

Department of Botany
University of Veterinary Medicine Budapest

Poisonous plants for horses and companion animals in Ireland

Lucia Baily

Supervisor: Dániel Cserhalmi

Department of Botany

2021

Contents

1. Introduction.....	1
2.Relevance to the owner	2
2.1 Identification	2
2.2 Toxicity of the plant.....	3
2.3 Geographical location of plants in Ireland	4
3. Poisonous plants for equines	6
3.1 Ragwort	6
3.2 Foxglove	10
3.3 Sycamore tree	12
3.4 Buttercup.....	14
3.5 Poison hemlock	16
4. Poisonous plants for companion animals	18
4.1 True Lily	18
4.2 Rubber fig.....	21
4.5 Rhododendron	25
4.6 Daffodil.....	27
5. Conclusion	29
Bibliography	31
Acknowledgements.....	36

1. Introduction

Plants are all around us in our everyday lives. Some may be kept to look good as house decorations. Other plants may just be growing naturally outdoors in gardens and pastures. Most of them are generally of low risk to animals, but some can pose a serious threat to animals. It is the responsibility of animal owners to educate themselves in differentiating between both poisonous and safe plants for their animals to be around.

Companion animals living indoors may be left at home alone all day long and become bored easily. They begin to explore and play with the plants. One reason for companion animals to nibble on plants is to induce vomiting. This is commonly witnessed in dogs with an upset gastrointestinal tract or even in cats needing to spit up a hairball. Nutritional deficiencies are another cause of plants being eaten. If the animal is lacking in a vitamin or mineral in its diet it may turn to plants for an additional source. Kittens may turn to eating grass and plants for their high folic acid content, found in the mother's milk during lactation. Horses can easily ingest poisonous plants also through undetected toxic plants in hay or haylage or even from heavy infestation of plants in their pasture particularly when no other source of food is available.

There are many ways that animals can be stopped from eating plants. Nontoxic sprays can be put on plants, while keeping the animal stimulated with minimal boredom to prevent them from eating it. Horse owners should purchase reliable hay or haylage that is free from toxic plants that could accidentally be present when manufacturing feedstuff. The most important prevention is to avoid poisonous plants around your animals. Ignorance of owners is the most likely cause of their pets ingesting poisonous plants. Owners must be knowledgeable about plants in their homes and surrounding areas where their pets are kept. Once the owner can identify which plants are poisonous and not to their animal they can be simply removed or kept out of reach of their animal.

In my thesis I present the most important and common plants that are poisonous for horses and companion animals in Ireland. The aim of this paper is to demonstrate the relevance of identifying toxic plants for animals and the specific prevention and treatment measures in

place in the event of the animal ingesting one of these poisonous plants. Plant toxicity is not only a problem in today's world, but a significantly rising problem especially in Ireland.

2.Relevance to the owner

2.1 Identification

When an animal ingests a plant of unknown origin it is difficult to understand what clinical signs and symptoms to expect. The owner should take a sample or photograph of the plant that was in contact with the animal and bring it to their veterinarian or local garden centre to help determine the plant. Particular attention should be paid on the height of the plant, the color of its leaves or flowers or whether it produces fruits or seeds. These are key features that should be observed with any plant when trying to identify it. Typical appearances of poisonous plants include shiny leaves, umbrella shaped or the production of white berries. (Rhodes, 2021)

It is important to note that different parts of a plant can be poisonous such as the leaves, berries, tuber or seeds either from ingestion or simply just by touching off them. It is essential to determine the correct plant the animal has been exposed to. Different plants affect different parts of the body. Some target the liver, heart, central nervous system, gastrointestinal system or even the skin. (W.K. Rumbelha, 2014) Correct identification is necessary for appropriate management. Mistakes in identification of the plant can be detrimental to the animal if poisonous plants are mistakenly identified as safe plants leading to delayed treatment and possibly death.

Plants are classified by common and botanical names. For example, Ragwort is botanically known as *Senecio Jacobea* . When trying to select what plant your animal has been exposed to it is important to take into consideration the season of the year. Studies show that acorns and berries are more commonly ingested during the autumn. Whereas during the winter plants such as holly tend to cause toxicity in animals. (Animals1stVets, 2019)

2.2 Toxicity of the plant

A poisonous plant may contain one or more toxic substances. These substances can be put into groups. Some examples of major groups include alkaloids, glycosides, oxalates, saponins or nitrites. For example in my thesis I will discuss the oxalate group. Oxalates typically occur in species of Araceae family. The oxalic acid can be water soluble or insoluble. Water soluble oxalic acid causes hypocalcaemia, tetany, renal tubule damage and disturbances in the bone. Whereas water insoluble oxalates are stored in idioblast cells and penetrate the mucus membranes and skin causing inflammation. All parts of the plant will be poisonous for all species containing oxalic acid (Vet girl on the run, 2021). Owners must take note that not all plants are entirely toxic. Some plants may only contain toxic substances in its leaves, stem or seeds.

It has been proved that some of the toxins found in plants can cause reactions simply just from touching the skin while others must be ingested to take effect on the animal. However some toxic substances can be of a benefit to humans. The cardiac glycoside foxglove has been proven to aid in human medicine in low amounts with its ability to increase and strengthen heart contractions.

Once the plant has been identified, it is easier to determine the concentration of toxic materials obtained by the animal. This concentration depends on a few factors, the location or region of the plant, the season, part of the plant that is toxic and its growth stage. The quantity of toxic plant material ingested by the animal must also be taken into account when trying to study and treat the poisoning. The consequence of poisonings depends on factors such as amount of poisonous substance ingested, over what period of time has the toxins been absorbed by the animal's body or the state of the animal at the time of ingestion. (M.Ensley, 2020)

Indeed, knowing the way substances may induce toxic effects in equines and companion animals can be useful in allowing easier diagnosis and treatment processes.

2.3 Geographical location of plants in Ireland

Plants are distributed all around Ireland. Their location depends on factors such as altitude, aspect for sunlight, soil type for nutrient uptake, time of the year, climate or even the presence of grazing animals in the area. (Brownie, 2020)

Ireland has a mild wet climate. Some plants favor these harsh weather conditions with average temperatures throughout the year. One example is the sycamore tree. This poisonous tree can withstand harsh wind and rain with its tough bark. It can be found along coastal areas or regions exposed to wind break, making it very suitable for Ireland, a typical coastal island. However Irelands unpredictable weather can lead to flooding of the landscape. Most plants cannot withstand this sudden increase in rainfall. Although some plants such as fern thrive in water logged areas leading to these type of water loving plants to become more popular in Ireland.

Peaty soils are distributed around Ireland in areas with wetter and colder climates. This soil is of an acidic nature. Plants usually find this soil type difficult to thrive in however coniferous trees such as pine or yew trees are able to lay their roots easily into it. One particular poisonous plant that thrives on this type of acidic soil of PH 4.5-6 in Ireland is rhododendron. When the PH is not correct for this toxic plant the leaves will turn a yellow color (The American rhododendron society, 2021). **Figure 1.** shows that blanket peats are typically found along the west of Ireland.

The West of Ireland is known for its poor quality land. It is mostly used for feeding animals on its infertile overgrazed landscape. Overgrazed land gives rise to soil erosion as all the plants protecting the soil are eaten by the animal and will no longer hold the soil together. Overgrazing is also another cause for water ponding on the land's surface because of a lack of infiltration. A typical poisonous plant that thrives on this type of land quality is ragwort. Plants like ragwort grow well on poorly managed land and will not stop multiplying until they are removed either manually by hand or by using herbicides.

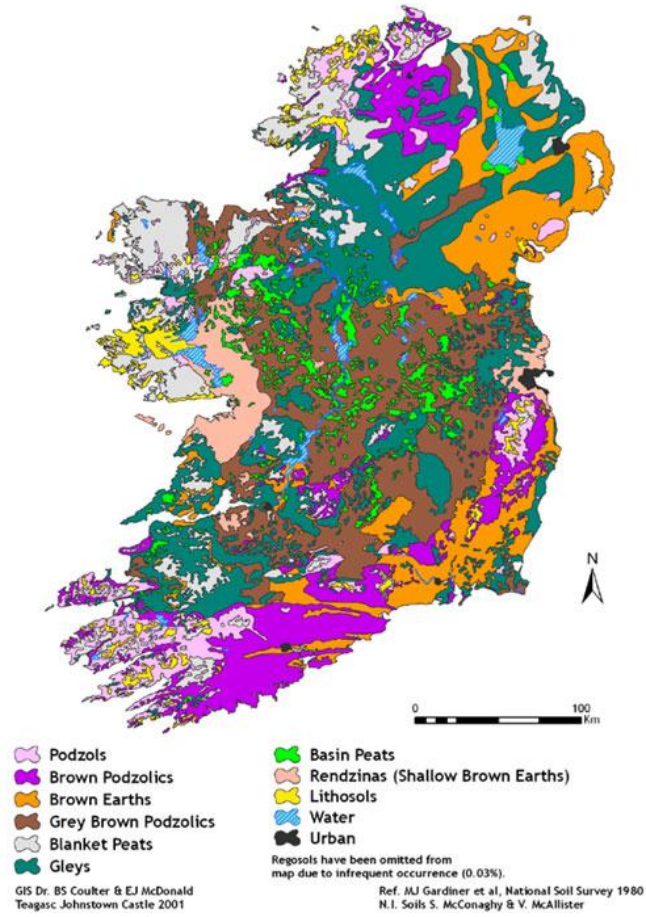


Figure 1: Different soil types distributed in Ireland (MJ Gardiner et al., 1980)

3. Poisonous plants for equines

Horses are very sensitive to poisonous plants. The most common reasons for them ingesting toxic plants are because of the growth of poisonous plants in pastures they are grazing in, or harmful plants accidentally becomes contaminated into their feed such as hay or haylage (Kip E. Panter, 2014) . It is important that horse owners can recognize these plants that are harmful to their animal, be familiar with their name and places they can be found in (Blue cross for pets, 2019).It has been proven that poisonous plants tend to thrive on poor pastures, so it is important that pastures are well maintained as a preventative action.

3.1 Ragwort

Ragwort poisoning is the most common cause of plant poisoning in Irish horses. Ragwort, also known as *Senecio Jacobea* is grown throughout Ireland. It is part of the Asteraceae family. This yellow flowering plant thrives on overgrazed pastures with bare patches and is an excellent indicator for badly managed grasslands. It has a rather bitter taste, but when cut it becomes more favorable to eat or when it wilts and dies. However, its toxins still pose a serious threat to animals, even though the plant may be dead. It is usually eaten in a grazing pasture when no other food is available. One plant can produce thousands of seeds.

Prevention is vital with this deep-rooted plant. Owners must be able to identify the plant to avoid their horse from ingesting it. It is important for them to be able to recognize the different stages of ragwort. Ragwort is normally a biennial, with rosette formation in the first year and flowering in its second year. However, it can behave as a perennial, flowering every year as a result of damage from grazing, hooves or machinery. (Department for Environment, Food and Rural Affairs, 2004)

In autumn, ragwort seedlings become visible. It consists of a hairless spade shaded leaf with a smooth edge that reaches up to 10-15mm(**Figure 2**). As the plant grows, rosettes can be found from spring onwards(**Figure 3**.) The leaves become more irregular with a jagged shape, deep green in color. Flowering begins from May to October. Mature plants can reach up to a meter

in height. Each yellow flower produces thousands of seeds which can be easily dispersed by the wind, water or from animal to animal (**Figure 4**).

After flowering most of the plants will die. The seeds will then germinate in the area where the mature plant was situated. The stem is tough with a bright green color and sometimes has a red tinge near the base. (The Donkey Sanctuary, Ireland, 2021)

It contains the toxic compounds pyrrolizidine alkaloids. The most common pyrrolizidine alkaloids found in ragwort are jacobine, senecionine and erucifoline. (Macel M, 2004). When ingested these toxic alkaloids become absorbed by the gastrointestinal tract, then go to the liver where they cause an accumulation of copper. They are metabolised by cytochrome P450 to cytotoxic and reactive pyrroles. (Glowaz, 1992). Both toxic and non-toxic forms of alkaloids are produced. The non-toxic forms are excreted whilst the toxic chemicals remain in the liver and interfere with cells resulting in liver damage.

Clinical signs usually aren't apparent until liver damage has occurred. Weight loss, depression, abdominal pain, unusual behavior or even photosensitization are some typical indicators of this plant poisoning. In the case of hepatic failure, it will eventually result in a slow death. It must be mentioned that often no clinical signs are evident until this poisoning has progressed so far that it is then untreatable. Different animals have different susceptibility to the poisoning. This toxic plant can also cause liver damage to dogs and cats, similar to horses.

The best treatment of this poisoning is removing all traces of ragwort in the horse's diet and surroundings. This can be done by pulling the ragwort out of the ground, removing as much of the root as possible with protective gloves and disposing of it in an approved manner. The roots have a deep spreading system. The best time for this removal is during the spring or summer, before the ragwort is able to seed. If this plant has been accidentally mixed into hay or haylage, it can be difficult to distinguish it from other plants. If there is suspicion that feed has become infected with ragwort remove it immediately from the animal's diet.

Supportive therapies can also be used to try regenerate the liver. A number of studies have been conducted with the aim of improving the horse's diet as a treatment option. It is thought that providing a high carbohydrate and easily but limited digestible protein diet will help

decrease the production of gastrointestinal ammonia and to limit the accumulation of aromatic amino acids. (TD., 1983)

Laboratory tests can aid the diagnosis of this plant poisoning. A study has been done on the liver enzymes of an animal affected by ragwort poisoning. It proved that gamma glutamyl transferase, alkaline phosphatase and glutamyl dehydrogenase all elevated above their control values, reinforcing that there is liver damage. (Craig Am, 1991). Next a biopsy of the liver can be taken when enzyme levels are high. This will highlight the typical microscopic abnormalities to help confirm a definitive diagnosis.



Figure 2 : Ragwort seedling (World horse welfare, 2021)



Figure 3 :Ragwort rosettes (World horse welfare, 2021)



Figure 4 : Mature plant flowers (World horse welfare, 2021)

3.2 Foxglove

The foxglove, also commonly known as *Digitalis Purpurea*, is another poisonous plant for horses. It is typically found in hedges, hilly areas, woodlands and in gardens as an ornamental plant throughout Ireland. It is derived from the Plantain family, Plantaginaceae. Foxglove has an extremely bitter taste making it unpalatable to horses. As a result, it is rarely eaten as a fresh flower. The most common source of ingestion of this poisonous plant is when it is accidentally mixed into the horse's feed such as hay or when food is extremely scarce for the animal, and they have no other choice but to eat this poisonous plant. The entire plant is poisonous for animals. It must be noted that both the dead and dried form of this plant is still poisonous to animals.

It is vital that horse owners are able to recognize this plant to prevent their animal from ingesting it. Foxglove is a perennial or biennial plant that can reach up to 1.5 meters. A large number of seeds are formed by this plant. The seeds are easily spread by water or wind. The stem and leaves consist of dense hairs. The leaves are found towards the base of the plant. They are green in color with a clear vein structure and form a rosette, where a spike develops from the centre of the rosette from spring to summer. The flowers develop from the top of the spike. The flowers are tubular, and bell shaped like a finger and can be white, purple or pink(**Figure 5**).The centre of the flower is spotted. (Beaulieu, 2021)

Foxglove contains cardiac glycosides which are known for disrupting the function of the heart. They give rise to irregular heart rhythms and rates. When ingested in large quantities it causes loss of heart rhythm, ventricular tachycardia, fibrillation and systolic cardiac failure as it interferes with the electrical conductivity of the heart. All parts of the foxglove plant contain the cardioactive steroids digoxin and digitoxin. During ingestion of this poisonous plant these compounds affect the cardiac muscle. Cardiac glycosides inhibit the Na/K pump and also the Na/Ca exchangers. This causes a dramatic increase in intracellular sodium and calcium. An increase of potassium outside cells is also witnessed. Raised calcium levels in the sarcoplasmic reticulum cause stronger and faster contractions known as a positive inotropic effect. (wag walking1, 2021).

The cardiac glycoside digitoxin is commonly used in heart medication for humans. In low and controlled amounts, it is proved to increase speed, strength and force of cardiac contractions.

There are many clinical signs associated with this cardiac glycoside poisoning. It has been noted that contracted pupils and breathing difficulty are typical signs. Neurological symptoms such as convulsions can be witnessed whilst digestive signs such as colic and diarrhea must be taken into account. Sudden death can occur even after a few hours of ingestion. It has been proven that even ingesting as little as 100 grams of this poisonous plant can be fatal for a horse. (Offord, 2006)

The diagnosis of this poisoning is based on clinical signs, symptoms and a history of the animal. Treatment options are limited as the toxins immediately damage the cardiovascular system. The first action to be taken is removing the horse from an environment contaminated with foxglove. If this intoxication is caught early enough activated charcoal followed by mineral oil can be used to decontaminate the horse's digestive system. Serum potassium levels should be closely monitored, and intravenous supportive fluid therapy administered. (university, 2021)

Owners should avoid grazing in pastures with visible foxglove. This poisonous plant can be removed by hand by pulling it up out of its origin wearing protective gloves. It has been noted that this colorful plant can cause skin irritation to humans.



Figure 5 : Foxglove flowers (Southern Living, 2021)

3.3 Sycamore tree

Sycamore poisoning is commonly found in Ireland. Sycamore is botanically known as *Acer pseudoplatanus*, part of the Aceraceae family. The sycamore tree is typically found in Ireland along streams and rivers in wetland areas on an overgrazed pastures. A study was done in 2014 in Ireland highlighting the importance of sycamore poisoning to horses. In this particular year more than thirty Irish horses died as a result of ingesting sycamore seeds after very good summer conditions. (Horkan, 2014)

It is necessary that horse owners are able to correctly identify the sycamore tree. This poisonous plant is a huge deciduous tree with 3-5 green lobed leaves resembling maple leaves that can grow up to forty meters in height. The leaves have a vein structure running to the tip with toothed edges. The sycamore bark is brown, brittle and mottled. It peels off in irregular masses exposing a white patch underneath. (Leafy Place, 2021) Sycamore seeds and leaves are also known as helicopters because of their shape(**Figure 6**). They are easily dispersed by the wind away from the original plant.

Sycamore tree poisoning is also known as atypical myopathy. It is caused by ingesting sycamore seeds or helicopters. It usually affects grazing horses during the spring where saplings are produced and autumn during seed production. The toxin hypoglycin A found in the seeds and seedlings is what causes this fatal muscle damage as it serves as a metabolic block on the muscles ability to burn fat, a fuel source. Pastures free from sycamore trees may still be dangerous as the seeds can be blown from one field to another by wind. Young animals are particularly susceptible to this toxin. The hypoglycin A toxin causes a rapid breakdown and slows down energy production in muscle cells. This breakdown results in muscle enzymes entering into the bloodstream. Serious pressure is then put on the kidneys causing acute kidney failure. (walking2, 2021)

Symptoms are usually noticed 12 to 72 hours after ingestion of sycamore tree seeds. Clinical signs include muscle stiffness and tremors, increased heart rate, choke(esophageal obstruction), sweating, weakness and dark red or brown urine (myoglobinuria). (Teagasc, 2021).

Atypical myopathy can be diagnosed by urinalysis. If the urine is a dark red or brown color this suggests sycamore poisoning. The dark colored urine suggests the presence of the muscle pigment myoglobin that's eliminated from damaged muscle cells into the blood where it will be removed by the kidneys. Blood tests can also be performed to indicate kidney damage and examine the muscle enzymes such as creatine kinase, for the presence of the hypoglycin A toxin. (walking2, 2021) .

Sycamore poisoning can be treated with fluid supplementation to help flush the kidneys. Fluids are particularly important as horses become extremely dehydrated with atypical myopathy. Supplementary minerals and vitamins such as vitamin B1 and B2 have been used in one study and proved to be effective for muscle cell function. Most horses recover well from this toxicity with no long term effects. (hospital, 2015).

Owners must put preventative measures in place to avoid this plant poisoning. Careful attention should be paid during spring and autumn months when the toxin hypoglycin A is actively being released through the sycamore seeds. If young sapling plants are present in the pasture they can be removed easily. Pastures with this poisonous plant should not be used to produce haylage, hay or silage. Research that was conducted showed that after six to eight months of storage the forage was still contaminated with the hypoglycin toxin. (González-Medina, 2019). In cases where the trees can't be removed it's recommended to reduce the horses time spent in the pasture from autumn to winter. Additional forage such as hay should not be placed down the ground in pastures near sycamore trees as the animal can accidentally ingest the poisonous seeds.



Figure 6: Helicopter seeds (Jersey trees for life, 2019)

3.4 Buttercup

The buttercup is part of the *Ranunculus* species. It is a perennial bright yellowed flower of 5-7 petals. It has a hairy thin stem (**Figure 7**). There are two types of buttercup, tall and small. The leaves are hairy and triangular. They consist of three lobes. Its creeping runners allow it to spread rapidly in pastures or gardens.

This toxic plant exacerbates in wet weather conditions , ideally in Ireland and on overgrazed pastures on lowlands. (Horse and hound, 2021) Buttercups must be eaten in very large quantities to become toxic to the animal. The toxin is of a bitter taste making the plant unfavorable for the horse although some horses may not taste the bitterness, making them ingest even more of the plant. However horses will ingest this plant when they are grazing on a poor pasture with very little other forage to consume. (MDS animal health hub, 2021). It is thought that even the horse sniffing the pollen up its nostrils can cause serious irritation.

The flowers of the buttercup contain the toxic glycoside ranunculin. When this yellow plant is chewed on by the animal the enzyme ranunculin is turned into protoanemonin, a toxic oil. (Wag walking3, 2021). This oil binds to proteins and will cause contact dermatitis

This poisonous plant has been proven to be most toxic during its flowering stage from April to August. However it must be noted that the dried plants in hay are not poisonous, making it different from the other plants that infect horses unknowingly through the hay. It is thought that the leaves, stem , pollen and flowers are all poisonous to animals.

The most typical clinical signs of buttercup toxicity are contact dermatitis on the muzzle or limbs, mouth ulcers, colic, blood in the urine, salivation or skin twitches. The severity of this toxicity will depend on how much of the plant was ingested. One particular study was conducted in Kentucky, USA on thoroughbreds grazing in pastures infected with buttercup. Clinical findings as a result of this plant toxicity included early abortion, weight loss and paralysis. (Swercsek, 2016)

This plant poisoning is usually very treatable with a good prognosis. Mouth ulcers must be treated with antibiotics or topical cream to prevent any bacterial infections arising. The poisonous oil protoanemonin has been proven to cause irritation in the horses stomach.

Demulcent may be given to the horse to aid in coating its gastrointestinal tract. Sometimes the feces of the horse infected with buttercup poisoning can have a foul smell., helping with the diagnosis of this toxicity.

The most efficient method of removal for this yellow plant is by using a herbicide spray. The timing of this spraying is very important. It should be applied when rapid growth is noticed in spring and before flowering takes place. It is recommended not to spray these poisonous plants when they are wet or when rain is forecasted. Animals must be taken off the pasture for at least two weeks after this procedure. (Horse and hound, 2021)



Figure 7: Buttercup stem and flowers (Wildflowers of Ireland, 2021)

3.5 Poison hemlock

Poison hemlock is scientifically known as *conium maculatum*, part of the carrot family apiaceae. It can be commonly found in Ireland along ditches and riverbanks on damp land or nitrogen rich soils. It is often mistaken for cow parsley. It must be noted that all parts of this toxic plant are poisonous to both humans and animals. Young leaves in the spring prove to be most toxic whilst the roots are believed to be the least toxic to animals.

It is vital that owners can identify this highly poisonous biennial plant that takes two years to flower and seed. During the first year the rosette grows leaving a cluster of leaves near the ground. In the second year it can flower up to six feet tall. It consists of umbrella like clusters of small white flowers (**Figure 8**). The leaves are long stalked with feathery leaflets of a waxy texture. An easy way for owners to distinguish this plant from others is by noticing the stem. It is hollow with purple dots running along it (**Figure 9**). It produces a repellent smell when damaged. Reproduction occurs via seeds that can be dispersed by wind, water or animals. After flowering it produces a brown fruit containing seeds. The fruit is dry and ridged. Poison hemlock consists of a solid taproot. (Vetter, 2004) .

The cause of this poisoning is because of the piperidine alkaloid known as Coniine. Coniine is very similar to nicotine. It acts on the central nervous system and is very easily and rapidly absorbed into tissues and the bloodstream. (Wag walking4, 2021) The concentration of the conium alkaloids depends on factors such as temperature, moisture and age of the plant. Drying can decrease its toxicity.

Clinical symptoms in companion animals may appear in as quick as one hour. Typical signs noticed include respiratory distress, seizures, drooling, in coordination or excitement followed by depression. (Glenn Nice, 2005)

Treatments for this neurotoxic plant include administering intravenous fluids. Emesis can be promoted to eliminate the toxin from the stomach. Activated charcoal can also be used to bind the toxins in the gastrointestinal tract so it won't be absorbed by the animal. (Wag walking5, 2021)

However, this poisonous plant doesn't just affect companion animals in Ireland. It poses an even bigger threat to livestock. Cattle will consume larger amounts if accidentally mixed into hay or silage. About 100-500g of green leaves can be fatal to the animal. Typical signs witnessed from this plant poisoning include bloating and increased salivation. If the animal ingests this poisonous plant during days 55-75 of pregnancy it has proven to give rise to skeletal malformations in the fetus. The alkaloids produce a neuromuscular blockage that can result in respiratory paralysis. It must be noted that poison hemlock can be excreted via the milk of a lactating cow. This can also be a serious threat to humans. (Vetter, 2004)

The most common method of prevention of this neurotoxic plant is to cut or remove it with your hand. It is recommended to pull it before it has started flowering. In areas invaded by poison hemlock it is best to use chemical control like pesticides. It is not advised to mow over this poisonous plant as the will seeds remain in the ground and will spread easily. Since there is no antidote for this toxicity it is best to just remove the horse and the poisonous plant in their environment.



Figure 8: Poison hemlock stem (Oregon state university, 2021)



Figure 9: Poison hemlock flower (Farm and dairy, 2021)

4. Poisonous plants for companion animals

Cases of plant intoxications in small animals are also commonly witnessed. Owners keeping ornamental plants around their house and garden for decoration is the most common reason for companion animal poisonings. Ingesting these toxic plants can be fatal to the animal. However, even just touching off one of these plants can affect the animals' body parts such as paws, ears or eyes. It is proven that animals with an increased amount of time spent indoors or younger inquisitive animals are usually much more prone to poisoning (Anadón, 2018). It is vital that owners have knowledge of garden and indoor plants that are poisonous for their pets.

4.1 True Lily

Lily poisoning is extremely dangerous to the feline species. True lilies are part of the Liliaceae family. In Ireland, the lily plant is commonly kept in households because of its color and fragrance. There are a number of different types of lilies including tiger lily, Easter lily or oriental lily. Lily plants of the greatest concern are any from the genus *lilium*. Other types of lilies not included in the *lilium* genus like peace lily are not as harmful to cats.

The lilies bulbs are usually planted from September to October in well-drained soil. This poisonous plant grows best in groups of 3 or 5 with a few hours of sunshine. The flower can face down or up. They release a fragrance and come in many different colors such as pink, orange or white. This nephrotoxic plant can grow up to 8 feet tall. **(Figure 10)**

It should be noted that lily toxicity occurs when the cat ingests any part of the lily plant including the leaves, flower or pollen. One common method of ingestion is when the cat brushes off the lily plant. the pollen falls into the cat's fur. Later the cat will lick the pollen off when they are grooming themselves and ingest the toxin. Another typical occurrence of ingestion is the cat drinking out of a vase containing cut lilies. (Young, 2020)

Clinical symptoms typically occur immediately after. Signs such as vomiting, lethargy, seizures, in coordination, excessive drinking, urination and drooling are common. (Wag Walking6, 2020). If a dog ingests this poisonous plant, they will only appear to have an upset stomach. It has been proven that dogs do not develop kidney damage. The exact toxin and lethal dose causing this renal damage is

currently unknown. However, the quick onset of clinical signs suggests a rapid rate of absorption. The mechanism of toxicity is also quite unclear. Several studies have shown that renal tubule epithelial cells become damaged, leading to polyuria.

.Diagnosis of this plant poisoning includes a laboratory analysis on the kidneys by taking a blood or urine sample. This should be done if you have witnessed your cat ingesting the lily plant, but no clinical symptoms are presented. It must be noted that kidney damage can still occur from the ingestion of this toxic plant even though there are no typical symptoms noticeable. Kidney metabolite excretion of keratinize, urea and phosphorous is compromised as their levels become elevated.

Treatment includes stabilizing the patient with fluid therapy. This will flush out any toxins in the bloodstream and rehydrate the kidneys preventing dehydration and shutting down. It is recommended that fluid therapy should be given at twice the normal maintenance rate. The cat will be induced to eliminate the toxic substance from the stomach. administer activated charcoal to bind any toxin in the stomach. (Young, 2020) .Anuria is a good indicator that treatment is not working. If the toxicity was caught early there is a good prognosis and recovery.

The only method to prevent your animal from ingesting this nephrotoxic plant is to keep the lily plant out of reach from your cat or totally eliminate it from their environment. The ignorance of the owner is the main reason for this plant poisoning.

In my own personal experience, I witnessed lily toxicity in a cat in a veterinary practice, as a result of ingesting this nephrotoxic plant. The owner observed their pet eating the lily plant leaf. The cat was brought into the veterinary clinic with symptoms of drooling and vomiting. Intravenous fluid therapy was administered immediately. Blood and urine samples were taken from the animal. Abnormalities were detected at the phosphate level. The cat had hyperphosphatemia with a result of 16 mg/dL. The normal range for phosphate is 4.5-8.1 mg/dL. Another laboratory finding concluded was an elevated creatinine value. The animals had a recording of 19.1 mg/dL, greatly outside the reference range of 0.8-1.8 mg/dL. Unfortunately , this renal damage caused anuria and eventually led to the death of the animal after 48 hours. A necropsy was performed, highlighting a slight enlargement of both kidneys. The kidneys were removed and placed in 10% formalin. Histologically on a microscopic exam it was noted that the proximal and distal tubules were necrotized whilst epithelial cells were necrotised



Figure 10: Lily Flower (Barcel, 2017)

4.2 Rubber fig

The rubber fig is scientifically known as *Ficus Elastica*. It is part of the mulberry family. In Ireland this plant is commonly seen in households as an ornamental plant that affects both cats and dogs. Rubber fig toxicity is caused when the companion animal ingests the plant. It can also occur when the poisonous plant comes in contact with the animal's mouth, eyes or skin.

It is quite easy for owners to identify this poisonous plant. It consists of thick oval leaves with a rubbery consistency that appear glossy green(**Figure 11**). The plant produces a milky sap from its leaves or stem when it is cut or scratched that can irritate the animal's skin or digestive system. The fruit is also edible. The amount of the plant that they ingest will determine how fatal this toxicity is to the animal. The toxic sap contains ficin, a proteolytic enzyme and ficusin which is a psoralen. These toxic substances will target DNA cells. (Wag walking7, 2021). The plant latex contains proteins intended to protect the plant.

The most typical clinical symptoms noticed as a result of this plant toxicity include drooling, vomiting, diarrhea, oral irritation and abdominal pain. Watery eyes and dermatitis are witnessed when the animal comes in contact externally with the plant. (Wag walking7, 2021) Diagnosis of this toxicity consists of taking a blood test and performing urinalysis to check function of body's organs.

Fig toxicity is not usually life threatening. Treatment will vary depending on how much of the plant was consumed. Intravenous fluids are given to prevent dehydration when the animal presents the symptoms of vomiting and diarrhea and correct any electrolyte imbalances. Next emesis is induced to remove the toxic sap. Activated charcoal can be administered to help bind the toxins so they won't be absorbed by the animal's body. The sap away can be washed away from mouth area if the animal ingested the poisonous plant. If it interacts with the animal's eye, an eyewash is performed to remove any remaining toxic substances. (Wag walking7, 2021)

The most effective method of prevention of this plant poisoning to companion animals is keeping it out of reach from curious animals or not keeping it as an ornamental plant as it poses a threat to companion animals.



Figure 11: Rubber fig leaves (Best of the south bay, 2021)

4.4 Dumbcane

Dumbcane is botanically known as *Dieffenbachia*. It is part of the Araceae family. Dumbcane is commonly found in households in Ireland as an ornamental plant. Dogs and cats are the most common companion animals affected. When these animals chew or ingest this poisonous plant, it causes a burning sensation in the animals' mouth. Every part of the plant is considered lethal, especially the stem and leaves.

This toxic plant is a herbaceous perennial houseplant. It is best grown indoors under bright indirect sunlight. It consists of an upright stem and a simple oval shaped leaves typically green in color. There are white spots or lines throughout the leaves(**Figure 12**). The plant can grow up to ten feet tall.

Dumbcane consists of insoluble calcium oxalates crystals in the form of raphides. The calcium oxalate crystals are of a needle like shape. They are packed with specialized cells called idioblasts. Idioblasts are isolated plant cells that differs from neighboring cells. The tip of the idioblast will be broken to allow animals saliva or plant sap to enter the cell. This leads to gelatinous material accumulating causing the raphides to be released from surrounding cells. When the animal chews this toxic plant, it will penetrate the skin and mucus membranes and then release the crystals. These calcium oxalate crystals insert themselves onto the tissues of the mouth, throat, tongue and stomach and cause serious aggravation for the small animal. (Paws dog day care, 2021).

Symptoms can develop immediately or a few hours after it's been in contact with the animal. Typical clinical signs include oropharyngeal swelling, respiratory distress, drooling, oral pain and dyspnea. Contents of the plant cause an inflammatory reaction. If the toxic plants sap comes in contact with the animals eye it may result in corneal or conjunctival inflammation or blindness. (Anadón, 2012) . In cases where the animal ingested a large amount of this toxic plant coma or death can be witnessed. The intensity of clinical symptoms depends on the amount of the plant ingested. A study was conducted on a poodle whose owners had witnessed it ingesting the stem of a dumbcane plant. One symptom it presented was asphyxia, a breathing difficulty as a result of deficient oxygen levels in the body. This rare clinical sign from this plant toxicity led to the death of this animal. (Loretti AP, 2003).

Typical treatments for this plant poisoning includes rinsing and flushing the mouth to eliminate any of the poisonous substances the animal ingested. Fluid therapy can be administered to animals who need to be rehydrated after an episode of vomiting or diarrhea. Antihistamines can be given to the animal for any oral inflammation. Severe oropharyngeal swelling may have to be resolved by tracheostomy. Animals suffering from respiratory distress may receive oxygen therapy.



Figure 12: Dumbcane leaves (ASPCA, 2021)

4.5 Rhododendron

Rhododendron is botanically known as *Rhododendron Ponticum*. It is part of the Ericaceae heather family. This toxic plant is distributed widely around Ireland. It is particularly common in the west of Ireland on acidic soils typically in woodlands or on open ground. However a study was conducted in Killarney National Park in recent years proving that more than 650 acres were infested with rhododendron. It was first introduced to Ireland as an ornamental plant but has recently become an invasive species to wildlife because Ireland has the ideal climate and soil for its reproduction and dispersal. (Invasive Species Ireland1, n.d.)

This evergreen shrub can grow up to three meters. It has hairless green leaves that are shiny on top and matte on the underside. It consists of five lobed bell-shaped flowers. The flowers are purple and held in large clusters. **(Figure 13)**. Flowering usually occurs during the spring and summer months. It is a prolific seed producer. (Invasive species Ireland2, n.d.)

Rhododendron contains grayanotoxins. These are diterpenoid compounds that disrupt metabolism and nerve or muscle functions. The grayanotoxins interfere with the sodium channels causing depolarization of cells and eventually it will affect cardiac and skeletal muscle. All parts of this plant are considered harmful to animals. Ingesting as little as 0.2% of the animal's bodyweight can affect them. This andromedotoxin produces an aconitum like effect. The honey produced from rhododendron nectar is also very toxic, especially for humans.

The clinical symptoms typically observed in both dogs and cats with rhododendron poisoning include gastrointestinal upset, excess salivation, dizziness, leg paralysis, seizures or a slow heart rate. Recovery will depend on the amount consumed by the animal and how quickly they administer the treatment.

Typically, when an animal ingests this poisonous plant, the veterinarian will induce emesis to eliminate the toxic substance from the animal's gastrointestinal system. Activated charcoal can also be administered which will bind to the toxin. Intravenous fluids are advised to prevent dehydration in the case of vomiting or diarrhea. Atropine may be administered to the animal if there is a dangerously low heart rate present in the animal. (Wag walking8, 2021).

Cutting or pulling is the easiest method of prevention for owners. They must act as close to the ground as possible. However, this isn't the most effective method as rhododendron vigorously regrows back. Another method that can be used is digging up the stump and roots with a tractor which deals better with regrowth. Herbicide can also be used but particular attention must be paid so each individual leaf is wetted by the spray.



Figure 13: Rhododendron cluster of flowers (Wild flowers of Ireland, 2021)

4.6 Daffodil

The daffodil is an extremely common plant in Ireland. It is kept as an ornamental plant and can be found growing outdoors typically in deciduous woodland along roadways and in hedges in well drained soil. They are well suited to the growing conditions of Ireland. It is scientifically known as *Narcissus*. It is part of the Amarylidaceae family.

They flower in early spring when they receive at least 6 hours of sunlight. They bloom year after year with very little attention. The centre of the flower is trumpet shaped, with a ring of petals around it resembling a star (**Figure 14**). Yellow petals are the most common color found in Ireland. However they can have either uniform or contrasting corona and tepals.

The bulbs receive nourishment from the leaves. Bulbs are usually planted in Autumn before the cold winter. They contain crystals in their outer layer that causes skin irritation or eventually lead to kidney damage. These calcium oxalate crystals are needle shaped and irritate the animal's mouth when ingested and cause dermatitis. (Wag walking9, 2021).

Daffodils pose a serious threat to companion animals when they ingest the flower or bulb. Another source of infection is drinking water infected by the daffodil. This can be done indoors by a vase that's holding the daffodil or simply outdoors in a puddle of water that has been in contact with the daffodil's poisons.

Daffodils contain the toxic crystalline alkaloid lycorine, which has strong emetic properties. It is found in all parts of this yellow poisonous plant. It is thought that the bulbs contain the most lycorine. Even inhaling dust from the bulbs can cause serious irritation for the animal.

Common clinical findings of daffodil poisoning include seizures, vomiting, abdominal pain, cardiac arrhythmia or mouth soreness (ASPCA, 2021). These symptoms are evident in both dogs and cats.

Prognosis and recovery is typically good especially if the animal is treated in sufficient time. Intravenous fluids are administered to prevent dehydration from the emetic effect. Vomiting can be induced with the aid of activated charcoal to help eliminate any toxins remaining in the animal's gastrointestinal tract.

Prevention of this poisonous plant is quiet hard. Don't set daffodil bulbs around your household or keep them out of reach from the animal. However daffodils are predominantly found in Irelands countryside so it is a lot more difficult to prohibit your animal from coming into contact with this poisonous plant.



Figure 14 : Daffodils trumpet shaped flowers (Britannica, 2021)

5. Conclusion

There are many plants in Ireland that cause illness or even death to horses and companion animals. They usually vary in toxicity. Studies have proved that some plants are more harmless than others when small amounts are ingested. However when large amounts of certain poisonous plants are ingested they can be detrimental to the animal. It must be noted that different species react differently to poisonous substances because of their different modes of absorption, metabolism and excretion.

Poisonings usually depend on a few factors such as palatability of the plant, where typically the more unpalatable the plant the less likely the animal is to ingest it unless there is absolutely no other source of food available or they are extremely bored. Another factor to be taken into consideration is the portion of the plant eaten by the animal. Some plants can be poisonous in one location such as the roots, stem, leaves whilst other plants are completely toxic in every part.

However I would believe that not all poisonous plants taste bad for equines and companion animals. Some plant ingestions can be beneficial to the animal rather than harmful. An example can be witnessed with lupins. Lupins are a legume with a high energy supplement for horses. They are typically used in Ireland to improve the performance of the horse especially in breeding or growing horses.

In conclusion the best way for owners to prevent their animal being poisoned by plants whether out in pastures, along roadways or indoors in the households is by familiarising themselves with plants that cause serious harm to their animals around their geographical location. There are hundreds of plants that are toxic to horses and companion animals but some only grow in certain geographical areas and climates which pet owners must be able to identify. Unfortunately, whether a poisoning will take place or not is going to be determined by the habits of the owners and the management of their animals.

Despite a variety of toxic substances in the poisonous plants listed above, early diagnosis and identification of these typical plant poisonings occurring in Ireland is proving difficult.

Plant poisoning is likely to be underdiagnosed and to pass unnoticed because of the non-specific clinical signs such as vomiting, diarrhea or salivation, or the difficulties for the owner to spot the animal ingesting the plant and of the general unfamiliarity with toxic plants of both owners and veterinarians.

If your animal is suspected of ingesting a poisonous plant it is vital that veterinary assistance is sought for immediately. In the case of a sudden death it is recommended to get your veterinarian to perform a post mortem examination to figure out if the cause of death was from the ingestion of poisonous plant, which could benefit the owner for the future and possibly prevent further loss of animals.

In summary, plant poisonings are becoming a major health liability for animals in today's society. It is a particularly worrying rising problem for owners in Ireland because of its ideal terrain and mild climate for plants to propagate.

Bibliography

Anadón, A. M.-L. M. A. I. a. M. M., 2012. In: *Veterinary toxicology: Basic and clinical principles..* San Diego: s.n., pp. 1080-1094.

Anadón, A. M.-L. M. A. I. a. M. M., 2018. In: *Veterinary toxicology: Basic and clinical principles..* s.l.:s.n., pp. 891-909.

Animals1stVets, 2019. *Animals1stVets*. [Online]
Available at: <https://www.animals1st.co.uk/blog/national-blog?id=39219>

ASPCA, 2021. *ASPCA*. [Online]
Available at: <https://www.asPCA.org/pet-care/animal-poison-control/toxic-and-non-toxic-plants/dumbcane>
[Accessed 05 10 2021].

ASPCA, 2021. *ASPCA*. [Online]
Available at: <https://www.asPCA.org/pet-care/animal-poison-control/toxic-and-non-toxic-plants/daffodil>

Barcel, E., 2017. *TBR news media*. [Online]
Available at: <https://tbrnewsmedia.com/long-island-gardening-growing-true-lilies-in-the-garden/>
[Accessed 08 09 2021].

Beaulieu, D., 2021. *The Spruce*. [Online]
Available at: <https://www.thespruce.com/tall-toxic-foxford-plants-2132588>

Best of the south bay, 2021. *Best of the south bay*. [Online]
Available at: <https://bestofthesouthbay.com/wp-content/uploads/2015/07/Rubber-Plant-Ficus-elastica.jpg>
[Accessed 25 10 2021].

Blue cross for pets, 2019. *Blue cross for pets*. [Online]
Available at: <https://www.bluecross.org.uk/pet-advice/nine-poisonous-plants-horses-should-avoid>

Britannica, 2021. *Britannica*. [Online]
Available at: <https://www.britannica.com/plant/daffodil>

Brownie, C. F., 2020. *Plants Poisonous to Animals*, s.l.: s.n.

Craig Am, e. a., 1991. Clinicopathologic studies of tansy ragwort toxicosis in ponies: sequential serum and histopathological changes. In: *Journal of Equine Veterinary Science*. s.l.:s.n., pp. 261-262, 264-271.

- Department for Environment, Food and Rural Affairs, 2004. *Code of practice on how to prevent the spread of ragwort*. [Online]
Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/801153/code-of-practice-on-how-to-prevent-the-spread-of-ragwort.pdf
- Farm and dairy, 2021. *Farm and dairy*. [Online]
Available at: <https://www.farmanddairy.com/news/watch-out-for-poisonous-plants-in-ohio/562164.html>
[Accessed 06 09 2021].
- Glenn Nice, B. J. T. B. T. J., 2005. *Purdue university*. [Online]
Available at: <http://www.carrotmuseum.co.uk/PHemlock03.pdf>
- Glowaz, S. M. M. a. H. R., 1992. Detection of a reactive pyrrole in the hepatic metabolism of the pyrrolizidine alkaloid, monocrotaline. In: *Toxicology and Applied Pharmacology*. s.l.:s.n., pp. 168-173.
- González-Medina, 2019. Atypical myopathy-associated hypoglycin A toxin remains in sycamore seedlings despite mowing, herbicidal spraying or storage in hay and silage. *Equine Veterinary Journal*.
- Horkan, P., 2014. *Irish Horses Liable to Poisoning from Sycamore Seeds*, s.l.: s.n.
- Horse and hound, 2021. *Horse and hound*. [Online]
Available at: <https://www.horseandhound.co.uk/features/are-buttercups-poisonous-to-horses-648261>
- hospital, L. e., 2015. *Liphook equine hospital*. [Online]
Available at: <https://liphookequinehospital.co.uk/wp-content/uploads/atypical-myopathy.pdf>
- Invasive Species Ireland1, n.d. *Invasive Species Ireland*. [Online]
Available at: <https://invasivespeciesireland.com/wp-content/uploads/wp-post-to-pdf-enhanced-cache/1/rhododendron.pdf>
[Accessed 03 11 2021].
- Invasive species Ireland2, n.d. *Invasive species Ireland*. [Online]
Available at: <http://invasivespeciesireland.com/wp-content/uploads/2020/10/NIEA-ID-Guide-ISNI-website-Rhododendron-ponticum-RhododendronV2.pdf>
[Accessed 28 10 2021].
- Jersey trees for life, 2019. *Jersey trees for life*. [Online]
Available at: <https://jerseytreesforlife.org/sycamore-acer-pseudoplatanus/>
[Accessed 03 11 2021].
- Kip E. Panter, D. R. G. D., 2014. Poisonous plants: biomarkers for diagnosis. In: *Biomarkers in toxicology*. s.l.:s.n., pp. 563-569.
- Leafy Place, 2021. *Leafy Place*. [Online]
Available at: <https://leafyplace.com/sycamore-trees/>

- Loretti AP, d. S. I. M. R. R., 2003. Accidental fatal poisoning of a dog by *Dieffenbachia picta* (dumb cane).. *Vet Hum Toxicol*.
- M. Ensley, S., 2020. *Factors Affecting the Activity of Poisons*, s.l.: s.n.
- Macel M, V. K. K. P., 2004. Variation in pyrrolizidine alkaloid patterns of *Senecio jacobaea*. In: *Phytochemistry*. s.l.:s.n., pp. 865-873..
- MDS animal health hub, 2021. *MDS animal health hub*. [Online]
Available at: <https://www.msd-animal-health-hub.co.uk/Healthy-Horses/Health/PoisonousPlants>
[Accessed 28 09 2021].
- MJ Gardiner et al., 1980. *National soil survey*, Northern Ireland: V. McAllister.
- Offord, M., 2006. Plants poisonous to horses an Australian field guide. In: K. Drake, ed. s.l.:s.n., p. 41.
- Oregon state university, 2021. *Oregon state university*. [Online]
Available at: <https://oregonstate.edu/>
[Accessed 26 10 2021].
- Paws dog day care, 2021. *Paws dog day care*. [Online]
Available at: <https://www.pawdogdaycare.com/toxic-and-non-toxic-plants/dumb-cane-poisonous-pets>
[Accessed 07 09 2021].
- Rhodes, H., 2021. *Plants know how*. [Online]
Available at: <https://www.gardeningknowhow.com/houseplants/hpgen/keeping-your-pet-safe-identify-poison-plants-in-your-house.htm>
- Southern Living, 2021. *Southern Living*. [Online]
Available at: <https://www.southernliving.com/plants/foxtail>
[Accessed 10 09 2021].
- Swercsek, T. W., 2016. Abortions in Thoroughbred mares associated with consumption of bulbous buttercups (*Ranunculus bulbosus* L). *Journal of the American veterinary medical association*, 248(6).
- TD., B., 1983. Chronic liver failure in horses. In: *Compend Contin Educ Pract Vet* . s.l.:s.n., pp. 423-430.
- Teagasc, 2021. *Teagasc*. [Online]
Available at: <https://www.teagasc.ie/rural-economy/rural-development/equine/equine-health/sycamore-seed-poisoning/>
[Accessed 30 10 2021].
- The American rhododendron society, 2021. *The American rhododendron society*. [Online]
Available at: <https://www.rhododendron.org/soil.htm>
- The Donkey Sanctuary, Ireland, 2021. *Ragwort kills*. [Online]
Available at: <https://www.thedonkeysanctuary.ie/ragwort>
- university, C. s., 2021. *Colorado state university*. [Online]
Available at: https://csuvth.colostate.edu/poisonous_plants/Plants/Details/59

Vet girl on the run, 2021. *Vet girl on the run*. [Online]
Available at: <https://vetgirlontherun.com/podcasts/calcium-oxalate-plant-toxicosis-in-dogs-cats-vetgirl-veterinary-ce-podcasts/>

Vetter, J., 2004. Poison hemlock (*Conium maculatum* L.). In: *Food and Chemical Toxicology*. s.l.:s.n., pp. 1373-1382.

W.K. Rumble, D. S., 2014. *Encyclopedia of Toxicology*. 3 ed. s.l.:s.n.

wag walking1, 2021. *Wag walking*. [Online]
Available at: <https://wagwalking.com/horse/condition/foxglove-poisoning>

Wag walking3, 2021. *Wag walking*. [Online]
Available at: <https://wagwalking.com/horse/condition/buttercup-poisoning>
[Accessed 29 09 2021].

Wag walking4, 2021. *Wag walking*. [Online]
Available at: <https://wagwalking.com/condition/poison-hemlock-poisoning>
[Accessed 05 10 2021].

Wag walking5, 2021. *Wag walking*. [Online]
Available at: <https://wagwalking.com/horse/condition/hemlock-poisoning->

Wag Walking6, 2020. *Wag Walking*. [Online]
Available at: <https://wagwalking.com/cat/condition/lily-poisoning>
[Accessed 07 09 2021].

Wag walking7, 2021. *Wag walking*. [Online]
Available at: <https://wagwalking.com/cat/condition/indian-rubber-plant-poisoning-1>
[Accessed 25 10 2021].

Wag walking8, 2021. *Wag walking*. [Online]
Available at: <https://wagwalking.com/cat/condition/rhododendron-poisoning>
[Accessed 08 09 2021].

Wag walking9, 2021. *Wag walking*. [Online]
Available at: <https://wagwalking.com/condition/daffodils-poisoning>

walking2, w., 2021. *wag walking*. [Online]
Available at: <https://wagwalking.com/horse/condition/sycamore-tree-poisoning>

walking2, W., 2021. *Wag Walking*. [Online]
Available at: <https://wagwalking.com/horse/condition/sycamore-tree-poisoning>
[Accessed 08 11 2021].

Wild flowers of Ireland, 2021. *Wild flowers of Ireland*. [Online]
Available at:
http://www.wildflowersofireland.net/plant_detail.php?id_flower=488&wildflower=Rhododendron
[Accessed 28 09 2021].

Wildflowers of Ireland, 2021. *Wildflowers of Ireland*. [Online]

Available at: http://www.wildflowersofireland.net/plant_detail.php?id_flower=48

World horse welfare, 2021. *World horse welfare*. [Online]

Available at: <https://www.worldhorsewelfare.org/advice/management/ragwort%20-%20~:text=Ragwort%20should%20be%20removed%20before%20it%20flowers%2C%20but,pulling%20the%20whole%20plant%20up%2C%20including%20the%20roots.>

[Accessed 09 10 2021].

Young, A., 2020. *UCDavis Veterinary Medicine*. [Online]

Available at: <https://healthtopics.vetmed.ucdavis.edu/health-topics/feline/lily-toxicity-cats>

Acknowledgements

I would like to thank:

Dr. Cserhalmi Dániel ,

For supporting my chosen topic and investing time in my thesis

The staff of the University of Veterinary Medicine Budapest,

For guiding me during my studies in Budapest and having such a good experience studying abroad.

My parents and friends,

For their encouragements and support while studying abroad in Budapest

HuVetA

ELECTRONIC LICENSE AGREEMENT AND COPYRIGHT DECLARATION*

Name: Lucia Baily
Contact information (e-mail): luciabaily@hotmail.com
Title of document (to be uploaded): Poisonous plants for horses and companion animals in Ireland
Publication data of document: 18/11/2021, Budapest
Number of files submitted: 1

By accepting the present agreement the author or copyright owner grants non-exclusive license to HuVetA over the above mentioned document (including its abstract) to be converted to copy protected PDF format without changing its content, in order to archive, reproduce, and make accessible under the conditions specified below.

The author agrees that HuVetA may store more than one copy (accessible only to HuVetA administrators) of the licensed document exclusively for purposes of secure storage and backup, if necessary.

You state that the submission is your original work, and that you have the right to grant the rights contained in this license. You also state that your submission does not, to the best of your knowledge, infringe upon anyone's copyright. If the document has parts which you are not the copyright owner of, you have to indicate that you have obtained unrestricted permission from the copyright owner to grant the rights required by this Agreement, and that any such third-party owned material is clearly identified and acknowledged within the text of the licensed document.

The copyright owner defines the scope of access to the document stored in HuVetA as follows (mark the appropriate box with an X):

- I grant unlimited online access,
- I grant access only through the intranet (IP range) of the University of Veterinary Medicine,
- I grant access only on one dedicated computer at the Ferenc Hutýra Library,
- I grant unlimited online access only to the bibliographic data and abstract of the document.

Please, define the **in-house accessibility of the document** by marking the below box with an **X**:



I grant in-house access (namely, reading the hard copy version of the document) at the Library.

If the preparation of the document to be uploaded was supported or sponsored by a firm or an organization, you also declare that you are entitled to sign the present Agreement concerning the document.

The operators of HuVetA do not assume any legal liability or responsibility towards the author/copyright holder/organizations in case somebody uses the material legally uploaded to HuVetA in a way that is unlawful.

Date: Budapest, ...18...day1...month...2021...year

Lucia Baily

Author/copyright owner
signature

HuVetA Magyar Állatorvos-tudományi Archívum – Hungarian Veterinary Archive is an online veterinary repository operated by the Ferenc Hutýra Library, Archives and Museum. It is an electronic knowledge base which aims to collect, organize, store documents regarding Hungarian veterinary science and history, and make them searchable and accessible in line with current legal requirements and regulations.

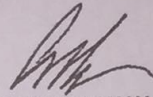
HuVetA relies on the latest technology in order to provide easy searchability (by search engines, as well) and access to the full text document, whenever possible.

Based on the above, HuVetA aims to:

- *increase awareness of Hungarian veterinary science not only in Hungary, but also internationally;*
- *increase citation numbers of publications authored by Hungarian veterinarians, thus improve the impact factor of Hungarian veterinary journals;*
- *present the knowledge base of the University of Veterinary Medicine Budapest and its partners in a focussed way in order to improve the prestige of the Hungarian veterinary profession, and the competitiveness of the organizations in question;*
- *facilitate professional relations and collaboration;*
- *support open access.*

I hereby confirm that I am familiar with the content of the thesis entitled **Poisonous plants for horses and companion animals in Ireland** written by Lucia **Baily** which I deem suitable for submission and defence.

Date: Budapest, 18, November 2021



Dr. Daniel Cserhalmi

Department of Botany

