer.

Even worse, **diterpenes** cause your body's immune system to release chemicals that cause inflammation, which manifests as redness, swelling, and pain. Therefore, a variety of toxins are working together to damage the skin and cause inflammation rather than just one culprit. [39]

## MANGEMENT :

### *MANAGEMENT OF MANCHINEEL TREE :*

Manchineel dermatitis has no known cure. Applying topical steroid creams usually has little effect because the reaction is caused by skin irritation rather than an allergic (type IV hypersensitivity) reaction.[40]

### *MANAGEMENT OF NERIUM OLEANDER :*

In cases of oleander poisoning, it is crucial to assess the patient's breathing, circulation, and airway as soon as possible..[41]

**Gastrointestinal decontamination :**
Activated charcoal binds to toxins in the stomach and intestines to prevent them from entering the bloodstream. This reduces the effects of the drug or poison. The usual dosage is one gramme per kilogramme of body weight.[41] Multi-dose activated charcoal (MDAC), also known as “gastrointestinal dialysis,” is a medical procedure used to enhance the body’s capacity to remove particular toxins or drugs after an overdose or poisoning. [41]

**Digoxin antibodys :**
Because the cardenolide group of cardiac glycosides has a similar biochemical structure, researchers have looked closely at the use of digoxin-specific antibodies in the treatment of oleander poisoning.[41] Atropine:

A drug called atropine inhibits certain nervous system signals. By increasing heart rate and reversing the slowing effect of the vagus nerve, it helps in cases of oleander poisoning. [41]

## CONCLUSION:

Inhaling or touching Parthenium hysterophorus pollen can cause severe allergic reactions, skin rashes, and respiratory problems. The manchineel tree, sometimes referred to as the "tree of death," produces a highly toxic sap that can cause blindness, severe skin burns, and even death if ingested. Oleander's potent cardiac toxins can cause serious poisoning or even fatal heart problems if ingested.

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