



The Use of Medicinal Plants in the Treatment of Asthma: Surveys of Asthmatic Patients at Moulay Youssef Hospital

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Abstract

Asthma is a chronic inflammatory disease of the bronchi, responsible of various phenomena at the respiratory level. There would be more than 235 million asthmatics in the world. Usually, an appropriate drug treatment allows good control of the disease, but many patients have recourse to complementary therapies such as phytotherapy (herbal medicine).

This study focuses on the place of herbal medicine in the basic management of asthma. A survey was conducted among asthmatic patients at the Moulay Youssef hospital in Rabat. 100 asthmatic patients were interviewed and 41% associate a non-drug herbal treatment with it. A total of 26 species of medicinal plants belonging to 15 different families haven't been identified, the most represented families were Lamiaceae and Fabaceae. Among the most used plants: nigella, garlic, onion and fig, the most used parts were the seeds (54%). 74% of patients take their herbal medicine in the form of plant combinations and 67.5% report feeling an improvement in their condition as a result. Among the species listed, 17/26 present evidence in the literature of their anti-asthmatic action through clinical or animal trials. The rest of the listed species are used in a folkloric way, for the treatment of asthma, this represents new avenues of scientific research on their effectiveness, their mechanism of action and their toxicity in order to develop new therapeutic means in the treatment of asthma.

Keywords: Asthma; Phytotherapy; Hospital Moulay Youssef rabat; Plante; Ethnobotanic study

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Introduction

Asthma is a chronic inflammatory disease of the bronchi, this inflammatory reaction is responsible for various phenomena in the airways (oedema, contraction of the bronchial muscles, secretion of mucus) [1] and is manifested by attacks which are episodes of respiratory discomfort wheezing and coughing. The frequency and severity of seizures vary from individual to individual [2].

According to the latest WHO figures, there are more than 235 million asthmatics worldwide; it is the most common chronic disease of childhood. It accounts for about 11 million hospital visits annually and the sixth most frequent reason for visits in ambulatory setting [3].

This prevalence varies from one country to another; Morocco has been placed in the category of countries with intermediate prevalence, i.e. 10% to 15% [4].

The occurrence of asthma results from the combination of predisposing genetic and family factors (atopic disease, allergic rhinitis, prematurity, etc.) and environmental factors such as allergens, smoking or air pollution. Cold air, strong emotions, certain medications, or physical exercise can also trigger an attack [5].

The management of asthma is mainly based on symptomatic drug treatment, with a bronchodilator drug and, if necessary, a background anti-inflammatory treatment (inhaled corticosteroids) which makes it possible to avoid attacks and maintain normal respiratory function.

To which are added additional measures, such as the elimination of triggering factors and a healthy lifestyle [6].

If the follow-up of the classic treatment adapted to the recommendations often allows good

control of asthma, many patients have recourse, either to avoid the side effects of conventional drugs, or to space out the attacks, to alternative and/or complementary therapies such as homeopathy, acupuncture, hypnosis or herbal medicine.

In this study we are particularly interested in the place of herbal medicine in the basic management of asthma in Morocco and more precisely in the region of Rabat, for this a survey was conducted among asthmatic patients of the Moulay Youssef hospital for pulmonary diseases and tuberculosis.

Materials and Methods

This is a descriptive, prospective ethnobotanical study carried out on patients diagnosed with asthma and followed at the Moulay Youssef hospital of the Ibn Sina university hospital in Rabat.

Data was collected via individual interviews and using an anonymous questionnaire (Appendix 1) comprising 15 questions divided into 2 Grabs items:

A part concerning information relating to the patient's profile (age, gender, level of study, etc.), and a second part concerning phytotherapy (the plants used, the methods of preparation, the doses administered, etc.).

The determination of the scientific nomenclature of the mentioned species was carried out, thanks to the following documents: The traditional Moroccan pharmacopoeia of Bellakhder (1997); the Practical Flora of Morocco by Fennane et al. (1999) and the Moroccan medicinal and aromatic plants of Hmamouchi (2001).

Results

This survey was conducted among 100 asthmatic patients followed at the Moulay Youssef Rabat Hospital, 59% of them were women. Indeed 47.5% (n = 28) of asthmatic women questioned resort to herbal medicine, while the percentage of asthmatic men who resort to herbal medicine represents only 31.7% (n = 13) of the entire male population questioned.

All of the patients questioned, without exception, declared that they were taking medication. But in addition, 41% associate a non-drug herbal treatment.

The age range went from 6 to 90 years old with an average age of 50 years old, knowing that more than 73% of the people questioned were over 40 years old. Among the age group under 30, the percentage of patients using herbal medicine in addition to their drug treatment does not exceed 30%, but this rate exceeds 50% among those over 40.

Regarding the geographical distribution, 87% of the patients actually came from the city of Rabat and Region, the remaining 13% came from other cities.

A total of 26 species of medicinal plants belonging to 15 different families were identified during this study, the most represented families were Lamiaceae (n=4) and Fabaceae (n=4).

Among the six most frequently used plants are: nigella, garlic, onion, fig, fenugreek and anise (Table 1).

The plant drug is the part of the plant used for its therapeutic use, the most used parts in our study were the seeds with a percentage of 54% followed by the bulb (18%), fruits 18%, roots and leaves. respectively at 12 and 11% and finally the flower buds and the whole plant with a cumulative percentage of 5%.

In 74% of cases, the patients questioned administered their herbal medicine in the form of combinations of plants. Among the plants identified, some have been used only in combination while others have been used only as monotherapy.

A total of 24 different combinations were listed. The most frequently cited was the garlic and fig mixture (n=5) followed by the anise, nigella and onion combination (n=2).

Six methods of preparation were cited, the most frequent being powder in 47.5% of cases, infusion at 13.2% and steam cooking with a percentage of 11.3%.

In the vast majority of cases, i.e. 98%, patients prefer the oral route. Of all the respondents, only one said that he took his preparation nasally in the form of drops.

For half of the herbal drugs used (50%), the patients declare that they do not set themselves fixed daily doses. And when the dose used is measured, the means most frequently used to quantify it was the tablespoon (57.5%) followed by the teaspoon (23%) and the glass (19%).

The duration of taking the treatment based on herbal medicine was variable, from 3 days to 3 years, but in 53% of cases, it does not exceed six months, in fact, 51.22% of patients followed cures of less than 30 days. and only 4% of them said they took their treatment for more than a year (Table 1 and 2).

At the end of our interrogation, asthmatic patients using herbal medicine in addition to their drug treatment were questioned about the results and the improvements in their condition felt, their answers indicated a positive result at 67.5%. The vast majority of respondents (92.7%) refer to their families and entourage to obtain information relating to the use of herbal medicine in the treatment of asthma. And only a cumulative percentage of 2.4% of patients mention other sources of information such as medical personnel (doctors/pharmacists), herbalists and the media (radio, TV).

Discussion

The therapeutic use of medicinal plants is very present in several countries of the world and particularly in developing countries, for cultural and socio-economic reasons (Tabuti et al., 2003). In Western countries, it is rather a practice that is experiencing renewed interest with strong media promotion of "natural" and "organic" [7, 8].

Morocco, by the richness and diversity of the origin of its flora, constitutes a real phytogenetic reservoir, with about 4,500 species and subspecies of vascular plants (Scherr et al., 2005). And traditional medicine has always occupied an important place in the traditions of medicine in Morocco. As confirmed by our results where 43% of those questioned use herbal medicine as a complementary alternative treatment for their asthma, this also joins the results reported by A. Belghitri and L. zemour, where 300 asthmatic patients were questioned and 45% declared have recourse to phytotherapy [9]. But this percentage remains relatively comparable to that found with patients treated for other pathologies, such as cancer for example 36%, diabetes 56.5% [10,11].

Our results revealed that women use phytotherapy much more than men (47.5% against 31.7%).

These results confirm other ethnobotanical work carried out on a national scale, the case of work by Mehdioui & Kahouadji (2007) in the Amsittène forest (Province of Essaouira) which showed that

Table 1: The species listed: Scientific Name, Family, Vernacular Name, Part Used, Method of Use, Dosage and Number of Citations.

Scientific name/family	English vernacular name	Arab vernacular name	Parts used	Method of preparation	Usual doses used	Number of quotes
<i>Nigella sativa</i> Ranunculaceae	Nigella	Sanouj Haba sawda	Seed	Seeds mixed with honey	1 c.a.c./day: 1 week - 1 month 1 c.a.c./day: 1 YEAR	14
<i>Allium sativum</i> Liliaceae	Garlic	Tum, Tuma	Bulb	Clove + olive oil pod+ honey	1 tbsp/d: until improvement 1 tsp/d: for 1 week	12
<i>Allium cepa</i> Liliaceae	Onion	Besla	Bulb Seed	Seeds mixed with honey Juice extracted from the bulb + honey	1 c.a.c./day: pdt 1 week 1-2 c.a.s./day: 15 days, 1 year 1-2 cases/day for 1-2 months	11
<i>Ficus carica</i> Moraceae	Fig	Karmous	Fruit	Fruit mixed with honey or olive oil		9
<i>Trigonella foenum-graecum</i> Fabaceae	Fenugreek	Helba	Seed	Seed decoction	1 glass/ day: for 5 months	8
<i>Pimpinella anisum</i> Apiaceae	Green anise	Habbet Hlawa	Seed	Seed powder+honey	1 case/d for: 2 months 1 cac/d: for 10 days	8
<i>Linum usitassimum</i> Linaceae	Linseed	Zarriat El-kattan	Seed			7
<i>Thymus vulgaris</i> Lamiaceae	Thyme	Zaatar	Leaf	leaf infusion	1 drink/ day: for 2 weeks, 1 month, 1 year.	7
<i>Vicia faba</i> Fabaceae	Bean	Foul	Seed			6
<i>Glycyrrhiza glabra</i> Fabaceae	Licorice	Arq sous	Root			5
<i>Illicium verum</i> Illiaceae	Star anise	Badiana	Fruit	Fruit powder mixed with honey	1 cac/d: for 10 days	5
<i>Zingiber officinale</i> Zingiberaceae	Ginger	Skinjber	Rhizome	Powder + honey root decoction	1 tbsp/d: until improvement 1 glass/d: until	5
<i>Citrus limon</i> Rutaceae	Lemon	Hammed	Fruit			3
<i>Syzygium aromaticum</i> Myrtaceae	Clove	Qronfel	flower buds	Infusion of buttons Powder+honey Infusion or decoction	1 glass 1 case/day for 2 months 1 glass/day duration 1 week	3
<i>Lepidium sativum</i> Brassicaceae	Garden cress	HabB er-rchad	Seed Leaf			2
<i>Mentha pulegium</i> Lamiaceae	Pennyroyal mint	Fliyyo	Aerial part			2
<i>Ajuga iva</i> Lamiaceae	Ivet musk	chendgoura	Plante entière	mixed with honey	1 case/d for: 1 month	2
<i>Curcuma longa</i> Zingiberaceae	turmeric	Kherqum	Rhizome			1
<i>Foeniculum vulgare</i> Apiaceae	Fennel	Besbas, nafa	Fruit Root			1
<i>Panicum miliaceum</i> Poaceae	Millet	Illane	Seed			1
<i>Cicer arietinum</i> Fabaceae	Chickpea	Houmous	Seed			1
<i>Sesamum indicum</i> Pedaliaceae	Sesame	Jeljlane	Seed			1
<i>Eucalyptus globulus</i> Myrtaceae	Eucalyptus	Kalitus	Leaf	leaf infusion	1 glass/d duration 1 year	1
<i>Rubia tinctoria</i> Rubiaceae	Madder	Fuwa	Root	Root decoction		1
<i>Marrubium vulgare</i> Lamiaceae	Horehound	Meriwwa	Leaf Flowering tops	leaf decoction	Nasal drop after the attack for 3 days.	1
<i>Brassica rapa</i> Brassicaceae	Turnip	Left	Bulb	Grated and sweet bulb	1 case/day during the crisis	1

women are more in possession of traditional phytotherapeutic knowledge. , which can be explained by the use of medicinal plants by women in fields other than therapy such as cosmetics or cooking as well as by their role as mothers, in the management of first family medical care and preparing grandmother's home remedies [12].

Regarding age, more than 73% of people questioned and using phytotherapy were over 40 years old. Indeed, the elderly use medicinal plants more than other age groups, since the experience accumulated with age is the main source of information at the local level about the use of plants in traditional medicine, Knowledge of the uses and properties of medicinal plants is transmitted from one generation to

another. But there is a loss of information on medicinal plants and some authors even consider that the transmission of this knowledge is currently in danger because it is not always assured [12-14]. This can be partly explained by the mistrust of some people, especially young people, who tend not to believe too much in this traditional medicine.

26 species were identified in total during this study, they belong to 15 different families, the most represented are the lamiaceae, the fabaceae, and this can be explained by the abundance of these families in the Moroccan flora and particularly in the region of Rabat [15]. The dominance of the Lamiaceae family in the treatment of respiratory

Table 2: The different combinations identified, their methods of preparation and their dosages.

Number of plants used	Association	Recipe	Dosage
2	Garlic+Fig	steamed then mixed with olive oil or honey	1 case/d for 3d
			1 bedroom x2/d for 15 days
			1 case/d for 1 month
			1 casex2/d for 2 months
	Lemon+Ginger	fresh ginger or powder + lemon juice + honey	1 case/d
	Watercress+Nigella	seed powder mixed with honey	1 bdx2d for 3 years
	Lemon+Onion	mixture of onion juice and lemon juice	1 case/d
	Fenugreek+Bean	powder mixed with honey, water or milk	1 case/d until improvement
	Fenugreek+Nigella	seed powder mixed with honey	1 case/d for 2 years
3	Ginger+Licorice	mix of both with honey	
	Flax seed+Licorice	powder + honey	1 case/d for 3 months
	Pennyroyal + Thyme	infusion or decoction of the leaves	1 drink during the crisis
	Garlic+Lemon+Turmeric	simple mix	during 1 month
	Garlic+Bean+Fig	steamed then mixed with olive oil or honey	1 case/day for 15 days
	Garlic+fig+thyme	steamed then mixed with olive oil or miel	2 cases/d duration 1 to 2 months
	Anise+fenugreek+bean	powder	1 month
4	Anise + nigella + onion	powder mixed with honey	1 casex2/d duration 3 months
	Fenugreek+flax+nigella	powder	1 bedroom/d for 1 month
	Fenugreek+bean+pea+chick	all crushed with honey	1 tsp/d
	Broad bean+flax+nigella+thyme	all mixed with honey	1 case/d duration 1 month
	Star anise+fenugreek+flax+liquorice	powder mixed with honey	1 casex2/d duration 1 month
5	Anise+flax+nigella+onion	seed powder	1 month
	Anise+fennel+fenugreek+bean	powder	1 tsp/d duration 1 year
	Anise+star anise+musk ivet+onion	all mixed with honey	1 year
7	Garlic+star anise+fig+mint pennyroyal+thyme	powder+honey+olive oil	1 box/d pdt15d
	Watercress+ginger+flax+nigella+liquorice	powder+honey	1 case/day for 3 months
7	Star anise+flax+millet+nigella+onion+liquorice+sesame	powder + honey or water	1 case pdt 1 month

ailments around the Mediterranean has also been reported by the work of Fatima et al. [16]. They contain most of the aromatic and condiment plants of this region, rich in essential oils.

Generally, the plant species used in the treatment of asthma have at least one of the following pharmacological properties: anti-inflammatory, antiallergic, antispasmodic, antioxidant, antimicrobial, immunomodulatory, expectorant and mucolytic. All of these activities are beneficial for the treatment of respiratory conditions and particularly useful in case of asthma [17].

Almost all of the species listed during our study have at least one of the pharmacological actions mentioned above.

In an attempt to prove the pharmacological interest of the medicinal plants identified in the treatment of asthma, a review of the available literature was conducted and the medicinal plants evaluated for their pharmacological effects were mentioned in Table 3.

10/26 of these species = presence of evidence in the international literature of their antiasthmatic action through clinical or animal trials.

The remaining species mentioned in the table below have yet to be pharmacologically evaluated in order to confirm their medical interest in the treatment of asthma, but studies have been found in

the literature which confirms their folk use in traditional medicine in the treatment of asthma, in Morocco and other countries, for the same indication.

Our bibliographical research has shown that a certain number of plants identified during our study have allergenic and irritant properties for the respiratory system, which can seriously harm asthmatic subjects (Table 4 and 5).

The patients questioned favored the use of a combination of several plants, rather than that of a single drug, and these associations could reach 7 different plants. These results were also observed during the BELGHITRI and Zemmour study where the combination of different drugs was used in 74.6% of cases.

Indeed, this mode of use has a number of advantages: complementary effects, synergy of action, etc., but it nevertheless carries a risk of toxicity [9].

The choice of which part of the plant to consume depends largely on socio-cultural beliefs, the ecological state, the practices of traditional healers, etc. In some of the ethnobotanical surveys carried out as part of the treatment of asthma, the most used part was sheet [68,74,75].

In our case it was rather the seed, this choice can be explained

Table 3: Summary of the pharmacochemical properties used in the treatment of asthma of the plants listed with scientific references of clinical trials or in vivo activity.

	Scientific name	Pharmacological Properties	Studies
1	<i>Allium cepa</i>	Antiasthmatic	[18-20]
		immunomodulatory	
		Antimicrobial	
		Bronchodilator	
2	<i>Allium sativum</i>	Antioxidant	[21, 22]
		Anti inflammatory	
		Anti-microbial	
3	<i>Turmeric longa</i>	Anti inflammatory	[23]
		Antioxidant	
		Antitumor	
4	<i>Eucalyptus globulus</i>	Anti-inflammatory	[24, 25]
		Mucolytic	
		Anti-asthmatic	
		Antimicrobial	
5	<i>Foeniculum vulgare</i>	Anti-inflammatory	[26, 27]
		Hypo-allergenic	
		Anti-microbial	
6	<i>Glycyrrhiza glabra</i>	Anti-inflammatory	[28-30]
		Anti asthmatic	
		Anti inflammatory	
7	<i>Lepidium sativum</i>	Anti asthmatic	[31-34]
		Bronchodilator	
		Anti inflammatory	
8	<i>Nigella sativa</i>	Anti-inflammatory	[35, 36]
		Immunomodulatory	
		Broncho dilator	
9	<i>Pimpinella anisum</i>	Antispasmodic	[37,38]
		Bronchodilator	
		antioxidant	
10	<i>Thymus vulgaris</i>	Anti-microbial	[39-41]
		Antioxidant	
		Anti inflammatory	
		Antitussive	
		Spasmolytic	
11	<i>Zyngiber officinalis</i>	Anti inflammatory	[42-45]
		Antioxidant	
12	<i>Linum usitatissimum</i>	Anti-inflammatory	[46-48]
		Antihistamine	
		Antimicrobial	
13	<i>Illicium verum</i>	Anti-inflammatory	[49-51]
		Immunomodulatory	

14	<i>Citrus limon</i>	Antioxidant	[52, 53]
15	<i>Brassica rapa</i>	Anti inflammatory	[54, 55]
		Immunomodulatory	
16	<i>Syzygium aromaticum</i>	Antioxidant	[56, 57]
		Anti-inflammatory	
17	<i>Trigonelle foenicum-graecum</i>	Anti inflammatory	[58 59]
		Anti-oxidant	
		Immunomodulatory	
		Mucolytic	

Table 4: Summary of plants identified in the treatment of asthma with scientific evidence of folk use.

	Scientific name	Pharmacological properties	Studies
1	<i>Marrubium vulgare</i>	Anti-inflammatory	[59-61]
		Antimicrobial	
		antioxidant	
		expectorant	
2	<i>Mentha pulegium</i>	Antimicrobial	[62, 63]
		Antioxidant	
		Spasmolytic	
3	<i>Ficus carica</i>	Spasmolytic	[64, 65]
		Antioxidant	
		Anti-inflammatory	
		Antimicrobial	
4	<i>Ajuva iva</i>		[66]
5	<i>Rubia tinctori</i>		[67, 68]
6	<i>Panicum miliaceum</i>	Spasmolytic	[69]
		Bronchodilator	

Table 5: Summary of plants listed in the treatment of asthma with scientific evidence of controversial properties.

	Scientific name	Pharmacological properties	Studies
1	<i>Sesamum indicum</i>	Anti-oxidant	[70,71]
		Anti-microbial	
		Anti-inflammatory	
2	<i>Vicia faba</i>		[72]
3	<i>Cicer arietinum</i>		[73]

by the fact that the seeds are easier to store to guarantee availability all year round as well as a rich source of active ingredients. These seeds are used in the form of powder mixed with honey or olive oil [68], the powder: makes the drug more easily assimilated, increases bioavailability and speed of dissolution.

It was raised, during our interrogations, that the dose consumed still remains uncertain, the patients considered these plants harmless and as part of the foods of everyday life and which can be consumed without moderation. Among these plants we find: fig, flax, broad bean, liquorice, lemon, garden cress, pennyroyal, turmeric, fennel, millet, chickpea, sesame, and madder. According to a study conducted in the region of Mechraà Bel Ksiri, 85.12% of users of medicinal plants use medicinal plants with unspecified doses, including 8.8% per pinch, 26.20% per spoonful and 50.12% per handful [14], idem concerning another ethnopharmacological study on the use of medicinal plants

in the treatment of tuberculosis in the south-east of Morocco [76].

While knowing that an ethnobotanical survey of medicinal plants carried out in the region of Fez, among 356 patients, revealed that the people surveyed were unaware of any information on the toxicity of the plants used [77].

Regarding the improvement felt, our results are in line with those collected from a population of asthmatics in the Telemcen region, where it was reported by 96% of patients that the use of plants in combination with their drug treatment gives them a beneficial effect [78].

Several studies affirm that the majority of patients, having recourse to phytotherapy, declared as main reasons for the use of medicinal plants, the experience, considered positive, of another patient [77,78]. Women remain more involved than men in the transmission and dissemination of information relating to phytotherapy. This is because they play a more important role in the management of family care and it is they who prepare home remedies or "grandmother's recipes", hence the vertical diffusion of this knowledge between generations of women [79].

Conclusion

Asthma is a disease that presents several therapeutic and economic challenges. This work shows the place occupied by herbal medicine in the unconventional therapeutic arsenal of this pathology given the large number of patients who resort to it without mastery of doses or knowledge of risk. The plant species used are very abundant and if some of them have already proven their effectiveness in animals or humans, the others constitute new avenues of scientific research on their effectiveness, their mechanism of action and their toxicity in order to develop new therapeutic means in the treatment of asthma.

Declaration of Interest

The authors declare that there is no conflict of interest.

The authors alone are responsible for the content of the paper.

References

- GINA. A Pocket Guide for Health Professionals based on the global strategy for asthma management and prevention. 2019.
- OMS/ ASTHMA. WHO n.d. <https://www.who.int/topics/asthma/fr/> (accessed November 21, 2019).
- Masoli M, Fabian D, Holt S, Beasley R, Global Initiative for Asthma (GINA) Program. The global burden of asthma: executive summary of the GINA Dissemination Committee report. *Allergy*. 2004; 59(5):469-78.
- Pearce N, Ait-Khaled N, Beasley R, Mallol J, Keil U, Mitchell E, et al. Worldwide trends in the prevalence of asthma symptoms: phase III of the International Study of Asthma and Allergies in Childhood (ISAAC). *Thorax*. 2007;62 (9):758-66.
- Von Mutius E. Gene-environment interactions in asthma. *J Allergy Clin Immunol*. 2009;123 (1):3-11.
- Razzouk H, Cembreu L. "77 Contrôle de l'environnement et prise en charge de l'asthme bronchique." *Revue des Maladies Respiratoires*. 2007:36.
- Raphaëlle Maruchitch. *Phytothérapie : un marché français porteur*. 2019.
- Chevallier A. Motivations à la formation et à la prescription de la phytothérapie chez les médecins généralistes (Doctoral dissertation, Université de Lorraine). 2021.
- Belghitri A, Zemour L. La place de la phytothérapie dans la prise en charge de l'asthme bronchique. *Revue des Maladies Respiratoires*. 2018;35:A92.
- Tazi I, Nafil H, Mahmal L, Harif M, Khouchani M, Saadi Z, et al. Les médecines alternatives et complémentaires chez les patients cancéreux en cours de traitement à Marrakech, Maroc: étude prospective. *Bulletin de la Société de pathologie exotique*. 2013;106(4):278-85.
- Sekkat ZL, Skalli S, Hassikou R. Étude de prévalence des effets indésirables liés à l'utilisation des plantes médicinales par les patients diabétiques de l'hôpital Ibn-Sina de Rabat, Maroc. *Phytothérapie*. 2020;18 (1):17-29.
- Mehdioui R, Kahouadji A. Etude ethnobotanique auprès de la population riveraine de la forêt d'Amsittène: cas de la Commune d'Imi n'Tlit (Province d'Essaouira). *Bulletin de l'Institut scientifique, Rabat, section Sciences de la vie*. 2007;29:11-20.
- Anyinam C. Ecology and ethnomedicine: exploring links between current environmental crisis and indigenous medical practices. *Social Science & Medicine*. 1995;40(3):321-9.
- Benkhnigui O, Zidane L, Fadli M, Elyacoubi H, Rochdi A, Douira A. Etude ethnobotanique des plantes médicinales dans la région de Mechraâ Bel Ksiri (Région du Gharb du Maroc). *Acta Botánica Barcinonensia*. 2010:191-216.
- Hseini S, Kahouadji A. Étude ethnobotanique de la flore médicinale dans la région de Rabat (Maroc occidental). *Lazaroa*. 2007;28:79-93.
- El Hilah Fatima FB, Dahmani J, Belahbib N, Zidane L. Étude ethnobotanique des plantes médicinales utilisées dans le traitement des infections du système respiratoire dans le plateau central marocain. *Journal of Animal & Plant Sciences*. 2015;25(2):3886-97.
- Loignon C. Représentations de la maladie, des traitements et conduites thérapeutiques: l'expérience de l'asthme. 2006.
- Ghorani V, Marefati N, Shakeri F, Rezaee R, Boskabady M, Boskabady MH. The effects of *Allium cepa* extract on tracheal responsiveness, lung inflammatory cells and phospholipase A2 level in asthmatic rats. *Iran J Allergy Asthma Immunol*. 2018;17(3):221-31.
- Santas J, Almajano MP, Carbó R. Antimicrobial and antioxidant activity of crude onion (*Allium cepa*, L.) extracts. *Int J Food Sci*. 2010;45 (2):403-9.
- Oliveira TT, Campos KM, Cerqueira-Lima AT, Cana Brasil Carneiro T, da Silva Velozo E, Ribeiro Melo IC, et al. Potential therapeutic effect of *Allium cepa* L. and quercetin in a murine model of *Blomia tropicalis* induced asthma. *DARU J Pharmaceutical Sciences*. 2015;23:1-2.
- Sonibare MA, Gbile ZO. Ethnobotanical survey of anti-asthmatic plants in South Western Nigeria. *Afr J Tradit Complement Altern Med*. 2008;5(4):340-5.
- Mohi El-Din MM, Mostafa AM, Abd-Elkader A. Experimental studies on the effect of (Lambda-Cyhalothrin) insecticide on lungs and the ameliorating effect of plant extracts (Ginseng (Panax Ginseng) and garlic (*Allium sativum* L.) on asthma development in albino rats. *BMC Res Notes*. 2014;7:273.
- Ramsewak RS, DeWitt DL, Nair MG. Cytotoxicity, antioxidant and anti-inflammatory activities of curcumins I-III from *Curcuma longa*. *Phytomedicine*. 2000;7(4):303-8.
- Bastos VP, Gomes AS, Lima FJ, Brito TS, Soares PM, Pinho JP, et al. Inhaled 1, 8-cineole reduces inflammatory parameters in airways of Ovalbumin-challenged Guinea Pigs. *Basic Clin Pharmacol Toxicol*. 2011;108 (1):34-9.
- Juergens UR, Dethlefsen U, Steinkamp G, Gillissen A, Repges R, Vetter H. Anti-inflammatory activity of 1,8-cineol (eucalyptol) in bronchial asthma: a double-blind placebo-controlled trial. *Respir Med*. 2003;97(3):250-6.
- Rather MA, Dar BA, Sofi SN, Bhat BA, Qurishi MA. *Foeniculum vulgare*: A comprehensive review of its traditional use, phytochemistry, pharmacology, and safety. *Arab J Chem*. 2016;9: S1574-83.
- He W, Huang B. A review of chemistry and bioactivities of a medicinal

- spice: *Foeniculum vulgare*. *J Med Plant Res*. 2011;5(16):3595-600.
28. Al-Jawad FH, Al-Razuqi RA, Hashim HM, Al-Bayati NJ. Glycyrrhiza glabra versus *Boswellia carterii* in chronic bronchial asthma: A comparative study of efficacy. *Indian J Allergy, Asthma and Immunology*. 2012;26(1):6.
 29. Shin YW, Bae EA, Lee B, Lee SH, Kim JA, Kim YS, et al. In vitro and in vivo antiallergic effects of Glycyrrhiza glabra and its components. *Planta Medica*. 2007;73 (03):257-61.
 30. Patel S, Saxena N, Saxena RC, Arya N, Saxena R, Tharani M. Evaluation of anti-asthmatic activity of Glycyrrhiza glabra. *Biosci Biotech Res Asia*. 2017;6(2):761-6.
 31. Paranjape, Archana N., and Anita A. Mehta. A study on clinical efficacy of *Lepidium sativum* seeds in treatment of bronchial asthma. *Iran J Pharm Sci*. 2006; 5(1):55-59.
 32. Rehman NU, Khan AU, Alkharfy KM, Gilani AH. Pharmacological basis for the medicinal use of *Lepidium sativum* in airways disorders. *eCAM*. 2012;(1):596524.
 33. Baregama C, Goyal A. Phytoconstituents, pharmacological activity, and medicinal use of *Lepidium sativum* Linn. A review. *Asian J Pharm Clin Res*. 2019;12(4):45-50.
 34. Diwakar BT, Dutta PK, Lokesh BR, Naidu KA. Physicochemical properties of garden cress (*Lepidium sativum* L.) seed oil. *J Am Oil Chem Soc*. 2010;87:539-48.
 35. Koshak A, Koshak E, Heinrich M. Medicinal benefits of *Nigella sativa* in bronchial asthma: A literature review. *Saudi Pharm J*. 2017;25(8):1130-6.
 36. Ikhsan M, Hidayati N, Maeyama K, Nurwidya F. *Nigella sativa* as an anti-inflammatory agent in asthma. *BMC Res Notes*. 2018;11(1):1-5.
 37. Ezzeldin N, Zikri EN, El-Anssary AK, Salama AA. A clinico-pharmacological assessment of a herbal preparation for the treatment of Bronchial Asthma. *World J Med Sci*. 2015;12(2):115-24.
 38. Boskabady MH, Ramazani-Assari M. Relaxant effect of *Pimpinella anisum* on isolated guinea pig tracheal chains and its possible mechanism(s). *J Ethnopharmacol*. 2007;74(1):83-8.
 39. Van Den Broucke CO, Lemli JA. Spasmolytic activity of the flavonoids from *Thymus vulgaris*. *Pharm Weekbl Sci*. 1983;5:9-14.
 40. Zhou E, Fu Y, Wei Z, Yu Y, Zhang X, Yang Z. Thymol attenuates allergic airway inflammation in ovalbumin (OVA)-induced mouse asthma. *Fitoterapia*. 2014;96:131-7.
 41. Vigo E, Cepeda A, Perez-Fernandez R, Gualillo O. In-vitro anti-inflammatory effect of *Eucalyptus globulus* and *Thymus vulgaris*: nitric oxide inhibition in J774A. 1 Murine Macrophages. *J Pharm Pharmacol*. 2004;56(2):257-63.
 42. Khan AM, Shahzad M, Raza Asim MB, Imran M, Shabbir A. *Zingiber officinale* ameliorates allergic asthma via suppression of Th2-mediated immune response. *Pharm Biol*. 2015;53(3):359-67.
 43. Rahmani AH, Aly SM. Active ingredients of ginger as potential candidates in the prevention and treatment of diseases via modulation of biological activities. *Int J Physiol Pathophysiol Pharmacol*. 2014;6(2):125.
 44. Jedli O, Ben-Nasr H, Zammel N, Rebai T, Saoudi M, Elkahoui S, et al. Attenuation of ovalbumin-induced inflammation and lung oxidative injury in asthmatic rats by *Zingiber officinale* extract: Combined in silico and in vivo study on antioxidant potential, STAT6 and TNF- α pathways. *3 Biotech*. 2022;12(9):191.
 45. Aleem M, Khan MI, Shakshaz FA, Akbari N, Anwar D. Botany, phytochemistry and antimicrobial activity of ginger (*Zingiber officinale*): A review. *Int J Herb Med*. 2020;8(6):36-49.
 46. Zaid Z. Katan (*Linum usitatissimum* linn.) A potent unani therapeutic agent for respiratory tract diseases. *Int J Pharmacognosy*. 2021;8(3):112-18.
 47. Shek LP, Chong MF, Lim JY, Soh SE, Chong YS. Role of dietary long-chain polyunsaturated fatty acids in infant allergies and respiratory diseases. *Clin Dev Immunol*. 2012;2012:730568.
 48. Moghadam KG, Inançlı HM, Bazazy N, Plinkert PK, Efferth T, Sertel S. Phytomedicine in otorhinolaryngology and pulmonology: clinical trials with herbal remedies. *Pharmaceuticals (Basel)*. 2012;5(8):853-74.
 49. Sung YY, Kim SH, Kim DS, Lee JE, Kim HK. *Illicium verum* extract and trans-anethole attenuate ovalbumin-induced airway inflammation via enhancement of Foxp3+ regulatory T cells and inhibition of Th2 cytokines in mice. *Mediators Inflamm*. 2017;2017:7506808.
 50. Kim SH, Kim DS, Sung YY, Kim HK. Suppression of airway inflammation by *Illicium verum* and trans-anethole. *Planta Medica*. 2016; 82(S01):P1107.
 51. Patel BD, Welch AA, Bingham SA, Luben RN, Day NE, Khaw KT, Lomas DA, Wareham NJ. Dietary antioxidants and asthma in adults. *Thorax*. 2006;61(5):388-93.
 52. Shaheen SO, Sterne JA, Thompson RL, Songhurst CE, Margetts BM, Burney PG. Dietary antioxidants and asthma in adults: population-based case-control study. *Am J Respir Crit Care Med*. 200;164 (10):1823-8.
 53. Bae EA, Min SW, Kim NJ, Bang MH, Baek NI, Han EJ, et al. Inhibitory Effect of Brassica rapa in Ovalbumin-Stimulated Experimental Asthmatic Mice. *Natural Product Sciences*. 2007;13(2):114-7.
 54. Tang X. The effect of Brassica rapa L-Polysaccharide on inflammatory response with asthmatic rats. *J Chinese Physician*. 2012:1615-7.
 55. Mittal M, Gupta N, Parashar P, Mehra V, Khatri M. Phytochemical evaluation and pharmacological activity of *Syzygium aromaticum*: a comprehensive review. *Int J Pharm Pharm Sci*. 2014;6(8):67-72.
 56. Azim MHAE, Mesallamy AME, Gerby ME, Awad A. Anti-Tumor, antioxidant and antimicrobial and the phenolic constituents of clove flower buds (*Syzygium aromaticum*). *J Microb Biochem Technol*. 2014;10(s):8-007.
 57. Emtiazy M, Oveidzadeh L, Habibi M, Molaeipour L, Talei D, Parvin M, Kamalinejad M. Investigating the effectiveness of the *Trigonella foenum-graecum* L. (fenugreek) seeds in mild asthma: a randomized controlled trial. *Allergy, Asthma & Clinical Immunology*. 2018;14(1):1-8.
 58. Piao CH, Bui TT, Song CH, Shin HS, Shon DH, Chai OH. *Trigonella foenum-graecum* alleviates airway inflammation of allergic asthma in ovalbumin-induced mouse model. *Biochem Biophys Res Commun*. 2017;482(4):1284-8.
 59. Ahvazi M, Balali GR, Jamzad Z, Saeidi H. A taxonomical, morphological and pharmacological review of *Marrubium vulgare* L., an old medicinal plant in Iran. *J. Med. Plant Res*. 2018;17(65):7-24.
 60. Villanueva JR, Esteban JM. An insight into a blockbuster phytomedicine; *Marrubium vulgare* L. Herb. more of a myth than a reality?. *Phytother Res*. 2016;30(10):1551-8.
 61. Fatiha BA, Ouafae B, Souad S, Jamila D, Allal D, Lahcen Z. Ethnobotany study of medicinal plants used in the treatment of respiratory diseases in the middle region of Oum Rbai. *Int. J. Environ. Agric. Biotechnol*. 2017;2(4):238815.
 62. N'guessan-Irié GA, Kouakou LS, Djadjji TA, Kouassi JA, Effo EK, Siransy-Kouakou GN. Review of Experimental Pharmacological Studies of Plants Used for Asthma Management in Africa. *J Pharm Res Sci Technol*. 2020;4(2):1-1.
 63. Abbasi S, Kamalinejad M, Babaie D, Shams S, Sadr Z, Gheysari M, et al. A new topical treatment of atopic dermatitis in pediatric patients based on *Ficus carica* L. (Fig): A randomized, placebo-controlled clinical trial. *Complement Ther Med*. 2017;35:85-91.
 64. Muxiddinova M. Plants Used in the Treatment of Bronchial Asthma. *Science and Innovation*. 2022;1(4):233-5.

65. Leporatti ML, Ghedira K. Comparative analysis of medicinal plants used in traditional medicine in Italy and Tunisia. *J Ethnobiol Ethnomed*. 2009;5(1):1-8.
66. Ozturk M, Uysal I, Gucl S, Altundag E, Dogan Y, Baslar S. Medicinal uses of natural dye-yielding plants in Turkey. *Research Journal of Textile and Apparel*. 2013;17(2):69-80.
67. Savithamma N, Sulochana C, Rao KN. Ethnobotanical survey of plants used to treat asthma in Andhra Pradesh, India. *J Ethnopharmacol*. 2007;113(1):54-61.
68. Saqib F, Al-Huqail AA, Asma M, Chicea L, Hogeia M, Irimie M, Gavris C. Dose-dependent Spasmolytic, Bronchodilator, and Hypotensive Activities of *Panicum miliaceum* L. Dose-Response. 2022;20(1):15593258221079592.
69. Magni C, Ballabio C, Restani P, Fuggetta D, Alessandri C, Mari A, et al. Molecular insight into IgE-mediated reactions to sesame (*Sesamum indicum* L.) seed proteins. *Ann Allergy Asthma Immunol*. 2010;105(6):458-64.
70. Aamir M, Kumar A, Kumar S. Til Tail (*Sesamum Indicum*): A Hidden Cause Behind Tamaka Shwasa (Bronchial Asthma): A Literary Review. *Int J Ayurveda Pharma Res*. 2022;10(6)68-71.
71. Damiani E, Aloia AM, Priore MG, Pastore A, Nardulli S, Lippolis C, et al. *Vicia faba* hypersensitivity and ASA intolerance in a farmer: a case report. *J Allergy*. 2011;191787.
72. Verma AK, Kumar S, Tripathi A, Chaudhari BP, Das M, Dwivedi PD. Chickpea (*Cicer arietinum*) proteins induce allergic responses in nasobronchial allergic patients and BALB/c mice. *Toxicol Lett*. 2012;210(1):24-33.
73. Macumu P, Ntahobavuka H, Nzabandora C. Les plantes médicinales utilisées dans le traitement de l'asthme à l'île d'Idjwi (Sud-Kivu, RD Congo). *Int J Innov Scienti Res*. 2015;19:49-60.
74. Kayani S, Ahmad M, Zafar M, Sultana S, Khan MP, Ashraf MA, et al. Ethnobotanical uses of medicinal plants for respiratory disorders among the inhabitants of Gallies-Abbottabad, Northern Pakistan. *J Ethnopharmacol*. 2014 :28(156)47-60.
75. Eddouks M, Amssayef A, Ajebli M, Hebi M. Étude ethnopharmacologique sur l'utilisation des plantes médicinales dans le traitement de la tuberculose dans le sud-est du Maroc. *Phytothérapie*. 2019;18(5):340-8.
76. Zeggwagh AA, Lahlou Y, Bousliman Y. Enquete sur les aspects toxicologiques de la phytothérapie utilisée par un herboriste à Fes, Maroc. *Pan Afr Med J*. 2013;14:125.
77. Youssouf, Dahani. Utilisation des plantes médicinales dans le traitement de l'asthme dans la wilaya de Tlemcen. 2019.
78. Toygar I, Yeşilbalkan ÖU, Kürkütlü M, Aslan A. Complementary and alternative medicines used by cancer patients to cope with chemotherapy-induced constipation. *Complement Ther Clin Pract*. 2020;39:101108.