

Review Article

Most Common Toxic Plants of Turkey to Animals: Classification by Target Species/Systems and Management of Poisoning Cases

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Abstract

There are over 30 plants commonly reported to be toxic to animals primarily herbivores. Most of them are ornamental garden and house plants in Turkey as in the worldwide. Toxic parts and principles, toxicity and mechanisms, classifying by toxic effects on the systems and/or organs of animals of the toxic plants has been presented in this review. It also aims to provide an ideal manage of poisoning and will be of value to occupations within the scope of animal science. In toxicological cases including plants, administration of the basic principles of treatment has a vital importance as well as history taking and identification of the plant. Some cases are not usually fatal owing to low toxicity of plants or vomiting occurs spontaneously but some results in death if not managed ideally by owners and veterinary specialists. Thus botanical characteristics of plants for identification, applications for decontamination, toxic principles and target systems or organs for diagnosis and procedures of treatment for ideal manage has been also pointed out.

Keywords: Animal; Toxic Plant

Introduction

Bioactive substances called “toxins” have adverse effects that also produce by plants in many forms. Although many of the medical substances produced by plants, some of them have been reported as toxic such as Foxglove and Lily of the valley, which contains digitalis that prevents heart attacks [1-3]. Plants may cause toxic effects or even death as a result of inadvertent exposure by skin contact/absorption, eye exposure and inhalation or accidental ingestion of the plant parts (seed, fruit, root, etc.) while owners usually does not even suspect their toxic nature [3-6]. In considering any chemical synthesized by a plant, it is important to note that there may be marked variability in the amount due to different portions, the age and genetic differences of the plant, climate and soil influence [2,4]. According to the reports of The American Association of Poison Control Centers; about 11% of poisoning cases of small animals are due to plants and 75% to 80% of calls involve dogs, 15% involve cats [3]. According to another epidemiological study (12 year period) on which conducted in Italy by Human Poison Control Centre of Milan domestic animal poisoning by exposure to plants pointed out that 5.7% of total calls related by plants and the most commonly poisoned species was dog (61.8%) and cat (26%) [7].

The Table 1 includes ornamental garden plants such as *Pyracantha coccinea*, *Ilex* spp., *Cotoneaster* spp., *Cestrum* spp., *Rhododendron* spp., *Taxus baccata*, *Laburnum anagyroides*, *Cassia* spp., *Lonicera* spp., both ornamental garden and house plants such as *Cycas*, *Hemerocallis* spp., *Nerium oleander*, *Convallaria majalis*, *Narcissus* spp., *Hyacinthus orientalis*, *Euphorbia* spp., *Dieffenbachia* spp., *Lilium* spp., *Cycas* spp. and others such as *Daphne* spp., *Melia azedarach*, *Ricinus communis*, *Viscum album*, *Aesculus hippocastanum*, *Cannabis sativa*, *Nicotiana* spp., *Allium* spp., *Digitalis* spp. and also shown in Figure 1 according to their habitats by list number in Chapter 3.

A patient presented with the history of affected by toxic plant should be considered to have a potentially life-threatening problem [8]. As all such cases the history taking has a vital importance in cases of suspected animal poisoning. The interview must include the information about poisoned animal (species, breed, sex, age, body weight, reproductive status, medical problems, medications, diet, home, garden and stroll environment), suspicious plant (household or garden plant, the common or botanical name, picture or pieces, shape of leaves, flowers, fruits, seeds, color etc., ingested part and quantities) [9]. And identification the plant (toxic principles and parts, clinic effects, target species, systems and organs, antidote or special treatment) is also significant in terms of management of cases. The veterinarian faced with a these kind of cases must immediately evaluate the lifesaving procedures and support [8]. Due to unknown toxic characters of plants by owner and ignored in toxicological evaluation by veterinarians they widely unawares use in the environments such as gardens and houses that also animals live.

In this study, we provide an evaluation of poisonous plant species

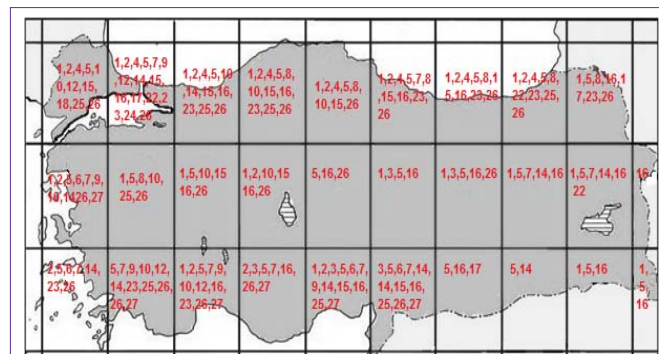


Figure 1: Map of the most common toxic plants habitat of Turkey.

Table 1: Classification of poisonous plants by target species and systems.

1.1 Daphnespp. [8,9,14-16]	
Common name(s)	: Flax olive, lady laurel, mezereon, mezereum, spurge iauier, spurge orive
Target specie(s)	: Cats, dogs and others (all species)
Target system(s)/organ(s)	: Gastrointestinal system, skin
Toxic part(s)	: All parts especially stems and leaves
Toxic principle	: Mezerein (diterpene ester), coumarin (glycoside)
Toxicityand mechanism	: 20-30 ppm coumarin cause severe coagulation defects. Vitamin K function inhibiting
Clinical sign(s)	: Severe mucosal irritation and inflammation, hyper salivation, dysphagia, severe abdominal pain, vomiting, bloody diarrhea, narcosis, muscle twitching
Treatment	: Activated charcoal and fluid therapy
1.2 Euphorbiaspp. [2,8,14,16,19]	
Common name(s)	: Poinsettia (<i>E. pulcherrima</i>), crown of thorns (<i>E. milii</i>), snow on the mountain (<i>E. marginata</i>), pencil cactus (<i>E. tirucalli</i>), creeping spurge (<i>E. myrsinites</i>), hat rack cactus (<i>E. lactea</i>), candelabra cactus (<i>E. candelabrum</i>)
Target specie(s)	: Cats, dogs and others(cattle, sheep, goat)
Target system(s)/organ(s)	: Gastrointestinal system, skin
Toxic part(s)	: Leaves, stems and sap
Toxic principle	: Diterpenoid euphorbol esters that activate protein kinase C, which causes cytoskeletal damage and enzyme dysfunction
Toxicity and mechanism	: Contain blistering compounds that directly irritate the skin, mucous membranes, and gastrointestinal tract on contact
Clinical sign(s)	: Vomiting, salivation, diarrhea, abdominal tenderness and, rarely, pyrexia
Treatment	: Emesis or gastric lavage, use soap or alcohol for skin decontamination, anti-inflammatory drugs are indicated in severe dermatitis and supportive care
1.3 Hyacinthus orientalis [8,14]	
Common name(s)	: Hyacinth, garden hyacinth, oriental hyacinth
Target specie(s)	: Cats, dogs and others (cattle)
Target system(s)/organ(s)	: Gastrointestinal system, skin
Toxic part(s)	: Bulbs
Toxic principle	: Calcium oxalate crystals
Toxicity and mechanism	: Mucous membrane irritation
Clinical sign(s)	: Gastrointestinal distress, nausea, increased salivation, vomiting
Treatment	: Symptomatic care
1.4 Ilex spp. [11,14]	
Common name(s)	: Gall berry, Japanese holly, inkberry, possum haw, yaupon,
Target specie(s)	: Dogs
Target system(s)/organ(s)	: Gastrointestinal system
Toxic part(s)	: All parts especially berries and leaves
Toxic principle	: Ilicin, ilexanthin, ilicic acid (saponins), cyanogenic glycosides and caffeine, theobromine (methylxanthines)
Toxicity and mechanism	:20 berries can be fatal in a large dog
Clinical sign(s)	: Abdominal pain, vomiting, diarrhea, salivation
Treatment	: Activated charcoal, fluid therapy and supportive care
1.5 Loniceraspp. [2,9,11,14]	
Common name(s)	: Honeysuckle, woodbine, twin berry, black twin berry (<i>L. involucrata</i>), Common honeysuckle (<i>L. peirclymenum</i>), Trumpet or coral honeysuckle(<i>L. sempervirens</i>), Fly honeysuckle(<i>L. xylosteum</i>), Perfoliate honeysuckle (<i>L. caprifolium</i>)
Target specie(s)	: Dogs
Target system(s)/organ(s)	: Gastrointestinal system
Toxic part(s)	: All parts especially berries
Toxic principle	: Valerianic acid,xylostein
Toxicity and mechanism	:Low toxicity
Clinical sign(s)	: Abdominal pain, vomiting, diarrhea, depression and lethargy

Treatment	: Emesis or gastric lavage, activated charcoal, fluid therapy and supportive care
1.6 <i>Melia azedarach</i> [2,9,14,16,19]	
Common name(s)	: Chinaberry, Persian lilac, pride of India, Ceylon mahogany, Texas umbrella tree, white cedar, paraiso, piocha, beed tree, bead tree, China tree, Chinese umbrella, hoop-tree, cape lilac, cape syringe
Target specie(s)	: Dogs and others(horse, cattle, sheep, goat, rabbit, rat, guinea pig, poultry)
Target system(s)/organ(s)	: Gastrointestinal and nervous system
Toxic part(s)	: Leaves, bark, flowers especially berries
Toxic principle	: MeliatoxinsA1, A2, B1, B2 (limonoid tetranorterpenes)
Toxicity and mechanism	: 5-6 drupe (0.6-0.7 g/kg) (small dogs)
Clinical sign(s)	: Salivation, vomiting, diarrhea, weakness, ataxia, depression, convulsions
Treatment	: Activated charcoal, narcotic antagonists, sedatives and fluid therapy
1.7 <i>Narcissus</i>spp. [11,14,16,19]	
Common name(s)	: Daffodil, narcissus, jonquil, paper white
Target specie(s)	: Dogs
Target system(s)/organ(s)	: Gastrointestinal system
Toxic part(s)	: All parts, leaves especially bulbs
Toxic principle	: Lycorine (also known as narcissine) and other 15 phenanthridine alkaloids
Toxicity and mechanism	: 15 g of bulbs. A portion of one bulb may be toxic or lethal to small animals.
Clinical sign(s)	: Gastrointestinal distress, nausea, increased salivation, vomiting
Treatment	: Emesis, activated charcoal, atropine, fluid therapy, sucralfate and diazepam if necessary
1.8 <i>Rhododendron</i>spp. [9,11,14,16,17,19]	
Common name(s)	: Azalea, mountain rosebay, red laurel, great laurel, white laurel.
Target specie(s)	: Cats, dogs and others (cattle, sheep, goat, lama, donkey, kangaroo)
Target system(s)/organ(s)	: Gastrointestinal and cardiovascular system
Toxic part(s)	: All parts especially flowers, nectar
Toxic principle	: Grayanotoxins I, II, III (andromedotoxin, rhodotoxin, acetylndromedol) (cardioactive diterpenoids)
Toxicity and mechanism	: 0.2% of bw leaves (7 mg/kg bw of grayanotoxin I for dogs)
Clinical sign(s)	: Hyper salivation, excitation, vomiting, diarrhea, bradycardia, arrhythmias, hypotension, weakness, ataxia, paralysis, coma
Treatment	: Emesis or gastric lavage, activated charcoal, cardiac monitoring and atropine for cardiovascular effects
1.9 <i>Ricinus communis</i> [2,8,9,14,16,18,18]	
Common name(s)	: Castor bean, castor oil plant, higuierilla, palmachristi
Target specie(s)	: Dogs and others (poultry, wild fowl, pig, horse, sheep, and goat)
Target system(s)/organ(s)	: Gastrointestinal system
Toxic part(s)	: All parts especially seeds
Toxic principle	: Ricin and ricinin (toxalbumin)
Toxicity and mechanism	: 1 mg ricin/g seed (rat, dog).Protein synthesis inhibition and cell death
Clinical sign(s)	: Abdominal pain, hemorrhagic diarrhea, dehydration, circulatory collapse
Treatment	: Apomorphine foremesis or gastric lavage, activated charcoal and fluid therapy
1.10 <i>Viscum album</i> [8,11,14,19]	
Common name(s)	: Mistletoe
Target specie(s)	: Dogs
Target system(s)/organ(s)	: Gastrointestinal system
Toxic part(s)	: All parts especially berries
Toxic principle	: Viscotoxins; viscummin (toxalbumin),
Toxicity and mechanism	: Low toxicity. Protein synthesis inhibition
Clinical sign(s)	: Gastrointestinal upset, nausea, vomiting, diarrhea and hypotension

Treatment	: Emesis or gastric lavage and fluid therapy
1.11 <i>Aesculus hippocastanum</i> [11,14,16,20]	
Common name(s)	: Horse chestnut, conker
Target specie(s)	: Cats, dogs and others (cattle, sheep, horse, mule, pig, monkey, fish, birds, bee, exotic, and laboratory animals)
Target system(s)/organ(s)	: Nervous and gastrointestinal system
Toxic part(s)	: Nuts, twigs, flowers, leaves
Toxic principle	: Esculin (coumarin glycoside), escin (saponin), frangula (anthraquinone)
Toxicity and mechanism	:1-2 seed (small animal), 20 seed (horses).Mechanism is unknown
Clinical sign(s)	: Enteritis, excitement, ataxia, muscle twitching, seizures, recumbence, death
Treatment	: Activated charcoal with a laxative, fluid therapy and diazepam if necessary
1.12 <i>Cannabis sativa</i> [8,14,4,9,15,20]	
Common name(s)	: Marijuana, Indian hemp, hashish, ganja, dagga
Target specie(s)	: Dogs
Target system(s)/organ(s)	: Nervous system
Toxic part(s)	: Leaves, flowers, seeds
Toxic principle	: 9-tetrahydrocannabinol (THC) and other cannabinoid compounds
Toxicity and mechanism	: Low toxicity.50-100 mg/kg bw. 9-tetrahydrocannabinol produces the high in the central nervous system is mediated through a G protein-coupled cannabinoid receptor.
Clinical sign(s)	: Depression, dizziness, hypersensitivity to different stimuli, muscle tremors.
Treatment	: Treatment is rarely necessary, activated charcoal, emetics, purgatives, and maintaining body warmth
1.13 <i>Laburnum anagyroides</i> [2,9,11,14,16]	
Common name(s)	: Laburnum, bean tree, golden chain tree, golden rain tree
Target specie(s)	: Dogs and others (cattle, horse, pig)
Target system(s)/organ(s)	: Nervous system
Toxic part(s)	: All parts especially seeds
Toxic principle	: Cytisine (quinolizidine alkaloid);
Toxicity and mechanism	: Low toxicity.6 g/kg of seeds is fatal (dogs).Binds strongly to nicotinic receptors, and at higher doses blockade of the ganglionic receptors
Clinical sign(s)	: Listlessness, muscular spasms and in coordination
Treatment	: Treatment is rarely necessary, activated charcoal and fluid therapy
1.14 <i>Nicotianasp.</i> [9,11,14,16,19,20]	
Common name(s)	: Tobacco, burley tobacco (<i>N. tabacum</i>), tree tobacco, mustard tree (<i>N. glauca</i>), flowering tobacco (<i>N. alata</i>)
Target specie(s)	: Cats and dogs
Target system(s)/organ(s)	: Nervous system
Toxic part(s)	: All parts especially leaves
Toxic principle	: Nicotine, anabasine (pyridine and piperidine alkaloids)
Toxicity and mechanism	: 20-100mg is lethal. Rapidly acting depolarizing agent of sympathetic and parasympathetic ganglia
Clinical sign(s)	: Vomiting, diarrhea, tremors, hypertension, mydriasis, seizures, weakness
Treatment	: Gastric lavage, activated charcoal, antacids, fluid and oxygen therapy, urine acidification and sedatives
1.15 <i>Pyracantha coccinea</i> [11,14]	
Common name(s)	: Firethorn, pyracantha
Target specie(s)	: Dogs and other (birds)
Target system(s)/organ(s)	: Respiratory system
Toxic part(s)	: Berries
Toxic principle	: Prunasin (cyanogenic glycoside)
Toxicity and mechanism	: Low toxicity
Clinical sign(s)	: Cyanosis, respiratory failure

Treatment	: Treatment is rarely necessary, symptomatic care
1.16 Cotoneasterspp. [9,11,16]	
Common name(s)	: Cotoneaster, service berry
Target specie(s)	: Dogs
Target system(s)/organ(s)	: Cardiovascularand respiratory system
Toxic part(s)	: Bark, leaves, flowers
Toxic principle	: Prunasin, amygdalin (cyanogenic glycosides)
Toxicity and mechanism	: Low toxicity. Cyanide combines with iron in cellular cytochrome oxidase to prevent terminal electron transfer and blocks cellular respiration
Clinical sign(s)	: Hyperventilation, decreased blood pressure, hypoxemia-induced convulsions, coma, shock, respiratory failure, death
Treatment	: Sodium nitrite (20% solution, 10 to 20 mg/kg) or methylene blue (1% to 4% solution, 1 g/100 kg bw). 20% thiosulfate solution (<600 mg/kg) IV
1.17 Convallariamajalis [7,9,14]	
Common name(s)	: Lily of the valley
Target specie(s)	: Cats, dogs and others (cattle, sheep)
Target system(s)/organ(s)	: Cardiovascular system and liver
Toxic part(s)	: All parts especially leaves, berries
Toxic principle	: Convalotoxin (cardiac glycosides)
Toxicity and mechanism	: Sodium–potassium–adenosine triphosphatase pump inhibition
Clinical sign(s)	: Lethargy, diarrhea, regurgitation, weakness, bradycardia, arrhythmias and death
Treatment	: Emesis or gastric lavage, activated charcoal with cathartics, serum potassium monitoring and fluid therapy, phenytoin against arrhythmias and use of digitalis antibody is indicated
1.18 Allium spp. [2,14,16,19]	
Common name(s)	: Garlic (<i>A. sativum</i>), onion (<i>A. cepa</i>)
Target specie(s)	: Cats, dogs and other (cattle, sheep, goat, horse)
Target system(s)/organ(s)	: Cardiovascular system
Toxic part(s)	: All parts
Toxic principle	: Disulfides (<i>n</i> -propyl disulfides, allicin), trisulfites, thiosulfonates
Toxicity and mechanism	: 11-15 g/kg/day bw. Erythrocyte membranes damaging and intravascular hemolysis.
Clinical sign(s)	: Heinz body anemia, tachycardia, tachypnea, lethargy, weakness, vomiting, diarrhea, hematuria or hemoglobinuria
Treatment	: Emesis, activated charcoal and blood transfusion in severe anemics
1.19 Dieffenbachiaspp. [2,8,11,14,16]	
Common name(s)	: Dumb cane, dumb cane, poison arum, leopard lily, mother-in-law's tongue.
Target specie(s)	: Cats, dogs and other (cattle, sheep, goat, birds)
Target system(s)/organ(s)	: Cardiovascular system
Toxic part(s)	: All parts especially stems, leaves
Toxic principle	: Calcium oxalate crystals, oxalic acid
Toxicity and mechanism	: Mucous membrane irritation, histamine releasing
Clinical sign(s)	: Edema of the oral mucous membranes (chewing), excessive salivation, difficulty in eating-swallowing, vomiting, sounding weak-hoarse, depression
Treatment	: Flushing the skin, eyes or mouth and anti-inflammatory therapy
1.19 Cestrum spp. [8,9,14,16]	
Common name(s)	: Day blooming jasmine, wild jasmine, Chinese ink-berry (<i>C. diurnum</i>), night blooming jasmine, poison berry (<i>C. nocturnum</i>)
Target specie(s)	: Cats, dogs and other (cattle, sheep, goat, horse, pig, poultry)
Target system(s)/organ(s)	: Musculoskeletal system and liver
Toxic part(s)	: Fruits, leaves, sap
Toxic principle	: 1,25-Dihydroxy-cholecalciferol (calcitriol) (calcinogenic glycosides)
Toxicity and mechanism	: Calcium absorption from the gastrointestinal tract and bone resorption of calcium increasing and renal calcium excretion decreasing
Clinical sign(s)	: Tissue calcification, weeks, develop a syndrome of chronic weight loss, stiffness, reluctance to move, lameness and recumbent

Treatment	: Use of furosemide, prednisolone, saline diuresis, and calcitonin or pamidronate to decrease serum calcium and phosphorus)
1.20 Cassia spp. [16,17]	
Common name(s)	: Coffee senna (<i>S. occidentalis</i>), sicklepod (<i>S. obtusifolia</i>), twin-leaf senna (<i>S. roemeriana</i>)
Target specie(s)	: Dogs and others (cattle, poultry)
Target system(s)/organ(s)	: Musculoskeletal system
Toxic part(s)	: All parts especially seeds
Toxic principle	: Unknown but most species contain quinones
Toxicity and mechanism	: 1% of bw. lysosomal acid phosphatase activity increasing in muscle
Clinical sign(s)	: Muscle weakness, in coordination, reluctance to move, recumbence, diarrhea, myoglobinuria, white to whitish-yellow areas of skeletal muscle, necrosis of skeletal, cardiac muscle, centrilobular necrosis
Treatment	: Prolonged supportive care.
1.21 Hemerocallis spp. [2,9,14,16,17,19]	
Common name(s)	: Day lilies
Target specie(s)	: Cats
Target system(s)/organ(s)	: Kidneys
Toxic part(s)	: All parts especially flowers
Toxic principle	: Un known
Toxicity and mechanism	: 2-3 leaves or part of a flower can be lethal. Mechanism is unknown
Clinical sign(s)	: Salivation, vomiting, depression, anorexia, proteinuria, isosthenuria, polyuria, dehydration, renal failure, anuria, weakness, recumbence, death
Treatment	: Emesis or gastric lavage, activated charcoal with a cathartic, fluid therapy, peritoneal dialysis or hemodialysis if necessary. Urine promote productions are unsuccessful
1.22 Lilium spp. [2,9,14,16,19]	
Common name(s)	: Easter lily (<i>L. longiflorum</i>), tiger lily (<i>L. tigrinum</i>), Japanese show lily (<i>L. hybridum</i>), rubrum lily (<i>L. rubrum</i>), star-gazer lily
Target specie(s)	: Cats
Target system(s)/organ(s)	: Kidneys
Toxic part(s)	: All parts especially flowers
Toxic principle	: Unknown
Toxicity and mechanism	: 2 to 3 leaves or part of a flower can be lethal. Mechanism is un known
Clinical sign(s)	: Salivation, vomiting, depression, anorexia, proteinuria, isosthenuria, polyuria, dehydration, renal failure, anuria, weakness, recumbence, death
Treatment	: Emesis or gastric lavage, activated charcoal with a cathartic, fluid therapy, peritoneal dialysis or hemodialysis if necessary and supportive care
1.23 Vitis venifera [2,14]	
Common name(s)	: Grape
Target specie(s)	: Dogs
Target system(s)/organ(s)	: Kidneys
Toxic part(s)	: Fruits
Toxic principle	: Unknown
Toxicity and mechanism	: 12-31 g/kg bw (grape or raisin). Mechanism is unknown but high sugar intake may affects kidney function.
Clinical sign(s)	: Vomiting, dehydration, weakness, collapse, acute oliguria or anuricrenal failure, increased BUN, creatinine, hypophosphatemia, hyperkalemia
Treatment	: Emesis, activated charcoal, fluid therapy, closely monitoring and peritoneal dialysis if necessary
1.24 Taxus baccata [8,9,11,16]	
Common name(s)	: Yew; English yew
Target specie(s)	: Dogs and others (cattle, sheep, deer, horse, birds, poultry)
Target system(s)/organ(s)	: Heart
Toxic part(s)	: All parts especially aril (fleshy red structure surrounding the seed)
Toxic principle	: Taxines (A, B) (cardioactive glycoalkaloids)
Toxicity and mechanism	: 8 g of bw (dogs), 0.2%-0.5% of bw (cattle), 0.05% of bw (horse). Ca - Na current inhibition. Decreased cardiac contractility, marked slowing of atrial and ventricular rates (Taxine B)

Clinical sign(s)	: Ataxia, mydriasis, abdominal pain, hyper salivation, vomiting, bradycardia, hypotension, hyperkalemia, death
Treatment	: Activated charcoal, gastric lavage or gastrotomy, atropine in bradycardia, pentobarbital or diazepam to control seizures
1.25 Digitalis spp. [8,9,16,16]	
Common name(s)	: Foxglove, common foxglove, long purples, dead men's fingers
Target specie(s)	: Cats, dogs and others (livestock)
Target system(s)/organ(s)	: Heart
Toxic part(s)	: All parts
Toxic principle	: Digitoxin, digoxin (cardenolides)
Toxicity and mechanism	: Na ⁺ /K ⁺ ATPase enzymes inhibition. At low doses, myocardial function is improved, but at high doses cardiac conduction is impaired with resulting arrhythmias, heart block and death
Clinical sign(s)	: Vomiting, abdominal pain, diarrhea, lethargy, bradycardia, ventricular arrhythmias; hyperkalemia
Treatment	: Induced emesis contraindicated because of vagal effects, gastric lavage or activated charcoal with cathartics, serum potassium monitoring and fluid therapy, phenytoin against arrhythmias and use of digitalis antibody is indicated
1.26 Nerium oleander [8,9,14,17]	
Common name(s)	: Oleander, rose laurel, laurel Colorado.
Target specie(s)	: Cats, dogs and others (cattle, sheep, goat, horse, birds, lama)
Target system(s)/organ(s)	: Heart
Toxic part(s)	: All parts especially leaves, stems, roots
Toxic principle	: Oleandrin (cardenolide cardiac glycoside),
Toxicity and mechanism	: 0.005% of bw. Na ⁺ /K ⁺ ATPase enzymes inhibition. At low doses, myocardial function is improved, but at high doses cardiac conduction is impaired with resulting arrhythmias, heart block and death
Clinical sign(s)	: Vomiting, diarrhea, bradycardia, arrhythmias, hyperkalemia, sudden death
Treatment	: Induced emesis contraindicated because of vagal effects, gastric lavage or activated charcoal with cathartics, serum potassium monitoring and fluid therapy, phenytoin, atropine or propranolol against arrhythmias and use of digitalis antibody is indicated
1.27 Cycasspp. [2,9,14,17]	
Common name(s)	: Cycad, sago palm, leather leaf palm, Japanese fern palm
Target specie(s)	: Dogs and others (cattle, sheep)
Target system(s)/organ(s)	: Liver
Toxic part(s)	: Seeds
Toxic principle	: Cycasin, neocycasin A and B, macrozamin (glycosides)
Toxicity and mechanism	: The toxic aglycone methylazoxymethanol (MAM) produce from the glycosides, which alkylates DNA and RNA causing severe hepatic necrosis and also carcinogenic, mutagenic, teratogenic
Clinical sign(s)	: Vomiting, diarrhea, ataxia, seizures, coma, death
Treatment	: Emesis, activated charcoal, sucralfate, H ₂ blockers such as cimetidine, 5% dextrose therapy and blood transfusion if necessary

respect of toxicology by useful information of botanical characteristics of plants for identification. The final objective is to list potential toxic plants of Turkey by target species, system and/or organs and toxic principles for diagnosis. Data could be useful for poison centers to support the animals that ingested suspicious plants and to define the suitable medical treatments rapidly for veterinary specialists such as applications for decontamination.

The Basic Principles of General Treatment

Decontamination [8-13]

- Flushing with water or sterile saline solution (eye exposure)
- Bathing and rinsing (dermal exposure)
- Emesis (<3 hours)

Apo morphine: 0.02-0.04mg/kg IV, IM, 0.1mg/kg subcutaneous (SC)

Xylazine: 0.1 mg/kg IV; 0.5-1mg/kg IM, SC

Syrup of ipecac: 1-2 ml/kg (dogs), 3.3 ml/kg (cats) per os (PO)

- Hydrogen peroxide: 1-5 ml/kg PO Gastric lavage (<2 hours)

Water or physiologic saline: 10 ml/kg

- Prevention of absorption

Activated Charcoal: 2-5g/10-50ml water/kg PO (q2-4h for 2-3 days)

(Activated charcoal (10-20 %) and cathartics can be combined)

Cathartics (<2 hours): Sorbitol (1-2 ml/kg), magnesium citrate, magnesium sulphate or sodium sulphate

Enhancement of elimination [8,9,11,13,14]

- Diuresis

Solutions: 130 ml/kg/24h IV (0.9% NaCl and 5 % glucose)

Diuretics: Furosemide 5mg/kg IV (q6-8h)

Mannitol: 1-2g/kg IV (q6h)

- Peritoneal dialysis and hemodialysis
- Exchange transfusion
- Blood transfusion
- Gastrotomy

Symptomatic and supportive care [8,9,11,12]

- Keeping the airway open
- Prevention of arrhythmia, hypotension and collapse, manage shock
- Prevention of convulsion
- Promoting of acid-base balance
- Treatment of hypoglycemia, hypothermia, hyperthermia
- Prevention of acute renal failure and cerebral edema

Toxic Plants

Poisonous plants that contain toxic substances of quantities may cause diseases or death in animals [3]. Assessed within this scope, most common toxic plants have been given in Table 1. Depending on the ingestion of these plants, damages in many systems and clinical symptoms occurs. Most toxic of all is *Ricinus communis* that contains one of the most toxic chemical "ricin" where *Melia azedarach* is toxic to the largest species of animal species (dog, horse, cattle, sheep, goat, rabbit, rat, guinea pig, poultry, and birds) and the most common target system is gastrointestinal for most of the cases occurs by ingestion [1].

Conclusion

Although not all are fatal, the poisonous cases are increasing with parallel widespread use in houses, gardens or landscapes. While it is vitally important for both owners and veterinarians which plants are potentially toxic and the management of the cases is not well known due to the limited publications. One of the most significant parts of the management is the identification of the plant. This has a vital importance because of provides information such as which toxic principles have, how kind of effects on which systems or organs and is there any antidote or special treatment. Diagnosis of plant poisoning is usually difficult wherefore cases often has not specific clinical signs and may not observed the exposure except chewed or remnants of plants in vomitus. The toxic characteristics of plants must be considered by caution symbols where they use. These properties also must be specified in the label at the point of sale and using. In

addition, due to regional differences plays a role on toxicity of plants, poison control centers and professionals must have data on this issue.

References

1. Gilbert SG. A Small Dose of Toxicology. 2nd Ed. Healthy World Press. 2012; 187.
2. Botha CJ, Penrith ML. Potential plant poisonings in dogs and cats in southern Africa. J S Afr Vet Assoc. 2009; 80: 63-74.
3. Bhatia H, Manhas RK, Kumar K, Magotra R. Traditional knowledge on poisonous plants of Udhampur district of Jammu and Kashmir, India. J Ethnopharmacol. 2014; 152: 207-216.
4. Bruni I, De Mattia F, Galimberti A, Galasso G, Banfi E, Casiraghi M, et al. Identification of poisonous plants by DNA barcoding approach. Int J Legal Med. 2010; 124: 595-603.
5. Tamilselvan N, Thirumalai T, Shyamala P, David E. A review on some poisonous plants and their medicinal values. Journal of Acute Disease. 2014; 85-89.
6. Slaughter RJ, Michael D, Beasley G, Lambie BS, Wilkins GT. Poisonous plants in New Zealand: a review of those that are most commonly enquired about to the National Poisons Centre. N Z Med J. 2012; 125: 87-118.
7. Caloni F, Cortinovis C, Rivolta M, Alonge S, Davanzo F. Plant poisoning in domestic animals: epidemiological data from an Italian survey (2000-2011). Vet Rec. 2013; 172: 580.
8. Gfeller RD, Messonnier SP. Handbook of Small Animal Toxicology and Poisonings. Mosby, Inc., 1998; 269-352.
9. Peterson ME, Talcott PA. Small Animal Toxicology. 2nd ed. Elsevier Saunders. 2006; 1002-1008.
10. Peterson ME, Talcott PA. Small Animal Toxicology. 3th edn. Elsevier Saunders. 2013; 357-400.
11. Campbell A, Chapman M. Handbook of Poisoning in Dogs and Cats. Blackwell Science Ltd. 2000. 7-258.
12. Kaya S, Pirincci I, Bilgili A. Toxicology in Veterinary Science. 2nd edn. Medisan. 2002; 53: 181-384.
13. Kaya A. Medical Botany and Medicinal Plants. Medisan. 2008; 68: 23-276.
14. Knight AP. A Guide to Poisonous House and Garden Plants. Teton New Media. 2007; 8-403.
15. Duncan L. Small Animal Toxicology. Elsevier Saunders. 2006; 345-410.
16. Plumlee K. Clinical Veterinary Toxicology. Elsevier Saunders. 2004; 337-442.
17. Roder JD. Veterinary Toxicology: The Practical Veterinarian. Butterworth-Heinemann. 2001; 105.
18. Hong IH, Kwon TE, Lee SK, Park JK, Ki MR, Park SI, et al. Fetal death of dogs after the ingestion of a soil conditioner. Exp Toxicol Pathol. 2011; 63: 113-117.
19. Signe JP. Emergency Procedures for the Small Animal Veterinarian. Elsevier Saunders. 2013; 793-800.
20. Klaassen CD. Casarett and Doull's Toxicology. The basic science of poisons. 7th edn. McGraw-Hill Companies, Inc. 2008; 1103-1104.