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Ethnobotanical study of the toxicity of *Ecballium elaterium* (L.) A. Rich. in the Northeast of Algeria

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ABSTRACT

Medicinal plants still remain a source of medical care in developing countries, in the absence of a modern medical system. The use of herbal medicine is deeply rooted in our culture, because Algeria is renowned for the richness of its medicinal flora which includes hundreds of plant species. *Ecballium elaterium* (L.) A. Rich. the species reported in this study is traditionally used in Algeria for a wide range of illnesses. The aim of this study was to evaluate the potential toxicity of it. Many herbalists (two hundred) in different regions in Northern Algeria (Tébessa, Khenchela, Oum El Bouaghi, Constantine, Skikda) were questioned to recognize the toxicological concern of *E. elaterium* in Algerian traditional medicine in these regions.

KEYWORDS: Ethnobotany, Medicinal plants, Northeast of Algeria, Toxicity

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INTRODUCTION

The plant *Ecballium elaterium* (*E. elaterium*) is commonly called *squirting cucumber* in English, *spritzgurke* in German, and *concombre sauvage* in French and was known to the ancient Greeks, having been described by the Greek philosopher Theophrastus in his history of plants [1]. *E. elaterium* is the scientific name of a plant belonging to Cucurbitaceae family. The plant is a decumbent, perennial herb (Figure 1); it is a wild medicinal plant indigenous and found abundantly in the Mediterranean region, and cultivated in central Europe and England. The fruit of this species is ovoid, fleshy; approximately 4 cm in length, when unripe of a pale green color, and covered with numerous, uniseriate glandular hairs [2]. The interior of the fruits contains black seeds and a liquid known as 'juice of *E. elaterium*'. The juice contains proteins, lipids, and sugars [3]. In folk medicine, *E. elaterium*, was empirically used as a purgative, because it is an energetic hydragogue cathartic, operating with great violence in doses of a few grams. Because of its property of producing copious watery evacuation from the mucosa and the vessels, it has been also used in the treatment of pulmonary edema and ascites, and to control arterial hypertension. *E. elaterium* is of interest today because

its fruits extracts are still used in Mediterranean region in different medicinal system [4,5]. Whose fruit juice is used for the treatment of jaundice, also is widely used, by people in the eastern Mediterranean region, to treat sinusitis, because of its inherent anti-inflammatory properties. However, the use of *E. elaterium* in some allergy-prone patients causes adverse reactions, such as edema of the upper respiratory tract, resulting in an emergency situation, which the otolaryngologist is frequently asked to diagnose and treat [2,4]. The fresh crude juice frequently used in the treatment of irritation of mucous membranes, drooling, dysphagia, and vomiting [6]. The diluted aqueous extract of *E. elaterium* fruits is a traditional anti-inflammatory and analgesic for chronic sinusitis. It also possesses other uses especially the treatment of fever, cancer, liver disorders, jaundice, constipation, hypertension, dropsy, rheumatic diseases, and fungicidal [7,8,9]. Man recognized very early the toxicity of plants, very early on, he also recorded his observation but if learning by trial and error of immediate toxicity and optimal quantities to be used was within reach of past centuries, the manifestations induced by therapy long term and especially the notion of adverse effects could not escape the best of observations. These effects can only be suspected by the accumulation of observations and experimentation and-if

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necessary - they are confirmed by ethnobotanical studies. This ethnobotanical survey was conducted in order to highlight the importance and uses of a plant of toxicological concern (*E. elaterium*) in traditional medicine. The choice of this plant for the practical study was based on its wide distribution in the Algerian territory, and its use for different indications and ignoring its real dangers to the patient's health because its toxicity is not too studied as other plants.

MATERIALS AND METHODS

The Study Area, Ethnobotanical Survey and Data Collection

During the period of February–October 2018, field work investigation was done to lay down a comprehensive survey study about the toxicity of *E. elaterium* (Figure 1); the data regarding the use of this plant were collected from 200 herbalist's

Figure 1: The plant *Ecballium elaterium* (squirting cucumber)

exercisers and experienced in the different provinces following: Skikda (40 survey), Constantine (40 survey), Oum El Bouaghi (40 survey), Khenchela (40 survey) and Tébessa (40 survey) (Figure 2). Most of the herbalist's were either native born or had been living in the area for long time. The study areas were chosen according to an increasing aridity gradient, from the humid sub which is in the northeast, as is the case of Skikda, which is considered as the wettest region in Algeria to the arid as Tebessa.

RESULTS AND DISCUSSION

The questioned herbalists are of opposite sex: 86% men and 14% women (Figure 3). 48% of them in this trade for over 20 years, or 60 years, 30% exercise only for 10 years, the rest (22%) are in this business for 10-20 years (Figure 4).

It was found that the majority of herbalists (80%) have learned these traditional medical knowledges through experience and practice. Only 20% are university graduates, particularly in biology and botany (Figure 5). These herbalists practice their craft in the popular souks (52%) and in stores (40%). Only 8% of them work at home (female) (Figure 6).

As regards the plant, all the herbalists know. 74% the mean by its vernacular name "fagouss lahmir" and 26% also know it by other names, especially "fagouss aghyoul" or "fagouss boughyoul" (Figure 7).

This herb is prescribed in its fresh form only, 72% of herbalists, its form desiccated by only 4%. All these herbalists claim that all parts of the plants, only the fruit is used (Figure 8).

Figure 2: Map of the regions considered in this study (Northeast of Algeria: Skikda Constantine Oum Bouaghi Khenchela Tébessa)

The fruit is given only by 70% of herbalists, while 30% give it in combination with olive oil above (and also with: gourd, turmeric, henna, clove, cinnamon, garden cress, cypress, mastic, lemon, honey, raw eggs, goat milk, goat meat and fat, vegetable fat and even lentil soup) (Figure 9).

The fruit is recommended for patients with jaundice and hepatitis by 44% of herbalists, and treating hemorrhoids (16%), headache (16%), diabetes (12%) and constipation (10%). The fruit is also used for the treatment of other ailments such joint and rheumatic pain, fever and ear infections; and for cosmetic purposes (strengthen hair) (Figure 10).

Other uses of this plant were for the treatment of acute or chronic sinusitis, and to treat chronic rhinitis, although the use

of *Ecballium elaterium* in treating rhinologic diseases is known to many otolaryngologists of the Mediterranean region. It seems that the juice of the fruit of *E. elaterium* indeed possesses curative properties for treating sinusitis and rhinitis. However, in a small number of allergy-prone persons, the fruit juice of *E. elaterium* causes allergic edema, which is located usually at the uvula or involves the nasal mucosa. In a few cases swelling occurs in other sites such as the lips, the tongue, or even at multiple sites, in a few patients the action of *E. elaterium* may be attributed to the contact of a large quantity of the fruit juice to the mucosa of the oral and the nasal cavity [2].

As for the route of administration, 70% of herbalists have agreed on the nasal instillation knew fruit juice, making the major route of traditional use, followed by maceration of the

Figure 3: Distribution of herbalist's sex

Figure 6: Distribution of herbalists by place of exercise

Figure 4: Distribution of herbalists on the accrual period

Figure 7: Use of *Ecballium elaterium* methods

Figure 5: Distribution of herbalists according to their level of study

Figure 8: Use forms of *Ecballium elaterium*

dry fruit (26 %). The other routes (rectal, oral and external use) are in the minority and are prescribed by 12%, 8%, 4% herbalists (Figure 11).

Figure 9: Known appellations plant

Figure 10: Different directions of the plant

Figure 11: Route of Administration of the plant

Figure 12: Different side effects

The toxicity of ass cucumber declared important by 62% of herbalists, including 19.35% say it is hepatotoxic or fatal, while 25.80% say it is toxic due to its irritant to skin and to the nasal passages. Some herbalists (four in number (04) attribute this plant other side effects such as digestive disorders (diarrhea and vomiting) and internal bleeding (Figure 12).

Kloutsos et al. [2] reported that some patients presented localized swelling of the uvula and the nasal mucosa, whereas others presented Uvula Nasal mucosa, Tongue, Cheek and Lips. Because of its harmful effects, ass cucumber is only used in adults and in children against all interviewed by herbalists. Toxic and beneficial effects of the fresh juice and elaterium have been reported including analgesic, antipyretic, and anti-inflammatory effects [10,11]. All parts of the squirting cucumber are toxic, particularly the ovoid green fruits. Several toxicity and allergic reactions have been described if used undiluted [2,6,12,13]. These toxic effects seem to correspond to the juice's major active compound, cucurbitacin B [7]. But the mechanism of toxicity is not well defined [14].

CONCLUSION

The ethnobotanical study carried out in the Northeast region of Algeria on *Ecballium elaterium* (L.) A. Rich., made it possible to highlight the use of this species in traditional phytotherapy and the possibility of toxicity from a certain dose. The survey of herbalists in the 05 cities of eastern Algeria reveals the importance of the use of the *E. Elaterium* fruit in local traditional medicine, it is widely used fresh (70% of herbalists prescribe it in this form) to cure hepatitis and jaundice. (44%). The survey of herbalists reveals in particular a black point when it comes to the medicinal use of this plant. Indeed, more than half (62%) speak of an obvious toxicity of this plant in precise doses. Also, the survey shows the non-use of fruits in fresh form and the non-use for children. In view of the results obtained in this study, it appears that the traditional use of *E elaterium* medicinal plants still persists in the eastern region of the country and this despite the ease of access to modern medication. It should be noted that the degree of toxicity of this plant remains not very well defined.

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