

POISONOUS SPECIES OF SOLANACEAE FAMILY IN THE FLORA OF "YAGORLYK" SCIENTIFIC RESERVE

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INTRODUCTION

The vascular flora of the "Yagorlyk" Scientific Reserve comprises 838 species. Of these, 216 are poisonous [4, 9]. The Solanaceae family is represented in the reserve's flora by six species, five of which are poisonous (*Alkekengi officinarum* Moench, *Datura stramonium* L., *Hyoscyamus niger* L., *Solanum dulcamara* L. and *S. nigrum* L.). All of these have medicinal properties.

MATERIAL AND METHODS

Taxonomic nomenclature follows recent revisions [2, 5, 11]. Species geographic elements were determined by analyzing global distributions based on published literature [2, 5]. The profile for each species includes scientific and common romanian names, data on its life form, flowering phenology, reproductive methods, global range, and geographic element, characteristic biotopes, alongside photographs of its growth habit. Furthermore, it details the species' distribution specifically inside the "Yagorlyk" Scientific Reserve, as well as its growth habits, toxicity to humans and animals, and medicinal properties [1, 3, 6-8, 10].

RESULTS AND DISCUSSIONS

Our study revealed that the Yagorlyk Scientific Reserve is home to five poisonous plant species from the Solanaceae family: *Alkekengi officinarum* Moench, *Datura stramonium* L., *Hyoscyamus niger* L., *Solanum dulcamara* L. and *S. nigrum* L.

***Alkekengi officinarum* Moench (= *Physalis alkekengi* L.) – Păpălău comun.** A perennial plant growing 60-100 cm tall (Fig. 1), featuring creeping underground shoots that terminate in a renewal bud, alongside numerous adventitious roots. It is a subterranean, short-rhizome hemicryptophyte that blooms from June to August. Reproduction and propagation occur both vegetatively and via



Figure 1. *Alkekengi officinarum* Moench

seeds contained within juicy berries. The species has a disjunctive distribution, encompassing Central and Eastern Europe, the Mediterranean, Transcaucasia, Asia Minor, Southwest Asia, Central and Southeast Asia, and Eastern Siberia. It has been introduced to Atlantic Europe, Japan, Southeast Asia, North America, and Africa (Morocco). Structurally, it is a Eurasian species, a forest mesophyte commonly found in open forests, forest edges, shrublands, and ravines, as well as a weed in orchards and vegetable gardens. Within the "Yagorlyk" Scientific Reserve, it occurs in artificial *Robinia pseudoacacia* plantations, where it forms small groups and clusters.

The species is poisonous to humans, containing toxic compounds (including physalin, alkaloids, and solanine) concentrated primarily in the leaves, calyces, and unripe fruits. The accrescent calyx is toxic and must be removed prior to consumption, though the fully ripe berries are edible. Ingestion affects the central nervous system, manifesting as delirium, anxiety, disorientation, and convulsions, while severe poisoning can lead to coma, paralysis, and death. Despite its toxicity, the plant also possesses documented medicinal properties.

***Datura stramonium* L. – Ciumăfaie**

comună. An annual plant reaching 1-1.2 m in height (Fig. 2), featuring a fusiform taproot. It is a therophyte characterized by an unpleasant odor. Flowering occurs from June until late autumn, and the species reproduces exclusively by seed, with a maximum fecundity of 45,500 seeds per plant. In the Republic of Moldova, it is an adventitious species. It is native to southern North America. It is secondarily distributed

throughout the globe. It typically grows near homes, in garbage dumps, vacant lots, along roadsides, in vegetable gardens, and in fields. It is a mesophytic weed. In the Reserve, it grows in weedy, damp communities. It grows solitarily, occasionally forming numerous groups.

Highly toxic to both humans and animals, the entire plant contains dangerous concentrations of tropane alkaloids, collectively termed stramonines or daturines, including hyoscyamine, scopolamine, and atropine, with the highest levels found in the flowers and seeds. These compounds exhibit an anticholinergic (atropine-like) effect, exerting an antispasmodic action on smooth muscle tissues, inducing mydriasis (pupil dilation), elevating intraocular pressure, causing cycloplegia (paralysis of accommodation), suppressing glandular secretions, and precipitating tachycardia (increased heart rate). The alkaloids exert divergent effects on the central nervous system: hyoscyamine stimulates nervous excitability, whereas scopolamine suppresses it. These toxic principles remain stable during drying and



Figure 2. *Datura stramonium* L.

silage processes. Human poisoning typically occurs via seed ingestion (particularly in children) or accidental therapeutic overdose. Although adult livestock generally avoid the plant due to its malodorous nature, juvenile animals, such as calves and piglets, occasionally consume the foliage and flowers, frequently resulting in fatal toxicosis. Horses and cattle exhibit the highest sensitivity to these tropane alkaloids, whereas certain animal groups (rabbits, rats, dogs), birds (pigeons, chickens), and specific insects show notable resistance. Clinically, it is critical to note that *Datura* alkaloids induce gastrointestinal hypomotility by blocking gastric wall musculature. Despite its severe toxicity, the species has documented medicinal value.

***Hyoscyamus niger* L. – Măselariță neagră.**

A true biennial reaching 20-100 cm in height (Fig. 3), characterized by a thickened, cylindrical taproot up to 2(3) cm in diameter that is upright, branched, soft, and occasionally almost spongy. The plant is malodorous and is classified as a therogemicryptophyte. Flowering occurs in the second year, spanning from the second half of May through August. The species reproduces exclusively by seeds, which can remain viable in the soil seed bank for up to 5 years, with a maximum fecundity of approximately 450,000 seeds per plant. The global range encompasses Eurasia and Northwest Africa; it has naturalized in Atlantic Europe, Central North America, and Southeast Australia. Structurally a Eurasian species and a mesophytic weed, it grows predominantly in wastelands, where it forms fairly numerous populations. From these ruderal sites, it colonizes disturbed areas under the forest canopy, clearings, forest edges, meadows, and pastures. Within the "Yagorlyk" Scientific Reserve, it occurs rarely along roadsides and in ruderal habitats, forming small groups.



Figure 3. *Hyoscyamus niger* L.

Highly toxic to both humans and animals, all parts of the plant, particularly the seeds, contain a potent alkaloid complex. This includes hyoscyamine, the primary constituent with pronounced psychotropic effects; scopolamine, an exceptionally dangerous component lethal even in minute quantities; and atropine, which induces anticholinergic toxicity by blocking muscarinic receptors and disrupting nervous impulse transmission. Poisoning typically manifests as acute psychosis accompanied by hallucinations. The plant retains its full toxicity when dried. Due to the visually distinctive calyx and capsule, children are frequently attracted to the plant, placing them at an exceptionally high risk of severe or fatal poisoning. While adult livestock generally avoid *Hyoscyamus* due to its malodorous nature and bitter taste, accidental toxicosis remains a noted veterinary issue. Poisoning via seed or foliage ingestion has been documented in cattle, calves, swine, and poultry, often



Figure 4. *Solanum dulcamara* L.

occurring when contaminated forage is processed into grass meal. Despite its dangerous profile, the species remains a recognized medicinal plant.

***Solanum dulcamara* L. – Zârnă dulcamară.**

A subshrub reaching up to 200 cm in height (Fig. 4), characterized by climbing stems and a root system composed of thickened underground shoots. It is a racemose, medium-rhizome chamaephyte (nanophanerophyte). Flowering typically occurs in the second year, spanning from May to October, with reproduction proceeding both vegetatively and by seed. The global range

encompasses Eurasia and Northwest Africa, with introductions reported in North and South America. A Eurasian species and a meadow hygromesophyte, it grows in damp forests, shrublands, damp meadows, and along riverbanks and lakeshores, as well as occurring as a weed in fields, gardens, and vegetable plots. Within the "Yagorlyk" Scientific Reserve, it is distributed along the banks of the Yagorlyk waters, where it occurs in small groups of 2-3 specimens.

Highly toxic to both humans and animals, this species simultaneously targets the gastrointestinal tract and the central nervous system. The roots, herbage, and unripe fruits are poisonous, containing the toxic glycoalkaloid solanine, the glycoside dulcamarin, starch, resin, and proteins. Dulcamarin exhibits an action mechanism similar to that of atropine. The toxic properties dissipate as the fruit matures, rendering the fully ripe berries edible. Ingestion of unripe fruits remains a frequent cause of accidental poisoning, particularly in children, while toxicosis can also result from a medicinal overdose. In livestock and poultry, poisoning typically occurs when animals consume unripe *Solanum dulcamara* in heavily degraded paddocks where all alternative forage has been depleted. Despite its severe toxicity, the species is a recognized medicinal plant.

***Solanum nigrum* L. – Zârnă neagră.** An annual plant growing 15-90 cm tall (Fig. 5), characterized by a short, branched taproot. It is a therophyte that flowers from June to October, reproducing exclusively by seed. The maximum fecundity of a single individual is approximately 280,000 seeds. The global range covers Eurasia and Northern and Northeastern Africa; it has naturalized in Malaysia, Australia, southern Africa, and North America, exhibiting a cosmopolitan distribution. A mesophytic weed, it is common in ruderal sites near dwellings, cultivated fields,



Figure 5. *Solanum nigrum* L.

gardens, vegetable plots, along riverbanks, and within shrub thickets. Within the “Yagorlyk” Scientific Reserve, it occurs in disturbed, weedy areas, growing either singly or in small groups.

Highly toxic to both humans and animals, this species simultaneously targets the gastrointestinal tract and the central nervous system. The entire plant, including the unripe green fruits, contains a toxic complex comprising the bitter glycoside dulcamarin (which exhibits an action mechanism similar to that of *Hyoscyamus* alkaloids) and the glycoalkaloids solanine, solaceine, and solaneine. As the berries mature, solanine levels dissipate almost entirely, rendering the fully ripe fruits edible. Human toxicosis, particularly in children, typically occurs because the berries are recognized as edible, leading to the accidental ingestion of unripened fruits or mixed batches containing toxic green berries. In veterinary contexts, livestock poisoning occurs when animals graze on the unripe herbage in overused pens where alternative forage has been depleted; cases of fatal toxicosis are well-documented in piglets and poultry. Clinical manifestations of severe poisoning include clonic seizures, respiratory or circulatory failure, and death. Despite its high toxicity, the plant has recognized medicinal applications.

CONCLUSIONS

Within the spontaneous flora of the Republic of Moldova, 506 species of poisonous plants have been identified, 216 of which occur within the plant communities of the “Yagorlyk” Scientific Reserve. In the reserve’s flora, the Solanaceae family is represented by six species, five of which are poisonous: *Alkekengi officinarum*, *Datura stramonium*, *Hyoscyamus niger*, *Solanum dulcamara* and *S. nigrum*. Notably, all five of these toxic species also possess documented medicinal properties.

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