***POISONOUS PLANTS***

***WHAT IS POISON?***

*Any substance which, when taken into the system, acts injuriously, in a manner neither thermal nor mechanical, tending to cause death or serious detriment to health.*

***Grades of poisoning:***

*Following are the grades of poisoning produced by poisonous plants:*

***Mild poisoning:***

*poisoning may be called as mild poisoning if symptoms produced by the poisonous plants are like itching (on the palm of hands, soles of feet, body etc) sneezing, lacrimation, redness of the area or skin of red patches or hives, shivering, dizziness, dryness of mouth(thirst) etc. e.g. poisoning due to chrysanthemum, Asparagus, daffodils etc.*

***Moderate poisoning:***

*If the symptoms are not severe, i.e. may be bearable by the patient for sometimes, or become distressing and aggravated if left unattended or not properly treated e.g. diarrhea, abdominal pain, severe vomiting, gas-enteritis, colitis, buring sensation of mouth and throat, appearance of watery blisters that are painful and rapidly spreading, e.g. as with Toxicodendron radicans (Poison ivy)*

***Severe poisoning:***

*If the poisoning produced by poisonous plants gives rise to symptoms-appearance indicating involvement of vital system of the body (e.g. cardiovascular system, central nervous system or Respiratory tract) or if these symptoms are severe enough, not tolerable by the patient, it may be said that poisoning is severe. In many of the poisoning cases, if patient is left unattended and not properly and timely managed drastic consequences may occur, even leading to death.*

*Examples are: - Excessive, uncontrolled diarrhea and/or vomiting, fall in blood pressure (hypotension) or abrupt rise in blood pressure (Hypertension), bronchial spasm, narrowing of air passages (asthmatic attack)*

*Severe poisoning may be observed in certain individuals with following plants: e.g. Nux-vomica (strychnine) colchicum (colchicines), Digitalis leaves, Aconitum napellus (aconite) etc*

***REASONS OF TOXICITY***

***Plant contain two principles;***

* ***Toxic principles***
* ***Medicinal principles***

*“ALL THINGS ARE POISON. DOSE ALONE DECIDES THAT A THING IS POISON OR MEDICINE.”*

*About 80% of plant population serves medicinal purposes while 15-20% is toxic or have no medicinal effects.*

***WHAT ARE POISONUS PLANTS?***

* *Poisonous plants are the plants possessing toxic principles which when introduced into the body in relatively small quantity will effect very deleterviously and may cause impairment of the body function, even leading to death.*
* *Poisonous plants produce poison, i.e., toxin that is a protein or conjugated protein. Poison or toxin produced by posinous plants is called phytotoxin. Thus poisonous plants produce these poisonous (chemical) compounds that interfere in the metabolism of living organisms, and damage the basic life principle, i.e. protoplasm of the cells.*
* *They exert directly or indirectly toxic action leading to poisoning in man and animals. These poisonous principles responsible for toxic effect of plants arise through various ligenetic pathways and are mostly so-called secondary metabolites. Many plant poisons are highly active substances; these substances make a plant a poisonous plant because they are present in high concentration.*

***INTRODUCTION TO POISONUS PLANTS OF PAKISTAN***

* ***Poisonous Plants***

1. *Cardio-Toxic Plants*
2. *Plants Acting on G.I.T*
3. *CNS Toxic Plants*
4. *Liver damaging Plants*
5. *Atropine like Plants*
6. *Cyanogenetic Plants*
7. *Plants having Nicotine-Like Action*

***A)-Plants acting on C.V.S:-***



1. ***Digitalis:***

***Botanical Source:***

1. *Digtalis purpurea*
2. *Digtalis lanata (Fam: Scrophulariaceae)*

***Habitat:*** *Digitalis purpurea is formed in Azad Kashmir,Northern areas and Hazara division;Peshawar, but digitalis lanata is rarely found in these areas.*



***Toxicology of the plant:***

*The leaves contain cardioactive glycosides, the most active of which are purpurea glycosides A and purpurea glycosides B, which upon hydrolysis yield digitoxigenin, gitoxigenin, Gitoxin, digitoxin, Digoxin, gitatoxin etc. In low doses, these act as cardio-active glycosides (cardio-toxic) to strength the weaker cardiac muscles, hence are useful in congestive heart failure (CHF) and angina pectoris; but in higher doses, the heart muscle become quicker and irregular (Arrhythmias) All parts of the plant are toxic and a few grams of leaves can cause toxicity, signs of poisoning are contracted pupil, blurred vision, strong and slowed pulse nausea, vomiting, dizziness, fatigue, excessive urination (polyuria) convulsion; breathing becomes more difficult, leading to unconsciousness, respiratory failure. Cardiac signs include atrial arrhythmias and A.V block. Death occurs due to cardiac and respiratory system collapse.*

***(B) OLEANDER***

***Biological source:***

*Nerium oleander; N. indicum*

***Family:*** *Apocynaceae*

***Habitat:*** *In Pakistan, this plant in found in Kashmir and Sind (N.oleander); while N.indicum is common in Kashmir, Muree, Swat, Chitral and many areas of Punjab like Lahore Bahawalpur etc.*

***Toxic principles:***

*The chief principles are oleandrin and nerin which are also cardio-active constituents.*



***Toxicology plants:***

*Leaves and roots contain complex mixture of glycosides. These glocosides are chemically and physiologically related to digitalis glycosides. (e.g the leaves also contain gitoxigenin and digitoxigenin, like that of digitalis)*

***Symptoms of Toxicity:***

*Oleander ingestion causes many cases of poisoning wold-wide; in 1994, 303 cases were reported in Texas, and in Australia during 1972-8 it was responsible for 27% of paediatric plant poisoning. Fatal cases have been reported elsewhere and in Sri Lanka; the use of seeds in suicide attempts, particularly among teenagers, poses a problems.*

*Ingestion of plant produces irritation of mouth and stomach, and followed by emesis. C.V.S collapse, strychnine like effects, coma, seizures, respiratory arrest.*

*C.* ***ACONITUM***

***Botanical source****:*

*Aconitum napellus*

***Habitat :*** *in Pakistan, it is found in Dir, chitral, Gilgit and Kashmir.*

***Aconitum ferox:***

*This species is found in Kashmir and northern India*

***Aconitum heterophyllum:***

*Habitat: Chitral, Muree and Kashmir*

*Family: Ranunculaceae*

***Toxic principles:***

*These leaves and roots both contain toxic principle, aconitine, and alkaloidal compound. Aconite is a very potent and quick acting poison.*

**

***Symptoms:***

*Death occurs due to ventricular fibrillation and rarely due to respiratory failure.*

*Very little dose i.e; 2 mg of aconite may produce death due to paralysis of heart and respiratory failure. (respiration centre fails)*

*If leaves are ingested, there is tingling ling and buring sensation of the lips, tongue and mouth; which is followed by numbness, salivation, nausea and emesis: pulse become weak and breathing become difficult.*

***Treatment:***

*The treatment is to empty the stomach by tube or non-depressant emetic*

*The physiological antidotes are atropine and digitalin or strophantin, which should be injected sub- contaneously is maximal doses. Alcohol and warmth may also be employed.*

*Milk is given as antidote.*

***B)-PLANTS ACTING ON G.I.T***



*These usually cause damage to GIT lining and mucosa and cause emesis.*

1. ***Podophyllum:***

***Biological source:*** *Podophyllum hexandrum ( Indian spp)*

*P. emodi* ***Fam:*** *Berberidaceae*

***Habitat :***

*The plant is found in Himalayan areas of pakistan including northern areas, swat , chitral and pouch valley (Azad Kashmir)*

***Toxicology:***

*Toxic principal is resionous in nature called “podophyllotoxin”. It is present in the roots and rhizomes of the plant.*

**

**

*Symptoms of poisoning:*

*Ingestion of the plant produces abdominal pain, emesis and diarrhea, which is followed by headache, respiratory stimulation and elevation in body temp.*

1. ***Taxus:***

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***Botanical origin:*** *Taxus baccata (The common few)*

***Family:*** *Taxaceae.*

***Habitat:*** *Hemalayan areas of Pakistan, Ponch valely (Azad Kashmir), Swat, Chitral and Muree.*

***Toxicology:***

*The plant contains complex mixture of toxic alkaloids and most important toxic alkaloids are*

1. *Taxine “A”*
2. *Taxine “B”*

*These occur in leaves, bark and seeds.*

***Symptoms of poisoning:***

***G.I.T:.*** *Emesis, severe diarrhea, dryness of throat, colic, irritant effection of mucous membrane, so it produces gastro-enteritis.*

***Other symptoms include***

*Muscle weakness, slow irregular pulse, hypotension and respiratory depression.*

1. ***RICINUS SPECIES:***

***Botanical origin:***  *Ricinus commums*

***Symomyms:*** *Castor oil*

***Family:*** *Euphorbiaceae*

***Habitat:*** *Almost throughout Pakistan.*

***Toxicology of the plants:***

*Seeds of the plants contain protein, called “Ricin” (a toxalbumin). Intoxication may occur after ingestion of 2-3 seeds*

***Symptoms:***

*In case of ingestion, there is burning sensation in mouth and throat and nausea, intense thirst and bloody diarrhea. These symptoms are followed by headache, dizziness and depression; later signs are degradation of liver and kidneys.*



1. *Solanum Spp*

*Botanical origin:*

*Solanum nigrum*

*S. tuberosum*

*S.incanum*

**

***Habitat:***

*Hazara division, Mansehra, Muree, Jhelum, Many parts of Punjab and Hilly areas of NWFP (KPK).*

***Toxicology of the plant:***

*These plants contains glycol-alkaloids, important one are “solanine” and ”demissine”. Enzymatic cleavage of solanine produces two components:*

1. *Steroidal alkaloids (Alkamine) and*
2. *Sugar*

*Alkalamine may be absorbed through intenstine whereas unhydrolyzed solanine is properly absorbed through intestine and produces toxic symptoms i.e irritantion to intestine, and may cause gastro- enteritis.*

*Symptoms: Nausea, emesis, diarrhea, salivation, sweating and muscular weakness.*

1. ***Rheum spp:***

***Botanical origin****:*

*Rheum palmatum*

*Rheum rhaponticum*

*Rheum emodic; and R. officinale*

***Fam:*** *Polygonaceae*

***Habitat:*** *Kashmir, Gilgit and Swat (Himalayans)*

***Toxicology of the plant:***

*The leaves of plant contain oxalic acid, which has corrosive effect in gastro-enteritis. Toxic manifestations occur due to formation of calcium-oxalate crystals, which are insoluble.*

***Symptoms:***

*The concentration of ionized ca+2 is decreased causing hypocalcimia .It defects the heart function, neuromuscular junctions and central nervous system disturbances. Other symptoms of toxicity include nausea, emesis and bloody diarrhea.*



1. ***COLCHICUM:***



***Botanical origin:*** *Colchicum luteum and C. autumnale*

***Fam:*** *Liliaceae*

***Habitat :*** *Muree, Northern areas.*

***Toxicology of the plant:***

*All parts of the plant (esp. seeds and corms) contain alkaloid colchicines, it is a mitotic poison.*

***Symptoms:*** *Burning sensation of mouth and throat, thirst, nausea, abdominal discomfort followed by diarrhea, vomiting and cardiac depression. CNS related are depression, shock and death*

***C)-CNS TOXIC PLANTS***



*(A)* ***Nux-vomica***

***Botanical origin:*** *Strychnos nux-vomica*

***Family:*** *Loganiaeceae*



***Toxic principle****:*

*The dried ripe seeds contain toxic principles which are in the form of indole-alkaloid i.e strychnine and brucine.*

***Habitat:*** *it is widely cultivated in KPK/NWFP*

***Symptoms of poisoning:***

*If drug is taken orally or inhaled, it produces following symptoms of poisoning:*

* *Nausea and vomiting*
* *In large doses, the excitability of the motor nerve cells is so much increased that violent titanic convulsions may occur; so that they lead to stiffness of neck and facial muscles, and them this stiffness spread throughout the body. Convulsions may also involve respiratory muscles.*
* *Asphysia leads to death within 2-3 hours.*

*(B)* ***CANNABIS (Indian hemp)/mariyuana in USA***

*Biological source: Cannobis indica*

*Cannanabis sativa*

***Family:*** *Moraceae/Cannabinaceae*

**

***Habitat:*** *NWFP and sindh, Balochistan and Punjab.*

***Toxicology of the plant:***

*Cannabis consists of dried flowering and fruiting tops of pistillate plants, that contain toxic principles which are resins in nature and contain over 60 compounds known as cannobinoids; some principal components are tetra hydocannabinol (THC), cannabinol, cannabidiol and cannabigerol etc*

***Cannabis products:***

*Followings are three main types of products*

*Bhang or Hashish: it consists of larger leaves and twigs of both male and female plants. It contain less amount of resin.*

***Charas:*** *it contains crude resin; obtained by rubbing the flowering tops between the hands, beating them on clothes or carpets. A greenish brown soft mass adheres, these masses (resin) are them scraped off.*

***Symptoms of toxicity:***

*It causes nausea vomiting , diarrhea, dryness of throat and mouth and redness of eyes.*

*It increase appetite and thirst*

*It is hallucinogenic; it first produces tremors, excitement and increased H.R, euphoria, but later on lethargy and sleep. Immune –response of the body is decreased, i.e., immunosuppresion. Moreover, it also produces dizziness, difficulty in concentrating, confusion, difficulty in walking*

*(C)* ***CICUTA***

***Biological source:*** *Cicuta virosa (water hemlock) and C. maculat.*

***Family:*** *umbelliferae*

***Habitat:*** *Kashmir and Northern areas.*

***Toxicology of the plant:***

*Toxic principle is “Cicutoxin”, that is an unsaturated aliphatic alcohol. The whole plant contains toxic principle. However,its high concentration is found in stem and rhizomes. Flowers are slightly toxic and produces mild gastro-enteritis. Toxin is a violent convulsant that acts directly on CNS.*

***Symptoms of poisoning:***

*CNS: excitement, convulsion (tremors)*

*G.I.T: Nausea, vomiting, diarrhea, salivation*

*Respiratory: Respiratory failure leads to death.*



***D)- LIVER DAMAGING PLANTS:***



***A: Sapindus***

***Botanical origin:***

1. *Sapindus trifoliatus*
2. *Sapindus saponaria*

***Family:*** *Sapindaceae*

***Habitat:*** *Punjab*

**

***Toxicity of poisoning:***

*Fruit wall and seeds contain toxic principles hypoglycin A*

***Symptoms of the poisoning:***

*The symptoms of toxicity are:*

1. *Hypoglycaemia*
2. *Weakness*
3. *Nausea, vomiting*
4. *Convulsions*
5. *Coma*
6. *Liver damage by disturbing enzymatic function of liver.*

***E)-ATROPINE CONTAINING PLANT***

*(a)* ***Belladonna***

***Botanical source:*** *Atropa bellodona*

***Fam:*** *Solanaceae*

***Habitat:*** *Kashmir,Muree, and Hazara division*



* ***Symptoms:***

*Overdose can occur from excessive ingestion of the herbal medicine, by accidental poisonings, or intentional ingestion:*

*Symptoms include;*

* *Intense thirst*
* *Visual disturbance*
* *Flushed skin*
* *Central nervous system hyperirritability*
* *Delirium*
* *Rapid Heart beat with elevated temperature .*
* *Subjects may be prone to violence, hallucination, convulsions, coma, and death.*

*(B)* ***Datura alba***

*Datura stramonium*

***Fam:*** *Solanaceae*

***Habitat:*** *Balochistan, Potohar region, Punjab*



***Toxicology of the plants:***

*All the above plants contain tropane alkaloids important one of these are: Atropine, hyoscine and scopolamine, These are present in all parts of the plant. Children have been poisned by eating as few as three berries. Moreover, both adult and children have been victim of poisoning due to ingestion of honey (containing atropine-like constituents i.e alkaloids) similarly, frequently poisoning also occurred in children when seeds of D.Stramonium were ingested.*

***Symptoms:***

*The chief toxic symptoms are those of atropine poisoning: dryness of mouth and throat due to dryness of secretions; extreme thirst, skin become dry and hot. Besides this there are also other toxic symptoms like headache nausea, mental confusion, muscular incoordination, stupor. In case of severe poisoning coma, slow respiration and cyanosis (bluish discolouration of skin due to presence of oxygen deficient blood).*

***F)-CYANOGENETIC PLANTS***

* ***Toxic Principle:*** *Cyanogenetic glycosides or cyanogens (amygdalin, prunasin) .*
* *Hydrogen cyanide (HCN) is formed when the glycosides are hydrolysed by enzymes in plants or by microorganisms*
* *The glycosides occur in vacuoles of plant tissue while the enzymes are found in the cytosol .*
* *Damage to the plant from wilting, trampling, mastication, frost, drought, bruising etc. results in the enzymes and glycosides coming together causing hydrogen cyanide to be formed. Beta- glycosideases are also produced by microorganisms*
* *Occurrence:*

*Found in In North west frontier Pakistan and cultivated.*

* *Mechanism of toxic action:*

*Once free cyanide is released from the plant tissue and is absorbed it reacts with ferric iron (+3) in cytochrome oxidase which halts cellular respiration. Oxyhemoglobin cannot release oxygen for electron transport in the cytochrome system since the cyanide - cytochrome oxidase will not function in electron transport.*

1. ***Manihot esculanta***

***Family:*** *Eupharbiaceae*

***Habitat:*** *The plant is found in sindh*

*Toxic principle: The whole plant, including juice and rhizome contain glycoside Manitoxin which produces HCN on hydrolysis*

1. ***Prunus serotina (wild cherry)***

***Family:*** *Rosaceae*

***Habitat:*** *Balochistan*

***Toxic consitutents:***

*It contains prunasin, which upon hydrolysis release –HCN*

***Symptoms of toxicity:***

*Both the glycoside manitoxin and prunacin, have the similar symptoms of toxicity due to release of hydrocyanic acid; which are:*

*Gastrointestinal tract disturbances e.g vomiting, diarrhea, ataxia, muscular weakness, stupor, cyanosis, headache, dizziness, compulsions and coma leading to death.*

***G)-(PLANTS HAVING NICOTINE-LIKE ACTION:***

*(a)* ***Nicotine/Tobacco***

***Botanical origin:*** *Nicotiana tabacum*

***Family:*** *Solanaceae*

***Habitat:*** *Gilgit, NWFP (Hazara, Swat) and Punjab*

***Toxicology of the plant:***

*Toxic principle is an alkaloid “nicotine”*

***Symptoms of poisoning***

***G.I.T*** *Irritation, nausea, vomiting, increased salivation, diarrhea, abdominal pain.*

***C.N.S.*** *Stimulation of central nervous system, tremors convulsions, headache, dizziness, bad hearing, decrease in blood pressure and vision, weak pulse and mental confusion.*

***Respiratory :*** *Respiratory failure that leads to death.*

*b)* ***lobel or Indian tobacco.***

***Botanical origin:***

* *Lobelia frutescence*
* *Lobelia plumier  
  Lobelia inflate*

***Fam:*** *Lobeliaceae*

*Habitat: sindh.*

***Toxicology of the plant:***

*The drug contain 14-alkaloids, of which lobeline is the most important and major toxic principle. These alkaloids are present in the leaves and tops of the plants. Lobeline occurs as colourless crystals that are soluble in water, but readily soluble in hot alcohol*

***Symptoms of poisoning:***

*Symptoms are like that of nicotine-poisoning but are less pronounced.*



***ROLE OF PHARMACIST IN CONTROLLING POISONOUS PLANTS:***

* ***STEPS OF CONTROLLING POISONOUS PLANT***
* The first step in handling any request is to obtain a thorough history. This way you can determine relevant facts and proceed with appropriate recommendations.
* The second step is to determine urgency. An acute poisoning is an urgent situation that needs to be dealt with immediately, as is contemplating suicide, even if ingestion has not yet occurred.
* The third step is to make a recommendation. The community pharmacist can readily supply the information about a therapeutic error, the patient’s profile and drug information resources available in the pharmacy. The pharmacist can work with the poison control centre to advise patients with particularly complicated problems.

***POISONING CONTROL CENTER***

* *A poison centre is a specialized unit that advises on and assist with the prevention, diagnosis and management of poison.  
  It answers, enquires about exposure to chemical agent including product of pharmaceutics and natural toxins, pesticides and industrial chemicals.  
  It also provides information about treatment and kind of treatment that should be given*
* *In smaller communities where poison control centre do not exist, the pharmacist may be the only knowledgeable person in this field providing guidelines to the local public.*

***POISONING CONTROL CENTERS IN PAKISTAN:***

* *Among other centres, the Faisalabad Poison Control Centre received 1,428 poison cases in 2003, including 789 those taking the wheat pills (aluminum phosphide (56 percent) and other ingredients).*
* *At the Liaquat University Hospital, Hyderabad, 82 cases.*
* *The number of patients reporting at the Jinnah Postgraduate Medical Centre (JPMC) for emergency treatment for poisoning has trebled in the last five years.  
  This was disclosed by Prof Jamal Ara, JPMC’s National Poison Control Centre (NPCC) head, while speaking at the 48th annual symposium of the state-run hospital.*
* ***Conclusion***
* *The need of hour is that the plants having medicinal value should be explore.*
* *Develop awareness among the community about their medicinal uses& properties*
* *Fill the immense gap between the local traditional knowledge&modern medical sciences.*

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