

Mini Review

Medicinal Plants in Morocco: Toxicity, Adverse Effects and Phytovigilance

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Introduction

Herbal medicine is widely practiced in Morocco due to its accessibility, low cost, and deep roots in cultural traditions. The country boasts a rich plant biodiversity, with several hundred medicinal species used in traditional medicine for the prevention and treatment of numerous conditions, ranging from minor ailments to chronic diseases, and sometimes even cancers [1, 2]. Among the most commonly used plants are *Atractylis gummifera* (glue thistle), *Aristolochia longa* (aristoloche), *Peganum harmala* (harmal), and *Trigonella foenum-graecum* (fenugreek) [3].

Despite their potential therapeutic benefits, medicinal plants are not free from risks. Their use may cause adverse effects, ranging from mild symptoms to severe toxicity involving the liver, kidneys, cardiovascular system, central nervous system, and hematological system [4]. Several cases of poisoning, some of them fatal, have been reported in Morocco, underscoring the fact that a product's natural origin does not guarantee its safety or the safety of its use [5].

Many factors contribute to the occurrence of these adverse effects, including self-medication, the irrational use of plants, botanical identification errors, confusion between species, quality or contamination issues, and interactions with conventional medications [6]. In addition to these factors, there are limitations in regulation and phytovigilance, which make it difficult to monitor and prevent risks associated with the use of these plants. The objective of this study is to catalog the main medicinal plants used in the country, describe the adverse effects associated with them, and propose concrete preventive measures to ensure their safe use.

Materials and methods

This study combines a retrospective descriptive analysis of Moroccan poisoning data with a narrative literature review. A literature search was conducted in the PubMed, ScienceDirect, and Google Scholar databases for publications released between 2000 and 2025, using the following keywords: "medicinal plants," "herbal medicine," "toxicity," "adverse effects," "phytovigilance," and "Morocco," as well as their French equivalents. Articles published in French or English that addressed the toxicity or adverse effects of medicinal plants used in Morocco were included.

This search was supplemented by an analysis of data published by the former Moroccan Poison Control and Pharmacovigilance Center (CAPM) during the period 2009–2019.

Results

Data from the Moroccan Poison Control and Pharmacovigilance Center (CAPM) show that poisonings related to medicinal plants represent a significant public health problem. Between 2009 and 2019, 1,826 cases of poisoning involving 183 plant species or traditional medicinal products were recorded, for an annual average of 166 cases. Approximately 20% of the reports involved unidentified plants. The main species implicated were *Ricinus communis*, *Atractylis gummifera*, *Peganum harmala*, *Juniperus oxycedrus*, *Dysphania ambrosioides*, and

Datura stramonium [7]. Clinical manifestations were dominated by gastrointestinal and neurological symptoms. According to the Poisoning Severity Score (PSS), the majority of poisonings were of moderate severity, while severe cases accounted for a small proportion but were responsible for the majority of deaths. The overall case-fatality rate was estimated at 5.2%, with deaths predominantly occurring among children. *Atractylis gummifera* was the leading reported cause of death (Table 1).

Clinical manifestations	Frequency
Gastrointestinal manifestations	47,5 %
Neurological manifestations	24,1 %
Impact on general health	9,1 %
Respiratory manifestations	4,8 %
Cardiovascular manifestations	3,6 %
Skin disorders	2,7 %
Urinary disorders	1,8 %
Osteoarticular disorders	1,5 %
Psychiatric disorders	1,5 %
Liver disorders	1,3 %

Table 1: Clinical manifestations of poisonings reported by the CAPM.

Studies conducted in various regions of Morocco confirm the high incidence of accidental poisoning, particularly among children, as well as the toxicity of certain plant species (Table 2). The study conducted in the Rabat region (1980–2015) reported 103 cases, mainly of accidental origin, with a favorable outcome in nearly 90% of cases, but a mortality rate of 9.2%, primarily associated with the sticky thistle [8]. The national study on *Atractylis gummifera* (2009–2020) identified 165 cases, primarily among children. The case-fatality rate was 11.5%, reaching 28.1% among children. Factors associated with death included age ≤ 14 years, male gender, rural residence, liver involvement, and a delay in treatment of more than six hours [9]. The case series on *Dysphania ambrosioides* (M'khinza) reports exclusively severe cases of poisoning, characterized by neurological, respiratory, hepatic, and renal involvement, often requiring intensive care. Four of the seven patients died. [10]. Finally, the study of 200 cases of *Peganum harmala* poisoning shows that the majority of cases involved women and that the substance was used primarily for therapeutic purposes. Neurological symptoms were the most common, followed by gastrointestinal and cardiovascular symptoms, with a case fatality rate of 6.2% [11]. Overall, these studies identify *Atractylis gummifera*, *Ricinus communis*, *Peganum harmala*, and *Dysphania ambrosioides* as the main plants responsible for severe poisonings in Morocco and highlight the particular vulnerability of children.

Study	Population	Key findings
CAPM (2009–2019) [7]	1 826 cas	<i>Ricinus communis</i> and <i>Atractylis gummifera</i> are the main plants implicated; case fatality rate of 5.2%.
Rabat (1980–2015) [8]	103 cas	Poisonings are primarily accidental; Maajoune (20%), <i>Atractylis gummifera</i> (12%); mortality rate of 9.2%.
<i>Atractylis gummifera</i> (2009–2020) [9]	165 cas	Accidental exposure (90.3%); case fatality rate of 11.5%; risk factors: children, rural areas, hepatitis, time to treatment >6 hours.
<i>Dysphania ambrosioides</i> [10]	7 cas	Severe neurological, respiratory, hepatic, and renal damage; 4 deaths.
<i>Peganum harmala</i> [11]	200 cas	Therapeutic use (32.5%); neurological manifestations (34.4%); case fatality rate of 6.2%.

Table 2: Summary of the main Moroccan studies on poisoning from medicinal plants.

Discussion

The results of this review highlight that poisonings related to medicinal plants constitute a significant public health problem in Morocco. Data from the Moroccan Poison Control and Pharmacovigilance Center (CAPM) show a significant incidence of poisoning, involving a wide variety of plant species and, in some cases, severe outcomes. These findings are consistent with several national and international studies that report widespread use of medicinal plants, as well as an increase in adverse effects and poisoning cases linked to their inappropriate use [1, 12, 13]. Clinical manifestations are primarily gastrointestinal and neurological, but severe liver, kidney, and cardiovascular involvement may also occur, requiring specialized care. These findings are consistent with data from the literature, which show that the most commonly affected organs are the liver, kidneys, and central nervous system, due to the presence of toxic compounds such as alkaloids, glycosides, or terpenes [13]. Among the plants implicated, *Atractylis gummifera* appears to be the species of greatest concern due to its high lethality, particularly in children. This toxicity is primarily linked to the presence of atractyloside and carboxy atractyloside, which cause mitochondrial dysfunction leading to fulminant hepatitis, acute renal failure, and multi-organ failure [14, 15]. The studies analyzed also highlight the potential severity of other plants widely used in traditional medicine, including *Peganum harmala*, *Dysphania ambrosioides*, and *Ricinus communis*. The frequency of accidental poisonings among children underscores the importance of preventive measures within families. These findings also highlight several factors contributing to poisonings, including self-medication, the lack of reliable botanical identification, preparation errors, folk beliefs, and delays in seeking medical care. Furthermore, underreporting of cases suggests that the true extent of the problem is likely underestimated. Strengthening phytovigilance, improving the reporting of adverse effects, and raising awareness among healthcare professionals and the general public appear essential to improving the safe use of medicinal plants in Morocco.

Conclusion

Medicinal plants play an important role in healthcare practices in Morocco, but their use is not without risks. Available data show that certain species can cause serious, even fatal, poisoning, particularly in children. *Atractylis gummifera*, *Ricinus communis*, *Peganum harmala*, and *Dysphania ambrosioides* are among the main plants of concern. The development of an effective national phytovigilance system, regulatory oversight of medicinal plant use, training for healthcare professionals, and public awareness campaigns are essential to reducing morbidity and mortality associated with these poisonings. Prospective, multicenter studies are also needed to better characterize risk factors and improve prevention and management strategies.

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