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An Overview Article On Several Toxic Plants That Are Available In India And Their Potential Medical Applications

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Abstract

Like its culture, India's flora is diverse and rich. In every way, plants are wonderful and helpful to us. Life on Earth would not be feasible without plants. Although certain plants are deadly by nature, flowers and plants are frequently employed as ornaments to decorate homes. Gorgeous flora and flowers may be poisonous. Rural residents who rely on their gardens and forms for sustenance may be poisoned. Numerous hazardous plant species from several plant groups have been identified. Seeds, roots, fruits, stems, tubers, bulbs, and even the whole plant have been identified as the most dangerous portions of hazardous plants. Alkaloids, glycosides, minerals, oxalate, photosensitizing compounds, toxic polypeptides, or amines may all contribute to a plant's poisonous character.

***Keywords*: –** Poisonous plants, Toxic Chemicals, Toxins, Medicinal uses.

Introduction

The kingdom of plants, which has religious and therapeutic importance in India and across the globe, is really a gift from God to humanity. The variety of therapeutic plants and their applications is remarkable. According to Paracelcus (1993–1541), however, all substances are toxic; there isn't a thing that isn't harmful. The correct dosage distinguished a poison from a cure. Therefore, some plants may be toxic to humans. Certain plant parts or whole plants, certain organs or the entire body, immediate or delayed cumulative effects, a single species

or entire genera, and often the concentration of a specific poisonous component are all factors that determine a plant's toxicity. Toxicology is often determined by erroneous plant identification, environmental circumstances, and plant state. Biological weapons are poisonous plants that may inflict major harm or even death. (Sharma B, Gupta VK, 2017) Because they are readily available and cost nothing, experienced poisoners in toxicological crimes use them first. The risk might be anything from a little annoyance to serious disease or even death. Any material that has the potential to negatively impact human health is considered poison.

Poisons could be categorized in two distinct divisions according to their origin:

1. Naturally occurring poisons (made by protists, fungus, bacteria, plants, and animals) and
2. Human-made synthetic compounds, such as home toxins, chemicals, sedatives, and insecticides

When consumed in excess, several plants that are typically safe may become hazardous. or for an extended length of time. Ancient India used poisoned weapons as a technique in battle.(Qureshi JM, 2001)

Types of poisonous phytochemicals

Plant poisons are organic chemical elements that are naturally produced by the individual cellular processes of plants with the aid of enzymes. Plant-based toxins are often divided into three main categories depending on how they affect the body, including

i. Systemic
ii. Corrosive and
iii. Irritant

which, as summed up in (Parikh CK 1999, Carod Artal, F.J. 2003), are separated based on their chemical makeup and place of action.

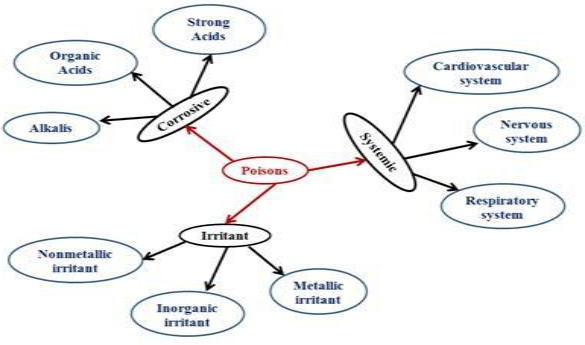

Fig: Categories of toxins based on the mechanism of toxicity

Only some plant portions have poisonous substance, whereas other plant parts contain poisonous material throughout. Cooking doesn't always eliminate toxins. A poisonous impact depends on a person's age and health. The word "poisonous" refers to a wide range of responses or consequences. (D.E. Cassidy, J. Drewry, and J.P. Fanning, 1982) These side effects include skin rashes or dermatitis, allergic responses, irritations, photosensitization of the skin, and internal poisonings. The majority of toxic substances are secondary metabolites or byproducts. Alkaloids, glycosides, minerals, oxalate, photosensitizing compounds, toxic polypeptides, or amines may all contribute to a plant's poisonous character (Upadhya, S.K. (1984)). There are several methods to categorize toxic substances: (i) by their physiological expression, such as nerve and muscle poisoning; (ii) by their chemical ingredients, such as alkaloids and glycosides; and (iii) by their botanical origin. (Verma N and Yadav R, 2018) (L.H. Lu, 2010)

Poisonous plant in India

1. **Datura metal (**Khaton M, Shaik M (2012))

The plant species Datura metel, belonging to the Solanaceae family, is recognised for its toxic and medicinal properties. Indigenous to tropical and subtropical regions, it is sometimes referred to as thorn apple, devil's trumpet, or angel's trumpet. It has been used in traditional medicine for several ages. This is a synopsis of the plant:

Key Characteristics:

- **Morphology:** *Datura metel* is a shrubby annual or perennial herb, growing up to 1–2 meters tall. It has large, trumpet-shaped flowers and spiny fruits.
- **Leaves:** Broad, ovate, and deeply lobed.
- **Flowers:** Usually white, purple, or yellow, with a pleasant fragrance.
- **Seeds:** Contained in a spiny capsule, highly toxic.

Medicinal Uses:

Traditionally, parts of *Datura metel* (leaves, seeds, flowers) have been used for:

1. **Asthma and Respiratory Disorders:** Smoked leaves are believed to alleviate asthma symptoms.
2. **Analgesic and Anti-inflammatory Properties:** Used to treat pain and inflammation.
3. **Antispasmodic Uses:** Effective in treating spasms and cramps.
4. **Sedative and Narcotic Properties:** Used in some cultures for inducing sleep and managing anxiety.

5. **Skin Ailments:** A poultice of the leaves is used for treating wounds, boils, and dermatological problems.

6. **Toxicity:**

- The plant includes very dangerous tropane alkaloids, including as scopolamine, hyoscyamine, and atropine.
- Dry mouth, dilated pupils, hallucinations, delirium, and, in extreme situations, coma or death are signs of poisoning.

Research Highlights (2012 Study by Khaton M. and Shaik M.):

This research may focus on:

- The phytochemical composition of *Datura metel*, identifying active compounds responsible for its medicinal properties.
- Toxicological profiles and safety considerations.

2. Nicotiana Tabacum (Uzelac b, Stojicic D, Snezana B 2019)

Cultivated tobacco, or Nicotiana tabacum, is a species of tobacco plant belonging to the Solanaceae family. For usage in cigarettes and other tobacco products, it is the main source of tobacco. Here are some important facts regarding it:

Taxonomy:

- **Kingdom**: Plantae
- **Order**: Solanales
- **Family**: Solanaceae
- **Genus**: Nicotiana
- **Species**: *Nicotiana tabacum*

Description:

- **Growth**: This herbaceous annual plant may reach a height of one to two meters.
- **Leaves**: Large, oblong leaves that are sticky and aromatic due to resin and alkaloids.
- **Flowers**: Trumpet-shaped, typically pink or white, and borne in clusters.

Habitat:

Native to the Americas, *Nicotiana tabacum* thrives in subtropical and tropical regions. It is now cultivated globally, particularly in areas with warm climates.

Uses:

1. **Commercial Tobacco**: Its leaves are dried and processed for use in smoking, chewing, and snuff products.
2. **Medicinal**: In traditional medicine, it has been used as a remedy for insect bites and various ailments, although its use is limited due to its toxic nature.
3. **Biotechnology**: It is also used as a model organism in plant research and genetic engineering.

Active Compounds:

The plant contains **nicotine**, an alkaloid responsible for its stimulant effects and addictive properties. It also has other minor alkaloids such as **nornicotine** and **anabasine**.

Health Implications:

- A number of illnesses, including as lung cancer, heart disease, and respiratory disorders, are linked to tobacco use.
- Nicotine itself is addictive and has a significant impact on the central nervous system.

4. Nux- vomica (Bhati R. 2012)

The tree Nux vomica, which is a member of the Loganiaceae family, is indigenous to Southeast Asia. Although traditional medicine has long used its seeds and other components, its alkaloid concentration makes it very hazardous. Here is a thorough summary:

Taxonomy:

- **Kingdom**: Plantae
- **Order**: Gentianales
- **Family**: Loganiaceae
- **Genus**: Strychnos
- **Species**: *Strychnos nux-vomica*

Description:

- **Tree**: A medium-sized tree, growing up to 12–15 meters in height.
- **Leaves**: Simple, glossy, and oval-shaped.
- **Flowers**: Small, greenish-white, and fragrant.
- **Fruit**: Round and orange when ripe, containing 2–5 flat, disc-shaped seeds.

Active Compounds:

1. **Strychnine**: A powerful neurotoxin that affects the central nervous system, causing severe muscle convulsions.
2. **Brucine**: Another alkaloid, less toxic than strychnine but still hazardous.

Uses:

1. **Traditional Medicine**:
    - Historically used in small doses as a remedy for digestive disorders, neurological problems, and as a stimulant.
    - Often included in homeopathic preparations for ailments such as indigestion, constipation, and stress-related disorders.
2. **Scientific Research**:
    - Used in studies on neurotransmission and toxin effects on the nervous system.

Toxicity:

- **Lethal Dose**: Strychnine is toxic even in small amounts. Symptoms of poisoning include:
    - Muscle spasms
    - Respiratory distress
    - Convulsions
    - Death due to asphyxiation or exhaustion in severe cases.
- The seeds are particularly dangerous and should never be consumed without medical supervision.

Precautions:

- **Medicinal Use**: The use of *Nux vomica* in traditional or homeopathic medicine should only be under the guidance of a qualified practitioner due to its high toxicity.
- **Legal Regulation**: In many countries, the use and sale of products containing strychnine are strictly controlled.

4. Peganum harmala (Aghajanshakeri S, (2013)

The perennial herbaceous plant Peganum harmala, often called Syrian rue, is a member of the Nitrariaceae family. Although it originated in the Middle East, North Africa, and Central Asia, it has now spread to many other places. Many cultures attribute spiritual, medical, and cultural importance to this plant.

Key Features:

- **Scientific Name**: Peganum harmala
- **Common Names**: Syrian rue, Harmal, Wild rue, Esfand
- **Habitat**: Arid and semi-arid regions; often found in deserts and steppe environments.
- **Growth**: It is a hardy plant that thrives in poor, sandy, or rocky soils.

Traditional Uses:

1. **Medicinal**:
    - Peganum harmala seeds contain alkaloids such as harmine, harmaline, and tetrahydroharmine, which have been studied for their psychoactive and medicinal properties.
    - Traditionally used to treat conditions like stomach ailments, skin infections, and inflammation.

2. **Spiritual and Cultural**:
    - The seeds are burned as incense in various cultures, believed to ward off evil spirits and bring good luck.
    - Used in traditional rituals for purification and protection.
3. **Psychoactive Properties**:
    - The alkaloids act as monoamine oxidase inhibitors (MAOIs), which make Peganum harmala an important component in traditional psychoactive preparations.

Modern Research:

- Studies suggest potential applications of Peganum harmala in treating depression, cancer, and neurodegenerative disorders due to its bioactive compounds.
- It has also been investigated for its antimicrobial and antifungal properties.

Toxicity:

While the plant has medicinal benefits, it is potentially toxic if consumed in large amounts. Overdoses can lead to nausea, vomiting, hallucinations, and other serious health issues.

Would you like detailed insights into its chemical composition, pharmacological uses, or cultural significance?

5. Abrus precautorius

Abrus precatorius, commonly known as the **rosary pea** or **jequirity bean**, is a slender, perennial climber belonging to the family Fabaceae. It is widely recognized for its striking seeds, which are often bright red with a black spot, resembling a ladybug. Here's a brief overview:

Botanical Description:

- **Family:** Fabaceae
- **Common Names:** Rosary pea, Jequirity bean, Gunja (India), Crab's eye
- **Native Range:** Tropical and subtropical regions, including India and Southeast Asia.
- **Plant Type:** Perennial, twining herbaceous vine.

Morphology:

- **Leaves:** Pinnate, with numerous leaflets arranged in pairs.
- **Flowers:** Small, pale pink to purplish, arranged in clusters.
- **Fruit:** A flat, oblong pod that contains the seeds.
- **Seeds:** Small, glossy, and highly distinctive due to their red and black coloration.

Uses:

1. **Traditional Medicine:**
    - Used in Ayurveda and other traditional systems for various treatments, including nervous disorders, skin diseases, and as an aphrodisiac.
    - Roots and seeds are used in powdered form, often with caution due to their toxicity.
2. **Cultural and Decorative:**
    - Seeds are used as beads for jewelry, rosaries, and ornaments.
3. **Scientific Research:**
    - Contains **abrin**, a highly toxic protein, used in biochemical and molecular studies.

Toxicity:

- **Abrin**, the primary toxin, is extremely potent. Ingestion or improper handling of the seeds can lead to severe poisoning, including symptoms like nausea, vomiting, abdominal pain, and even fatality if untreated.
- Handling the seeds with intact coatings is generally safe, but crushed or chewed seeds release the toxin.

Precautions:

- Not recommended for internal use without proper preparation and expert guidance due to its toxicity.
- Keep seeds out of reach of children and pets.

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