

Plant Poisoning: Increasing Relevance, a Problem of Public Health and Education. North-western Italy, Piedmont region.

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Abstract

Indoor and outdoor plants are responsible for a rising number of accidental poisonings. Plant ingestions are among the top five causes of accidental poisonings in children younger than 5 years. Pets are also frequent victims of plant poisonings. Young children and pets will often chew and eat anything within reach, no matter how it tastes or if it is bitter. Eating a small amount of a plant may not always be a problem, but large or repeated doses may be extremely harmful. There is no easy test for knowing poisonous plants from those that are safe. Don't assume a plant is safe for humans just because animals or birds eat it without harm, and heating and cooking do not necessarily destroy the toxin in a mushroom or a plant. Regarding plant exposures and/or poisonings in Piedmont region, on average fifty cases per year were monitored by the Milan Poison Control Center at the Niguarda Hospital, Italy. This study was divided into provinces, ages and sex, place of exposures (home, school, at work); in addition some cases of group intoxication were monitored. Many plants cause nausea, vomiting, abdominal cramps and diarrhea. Some plants have substances that are very irritating to the tongue, mouth and skin. The expositions mainly regard houseplants, garden or vegetable-garden plants, but the most severe and dangerous expositions are due to wild plants.

Key words: poisonous plants, children, pets, Milan Poison Control Center, Piedmont region

INTRODUCTION

In spring people are attracted to life in the open air, and start going for walks in the woods and countryside especially during the week-end. Toxic plants and mushrooms may be eaten by curious children, by hikers or amateur herbalists who sometimes confuse edible and non edible species. Unfortunately many people are convinced that natural products are all safe, and wild plants are better for the health than cultivated ones. There is no scientific proof concerning this topic, and unfortunately this belief can cause serious and severe health problems especially if poisonous wild plants are mistakenly considered edible. We must be extremely cautious when studying edible plants. Many plants that are edible have poisonous lookalikes or one part of the plant may be edible while another part not. A lot of practice and experience is necessary to get to know the plants of a certain area. The best solution is not to eat anything that you are not 100% sure of. Poisonous plants contain toxic substances that can harm children and adults. Some plants produce toxin themselves while in others the toxin is produced by micro-organisms growing on or inside the plant. Some have thorns that can cause physical injury. There are also certain plants that cause sickness or even death immediately after ingestion while with other plants clinical symptoms may not become apparent for several days or weeks.

For example, *Allium ursinum* L. (wild garlic) is a

popular spice and vegetable. When not in flower, the leaves may be confused with the leaves of *Colchicum autumnale* L., a toxic plant containing colchicine. Several accidental poisonings caused by the ingestion of Meadow Saffron *C.autumnale* mistaken for Ramsons *A.ursinum* have been described in literature. The lethal dose for colchicines is 0.5 mg /w [1]. Or, alternatively, *Allium ursinum* leaves can be confused with *Convallaria majalis* leaves. The Lily-of-the-valley, *C. majalis*, contains convallarin and related cardioactive glycosides with physiological effects similar to those of the *Digitalis*, but the concentration in the leaves is comparatively low, and, as a consequence, life-threatening conditions due to poisoning seldom occur. Many cases of accidental colchicine poisoning were reported as all three plants grow in the same habitat and are easily confused [2].

Digitalis sp. leaves are sometimes picked confusing them with *Borago officinalis*, and are eaten as cooked vegetables, but *Digitalis* leaves contain cardiac glycosides, that are toxic for healthy people [3]. We herewith wish to present a retrospective analysis on plant ingestion reported to the Milan Poison Control Center at the Niguarda Hospital, Milan, Italy. All the phone calls of plant poisonings received from January 2008 through to January 2010, were classified according to an operational procedure on the basis of agent, clinical presentation, age group affected, origin of

the phone call, and time from exposure to the toxic agent. Of 36,580 consultations received, 156 were poisonings due to ingestion of plants or mushrooms, and 53.9% of them affected children < 6years. Most patients were symptomatic at consultation, with digestive, neurological, anticholinergic or cutaneous symptoms. The most frequent accidental ingestion was of elephant's ear (*Colocasia* sp) by children, causing digestion problems, or by intentional ingestion of black henbane (*Hyoscyamus niger*) by adolescents, causing anticholinergic symptoms. Plant poisonings are an uncommon event, but can seriously compromise the health of those that ingest them. Despite the low incidence, public and medical community education is essential to prevent and manage these poisonings efficiently.

MATERIAL AND METHODS

Exposure and data concerning poisoning are obtained by examining anonymous medical files concerning expositions and/or poisonings occurred between 2008 and 2009 in the north-west of Italy, (Piedmont region) and registered by the Milan Poison Control Center at Niguarda Hospital. According to the International Programme of Chemical Safety (IPCS) within the World Health Organization (WHO) Guidelines [4], the Poison Center is a specialized unit providing information about poisoning, in principle to the whole community. The duties of the Poison Center are to provide information and advice about different causes regarding toxic substances, the management of the problems and the necessary follow-up depending on the different cases. To provide an effective information service and help in the prevention and management of the deleterious effects of toxic chemicals on human health and on the environment, it is essential for Poison Centers to cooperate closely with a wide range of partners, particularly with other professional and social institutions that can contribute to effectively supply information to the Centers. For example, specialists in fields such as botany and zoology can assist in the rapid identification of toxic plants or animal species. In all cases of exposures, drugs and ingested quantities are hypothetically reported by the patient or family and are not always reliable. Referring to the poison presumably ingested, the physician has to evaluate the initial severity and the potential toxicity in order to define monitoring and treatment. In cases of exposure to a plant, the cooperation between the physician and the botanist is important in order to identify the plant: the poisoning can be confirmed (or not) by the presence of one or more clinical symptoms. It was

only possible in a few cases to have a specimen of the entire plant, including the root. Usually the sample for the identification was a plant fragment either fresh, cooked, dried, frozen, conserved in olive oil, in aromatic wine or a fragment obtained from the gastric content of dead or living patients. Accurate and rapid identification of a poisonous plant is essential for the rational management of the patient suffering from poisoning. In some cases we performed a remote rapid identification of a plant using on-line transmission of photos taken with a mobile-phone camera.

RESULTS

Every year in Italy the Milan Poison Control Center manages a 24-hour hotline which is staffed by clinical toxicologist physicians. From the electronic database of all calls (about 12.500 per year), the data of plant poisonings were extrapolated. In the 2008 – 2009 period, in Italy, 1826 clinical cases due to plant poisoning and corresponding to 2% of all calls, were registered (Table I). The expositions mainly regard houseplants, garden or vegetable-garden plants, but the most severe and dangerous expositions are due to wild plants. Of all the cases studied, 109 were from the Piedmont region (Table II).

Table I - Total clinical cases of plant poison from Italy

<i>Italy - Total clinical cases</i>		
<i>year</i>	<i>2008</i>	<i>2009</i>
Men	902	845
Female	40	39
Total	942	884

Table II - Calls from Piedmont region

<i>Piedmont region</i>		
<i>year</i>	<i>2008</i>	<i>2009</i>
Men	54	47
Female	4	4
TOTAL	58	51

The Milan Poison Control Center of Niguarda Hospital is also contacted by pet owners (cats, dogs and other pets) whose animals are supposedly suffering from plant intoxication (Table III). Three cases of acute poisoning were registered in dogs and one in a cat in 2008, while there were 4 cases for cat poisonings in 2009. The three dogs had ingested *Ilex aquifolium*, *Nerium oleander*, *Datura stramonium*, while the cats had eaten *Hydrangea* sp., *Lilium* sp., *Capsicum* sp., *Petroselinum* sp. and *Iris* sp. All the animals had vomited (one to six time a day) and two animals presented diarrhea; they received pharmacological treatment at the Emergency Department. Four poisonings were registered as severe, three as

moderate, one as mild. In one case in which a dog seemed to have eaten *Datura stramonium* leaves, no connection was evidenced between the supposed plant toxin and the manifested symptoms, perhaps due to a pre-existing pathology. In particular the oleander plant (*Nerium oleander*), contains cardiac glycosides poison which produces symptoms similar to those of foxglove poisoning. Oleander poisoning is often caused by the ingestion of dead or dried leaves which apparently are more palatable to animals than the fresh green leaves.

Table III - Clinical cases for plant intoxication registered for cats and dogs

Piedmont region 2008-2009		
PROVINCE	pets	%
Alessandria	1 cat	12,50
Asti	0	0,00
Biella	0	0,00
Cuneo	1 dog	12,50
Novara	1 cat	12,50
Torino	5 2 cats, 3 dogs	62,50
Verbania	0	0,00
Vercelli	0	0,00
TOTAL	8	100,00

Regarding human exposures and poisonings, the study was divided into provinces (Table IV), and

sex (poisonings in men are more frequent Table II); in addition some cases of group intoxication were monitored (Table V). The level of toxicity of poisons varies greatly, as do the reactions or symptoms. Reactions can vary from mild (including nausea or skin irritation) to severe (including seizures, cardiac failure, liver or kidney failure, coma or death). As reported in Table V, two poisonings occurred at school, only one group of children received a decontamination treatment with activated charcoal; no symptoms were evidenced and the event was not classified poisoning. Only one event occurred in the open-air with repeated diarrhea and vomiting, in this case intravenous rehydration was necessary. A case report was registered for the consumption of *Digitalis purpurea* instead of borage leaves. The heart's electrical activity was monitored, intravenous rehydration was necessary due to repeated diarrhea and vomiting episodes. Two reported cases occurred at home and were due to borage and another one was due to *Arbutus unedo* (strawberry tree or apple of Cain), and they were classified as mild poisoning. The case report regarding only a single patient, was analysed in order to evaluate the place of poisoning (Table VI). In a percentage 80,7% (n=88) the exposure or poisoning occurred at home.

Table IV - Province distribution of intoxications in Piedmont region, 2008 and 2009 years

Piedmont region 2008-2009										
province	%		female		male		Group intoxication		unknown	
Alessandria	12	11,00	4	10,50%	6	11,30%	0	0,00%	1	16,67%
Asti	7	6,40	1	2,60%	5	9,40%	0	0,00%	1	16,67%
Biella	2	1,80	1	2,60%	1	1,90%	0	0,00%	0	0,00%
Cuneo	23	21,10	7	18,40%	11	20,80%	1	25,00%	4	66,67%
Novara	13	11,90	5	13,20%	4	7,50%	3	75,00%	0	0,00%
Torino	41	37,60	16	42,10%	19	35,80%	1	25,00%	0	0,00%
Verbania	3	2,80	2	5,30%	1	1,90%	0	0,00%	0	0,00%
Vercelli	8	7,30	2	5,30%	6	11,30%	0	0,00%	0	0,00%
	109	100,00	38	100,00%	53	100,00%	4	100,00%	6	100,00%

Table V - Group intoxications in 2008 and 2009

Piedmont Region					
Year	Plant	Place	Symptoms	Treatment	Epicrisis
2008	<i>Acacia dealbata</i>	school	No	No	No intoxication
	<i>Calicanthus</i> sp.	school	No	Yes	No intoxication
	<i>Wisteria sinensis</i>	open-air	yes: diarrhea, vomiting	Yes	Moderate
	<i>Digitalis purpurea</i>	home	yes: bradychardia, diarrhea, vomiting	yes	Moderate
	<i>Cucurbita</i> sp.	home	No	No	No intoxication
2009	<i>Borago officinalis</i>	home	Yes: diarrhea, vomiting	yes	Mild
	<i>Colchicum</i> sp.	home	No	yes	No intoxication
	<i>Arbutus unedo</i>	home	yes: diarrhea, vomiting	yes	Mild

Table VI - Place of exposures or intoxications

Province	At home	%	Open-air	%	At work	%	At school	Plant species	%	NN
Alessandria	11	12,5	1	7,7	0	0,0	0	unknown	0,0	0
Asti	6	6,8	0	0,0	1	50,0	0	unknown	0,0	0
Biella	2	2,3	0	0,0	0	0,0	0	unknown	40,0	0
Cuneo	16	18,2	3	23,1	1	50,0	2	1 <i>Prunus laurocerasus</i> – Cherry laurel 1 <i>Chimonanthus</i> sp. - Wintersweet	20,0	1
Novara	8	9,1	4	30,8	0	0,0	1	1 <i>Acacia</i> sp.	20,0	0
Torino	37	42,0	3	23,1	0	0,0	1	unknown	0,0	0
Verbania	2	2,3	1	7,7	0	0,0	0	unknown	20,0	0
Vercelli	6	6,8	1	7,7	0	0,0	1	1 <i>Eleagnus angustifolia</i> Oleaster	100,0	0
TOTAL	88	100,0	13	100,0	2	100,0	5		0,0	1

Plant poisoning in the work environment. It is interesting to note that poisoning can also occur in work environments. Two cases were studied: a 40 year old man suffering from tremors and vomiting about one day and a half after a skin lesion caused by *Cycas* sp. (better known as Crozier cycas) and a woman suffering from a local pain and localized edema due to a lesion caused by *Opuntia* sp. (better known as Prickly pears) ; the symptoms persisted for about 25 days.

Cases have also been found in the school environment with two multiple cases already mentioned and other three cases involving:

1. A six year old girl who could have eaten either *Laurus nobilis* or *Prunus laurocerasus* about an hour before reporting the problem and, although symptoms were not apparent, the patient underwent therapy with activated

charcoal.

2. A three year old boy whose parents contacted Milan Poison Control Center about six hours after exposure to a non identified plant and who was suffering from abdominal pains.
3. A four year old boy who had swallowed a piece of Oleaster an hour previously but no symptoms were present. He was also treated with activated charcoal.

Ages and gender involved are reported in Table VII. The principle ages involved were between 0 and 4 years old for both boys and girls, and taking into consideration Table 6, the home also represents a risk area as far as plants are concerned. Plants responsible for exposure and/or poisoning were identified and reported in Table VIII.

Table VII – Ages and gender involved

	Ages	Total	Male	%	Female	%
2008	<1	10	4	8,2	6	12,2
	1-4	23	13	26,5	10	20,4
	5-9	2	1	2,0	1	2,0
	10-14	0	0	0,0	0	0,0
	15-18	0	0	0,0	0	0,0
	19-64	9	6	12,2	3	6,1
	≥65	3	1	2,0	2	4,1
	Unkwnon	2	2	4,1	0	0,0
	Total		49	27	55,1	22
2009	<1	11	7	15,9	4	9,1
	1-4	18	11	25,0	7	15,9
	5-9	3	3	6,8	0	0,0
	10-14	4	2	4,5	2	4,5
	15-18	0	0	0,0	0	0,0
	19-64	4	3	6,8	1	2,3
	≥65	2	0	0,0	2	4,5
	Unkwnon	2	0	0,0	2	4,5
	Total		44	26	59,1	18

Table VIII – Poisonous plants involved in exposures and/or intoxications, with symptoms

Plant common name	Plant latin name	Cases number	Symptoms	
			yes	no
Acacia	<i>Acacia dealbata</i>	2	0	2
Azalea sp.	<i>Azalea</i> sp.	2	0	2
Barberry	<i>Mahonia</i> sp.	1	0	1
Bitter Nightshade	<i>Solanum dulcamara</i>	1	0	1
Borage	<i>Borago officinalis</i>	1	0	1
Butcher's broom	<i>Ruscus aculeatus</i>	4	0	4
Calla lilly	<i>Zantedeschia aethiopica</i>	2	0	2
Cherry laurel	<i>Prunus laurocerasus</i>	4	1	3
Chinese wisteria	<i>Wisteria sinensis</i>	5	3	2
Crozier Cycas	<i>Cycas</i> sp.	1	1	0
Cucurbita sp.	<i>Cucurbita</i> sp.	1	0	0
Deadly nightshade	<i>Atropa belladonna</i>	1	1	0
Dumb cane	<i>Dieffenbachia</i> sp.	4	1	3
Elder	<i>Sambucus</i> sp.	2	1	1
Eucalyptus	<i>Eucalyptus</i> sp.	1	1	0
European yew	<i>Taxus baccata</i>	2	0	2
False strawberry	<i>Potentilla indica</i>	2	1	1
Fire thorn	<i>Pyracantha</i> sp.	1	0	1
Flamingo flower	<i>Anthurium</i> sp.	2	1	1
Foxglove	<i>Digitalis purpurea</i>	2	1	1
Golden chain tree	<i>Laburnum anagyroides</i>	1	0	1
Guarana shrub	<i>Paullinia cupana</i>	1	1	0
Hazelnut	<i>Corylus avellana</i>	1	0	1
Heavenly bamboo	<i>Nandinia domestica</i>	1	1	0
Hemlock	<i>Conium maculatum</i>	2	0	0
Holly	<i>Ilex aquifolium</i>	3	0	3
Honeysuckle	<i>Lonicera</i> sp.	1	0	1
Hydrangea	<i>Hydrangea</i> sp.	1	0	1
Jasmine	<i>Jasminum</i> sp.	1	0	1
Jerusalem cherry	<i>Solanum pseudocapsicum</i>	2	0	2
Jonquil	<i>Narcissus</i> sp.	1	0	1
Lily of the valley	<i>Convallaria majalis</i>	1	0	1
Magnolia	<i>Magnolia</i> sp.	1	0	1
Marigold	<i>Calendula</i> sp.	1	0	1
Meadow saffron	<i>Colchicum</i> sp.	1	0	1
Mistletoe	<i>Viscum album</i>	1	0	1
Mountain arnica	<i>Arnica montana</i>	1	0	1
Oleaster	<i>Elaeagnus</i> sp.	1	0	1
Olive tree	<i>Olea europaea</i>	1	1	0
Passion flore Cp	<i>Passiflora</i> sp.	1	1	0
Poinsettia	<i>Euphorbia pulcherrima</i>	4	1	3
Pokeweed	<i>Phytolacca</i> sp.	1	0	1
Pothos	<i>Epipremnum aureum</i>	1	0	1
Prickly pears	<i>Opuntia</i> sp.	1	1	0
Storksbill	<i>Pelargonium</i> sp.	2	0	0
Strawberry tree	<i>Arbutus unedo</i>	1	1	0
Thorn-bush	<i>Prunus</i> sp.	1	0	1
Unknown berries		4	3	1
Unknown plants or herbs		8	5	3
Unknown seeds		1	0	1
Unkwnon herbs from herbal shop		2	1	0
Unkwnon homeopathic product		1	0	1
Virginian creeper	<i>Parthenocissus tricuspidata</i>	1	0	1
Weeping fig	<i>Ficus benamina</i>	3	1	2
White hellebore	<i>Veratrum lobelianum</i>	3	2	1
Willowleaf cotoneaster	<i>Cotoneaster salicifolia</i> "repens"	1	0	0
Wintersweet	<i>Chimonanthus</i> sp.	1	0	1

CONCLUSION

Children and pets are curious by nature. Most children are attracted to flowers. Fragrant and beautiful they are often irresistible to little hands, mainly during the oral stage of psychological development when everything goes in the mouth. [5] Among pets, dogs in particular have a tendency to hunt small game, or explore out-of-the-way places such as woodpiles, weed thickets and storage ports. This puts them into contact with insects, dead animals and toxic plants. A special consideration should be made for the houseplant *Cycas revoluta*, better known as sago cycad or sago palm. *C.revoluta* is extremely poisonous for animals (and humans) if ingested. Pets are at particular risk since they seem to find the plant very palatable. Clinical symptoms of ingestion will develop within 12 hours and may include vomiting, diarrhea, weakness, seizures, liver failure, or hepatotoxicity characterized by icterus, cirrhosis, and ascites. The pet may appear bruised, have nose bleeds (epistaxis), melena (blood in the stool), hematochezia (bloody straining), and hemarthrosis (blood in the joints). The Animal Poison Control Center (ASPCA) estimates a fatality rate of 50 to 75 percent when ingestion of the sago palm is involved [6], and the Niguarda Hospital Poison Center has also registered this serious problem.

It's important to know what poisonous plants may be near where you live, and even in your own home. The best way to keep children safe from poisonous plants is to make sure younger children do not taste or eat any part of a plant and instruct

older children on how to recognize poisonous plants: teach older children not to eat anything straight from a plant or bush.

In summary we need to remember that health problems may arise from contact or ingestion of native or non-native plant species, either ornamental or weeds.

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 (40% ca.) are from natural compounds obtained from poisonous plants. Scientists are always searching for toxic plants, in order to kill malignant cells or to defeat a disease.

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