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Ethnopharmacological investigation on Msindzano, a beauty mask used by Comorian women: What plants for what mixtures, for what applications?

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Although extensively used by Comorian women, limited information exists on Msindzano beauty masks. Thus an ethnopharmacological survey was conducted on two islands of the Comoros archipelago: Ndzuani and Ngazidja. An open-ended, semi-structured questionnaire was employed for data collection on the different plants used for Msindzano preparation, their different mixtures and their different applications. A total of 348 women were interviewed on both islands. Thirty-nine plant species were recorded in this investigation, 30 in Ndzuani and 27 in Ngazidja, with 19 being used on both islands. *Santalum album* is the main plant used in Msindzano. It is followed by *Acokanthera schimperi*, *Sesamum indicum* and *Arachys hypogea*. Regarding the different mixtures, twenty-one mixtures are used in Ndzuani and 10 in Ngazidja. The main purpose for the application of Msindzano is to lighten the skin, but also to eliminate acne, as a sun block against radiation, heat and allergies. In Ndzuani it is largely used against heat and to eliminate acne, while in Ngazidja it is employed mostly as a sun block against radiation. It is thus concluded that Msindzano is an important tool used by Comorian women as cosmetics as well as for the treatment of certain skin diseases.

Key words: Cosmetics, eliminate acne, lighten skin, Msindzano, Ndzuani, Ngazidja.

INTRODUCTION

Despite the advent of modern medicine and technical advances, the use of plants for therapeutic purposes is still a major part in the global primary health system (Ekor, 2014; Che et al., 2017). According to the World Health Organization (WHO), as quoted by Goleniowsk et al. (2006), a large majority of rural people use traditional medicine as the first defense of health care.In recent decades, the use of herbal remedies as alternatives

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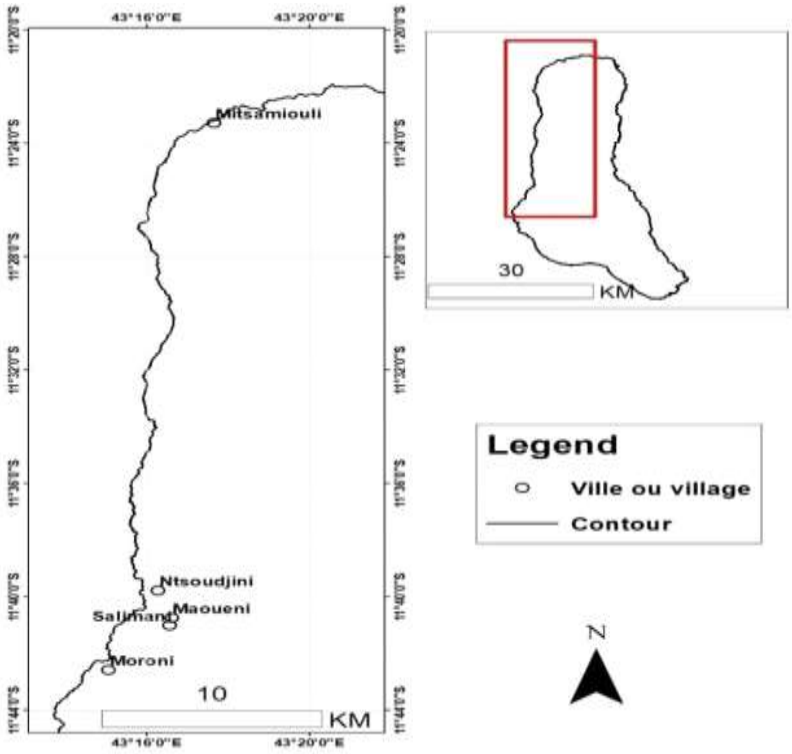

Figure 1. Study sites in Ngazidja Island.

to conventional medicines has grown in developed countries (Ekor, 2014).

Comoros is an archipelago with a culture that is a mix of Afro-Bantou, Arabo-Muslim and Indian Ocean cultures (Soidrou et al., 2013). Like many people around the world, the Comorian people have developed a traditional-based primary health system founded on natural products occurring in the Comoros (Soidrou et al., 2013). Although diverse plant species are used as medicinal and cosmetics, few studies existed about their traditional uses. However, none of these studies have focused on Msindzano, a traditional cosmetics worn by women.

Used as a beauty mask, the Msindzano is generally applied on the face or the whole body for various reasons. It is traditionally used for its relaxing, disinfecting, soothing and calming properties. It is also known to kill and prevent the growth of acne-causing bacteria, accelerate the healing process of pimples, and soothe irritated skin

The Msindzano is a combination of several plant ingredients mixed on a piece of coral, the main component being sandalwood. Different compositions are used, depending on the desired effect, the region or the island. This ranges from the use of sandalwood itself, to mixtures with many other plants such as *Curcuma longa, Lawsonia inermis, Sesamum indicum* and *Jasminium mummulariae folium*. Some women even add synthetic products such as Pandalao, Diprosone, and Betazol. In addition to Ndzuani and Maoré, the use of Msindzano is also losing ground in the other islands of the archipelago. This is because most young people find this practice archaic and rather like to use manufactured cosmetic products. Although used on a daily basis, very few young people know the different uses of Msindzano and even less the different mixtures used.

The present study is part of a framework of valorization of Msindzano. It aims to identify the different plants used in this product, their different mixtures and their different applications. It will be followed by laboratory tests to confirm or infirm these different observations. This will ultimately improve the quality of Msindzano and give more interest to this product among young people.

MATERIALS AND METHODS

Study area

This study was carried out in two of the four islands of the Comoros archipelago; Ngazidja and Ndzuani. The choice of these two islands is dictated by the fact that among the Comorian Islands, Ndzuani is the one where the use of Msindzano is well established. As for Ngazidja, it is an island where Comorians from different islands meet. The use of Msindzano is also well established there. In Ngazidja the investigations were conducted in the villages of Moroni, Ntsoudjini, Salimani Itsandra, Maweni Itsandra and Mitsamihouli (Figure 1). In Ndzuani, the investigations were conducted in the villages of Mutsamudu, Bandrani, Mirontsi, Ouani,

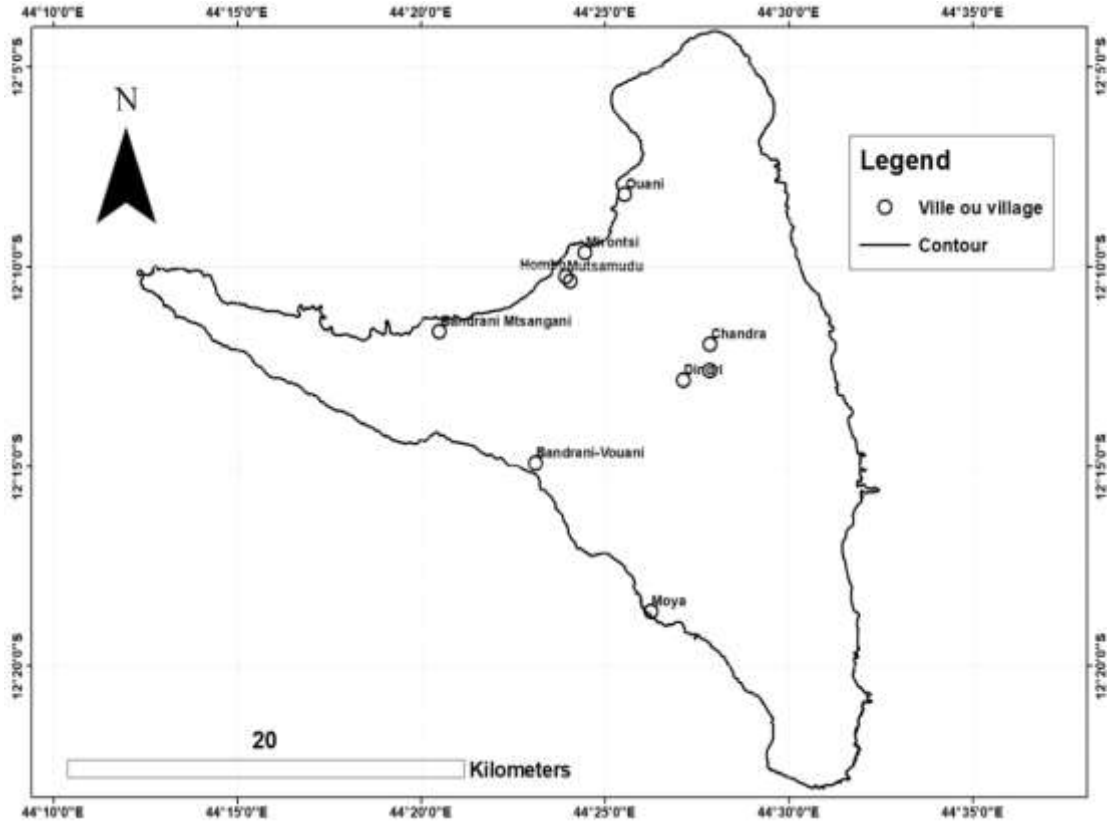

Figure 2. Study sites in Ndzuani Island.

Chandra, Chiwe, Shitsangani, Dindri, Tsembehou and Moya (Figure 2).

Data collection

The survey carried out from 3 April 2019 to 30 April 2019, used Rapid Appraisal methods like the door-to-door survey and individual interviews. 348 women, aged between 18 and 81 years were agreed to participate in this study. The great majority concerned Ndzuani Island with 249 women. The 99 others were interviewed in Ngazidja Island. The study categorized informants' demographic data according to interviewee's age categories (18 - 30, n=180; 30 - 50, n=131; 50 - 70, n =30; 70 - 90, n=6).

The information was collected based on a pre-established questionnaire and conducted in Shikomori (local language) for convenience and accuracy. The questionnaire focused on the following three themes: (1) plants species used, (2) their different mixtures, and (3) their applications.

Plant identification

The plants were identified by the team of the National Herbarium of Comoros where the specimens were deposited.

Data analysis

The data were expressed as a percentage, using Microsoft Excel™ and analyzed in descriptive way.

Ethical considerations

All the women who participated in this survey did so on a voluntary basis after explaining the objective of the survey, its progress and the use of the results.

RESULTS AND DISCUSSION

Plants inventories

Thirty nine plant species were documented, 30 in Ndzuani and 27 in Ngazidja. But 19 were used in both islands (Figure 3). *Santalum album* (74.42%) is the most used plant species in Msindzano, followed by *Acokanthera schimperi* (17.53%) and *Sesamum indicum* (10.06%). Women also use *Arachys hypogea* (7.47%), as well as *Kaya comorensis*, *Percea americana* and Tamtam (local name) with 4.88% usage each. In addition to *Curcuma longa* (3.74%) and muté (local name) (3.16%), the other plant species have a very low utilization rate, with a percentage use of less than 3%.

Ndzuani Island is where Msindzano is widely used. Thirty one plant species were inventoried (Figure 4). With 90.76%, *S. album* is the main plant species used in Msindzano in this island. It followed by *Acokanthera*

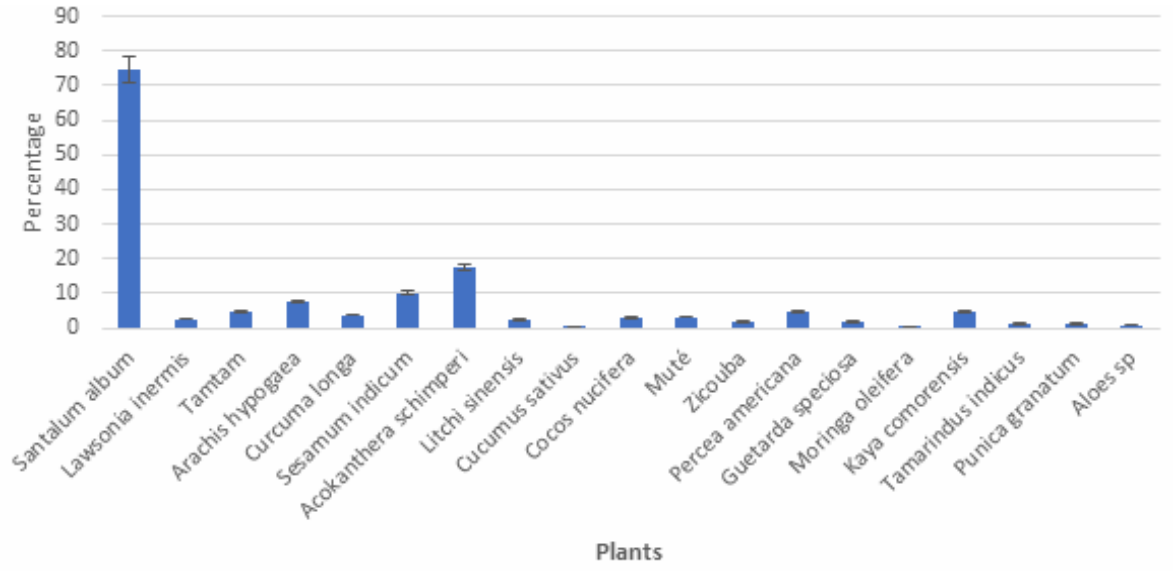

Figure 3. Plants used in Msindzano in Ndzuani and Ngazidja.

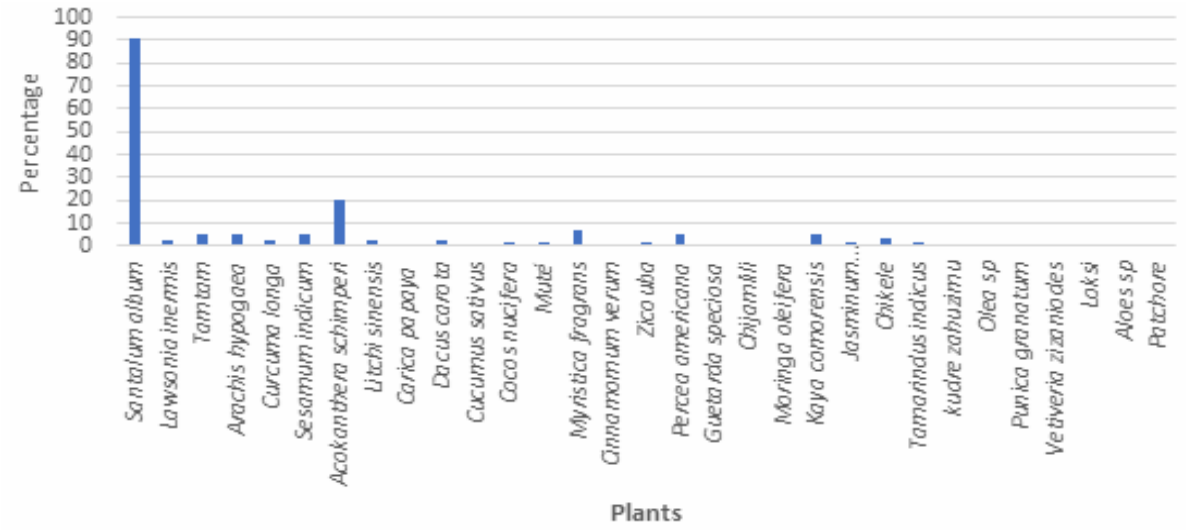

Figure 4. Plants used in Msindzano in Ndzuani.

schimperi (20.48%), *Myristica fragrans* (7.22%), *S. indicum* and Tamtam (5.22% each). There plant species have with a percentage of 4.81%, namely *Arachis hypogea*, *Kaya comorensis* and *Persea americana*. Thirteen plant species have a percentage use lower than 1%.

In Ngazidja, *S. album* is also the main plant species used (33.33%) in Msindzano production (Figure 5), but with a lower percentage than in Ndzuani. It is followed by three plant species with a percentage use higher or equal to 10%. These include *S. indicum* (22.22%), *A. hypogaea* (14.14%) and *A. schimperi* (10.1%). In contrast to what z is observed in Ndzuani, *A. schimperi* is not the second main plant species, but it is overtaken by *S. indicum* and *A. hypogaea*.

In contrast, in Ndzuani several plant species had a percentage use higher than or equal to 5%. They are Mté (local name) 7.07%, *Cocos nucifera*, *Euphorbia hirta* and *C. longa* (6.06%); *K. comorensis*, *P. americana* and *Guetterda speciosa* at 5% each; Mtamtam (local name) at 4%; *Punica granatum* and *Lawsonia inermis* at 4% each; *Ricinus communis*, *Tambourissa* species and *Aloes* species at 2% each. The other plants have a use percentage of 1%.

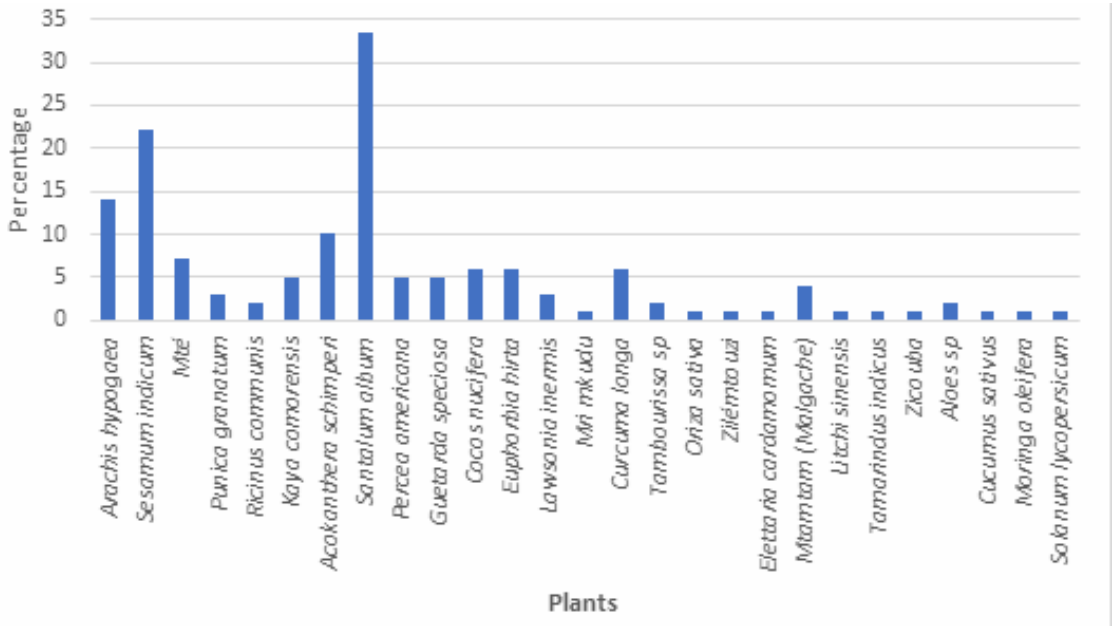

Figure 5. Plants used in Msindzano in Ngazidja.

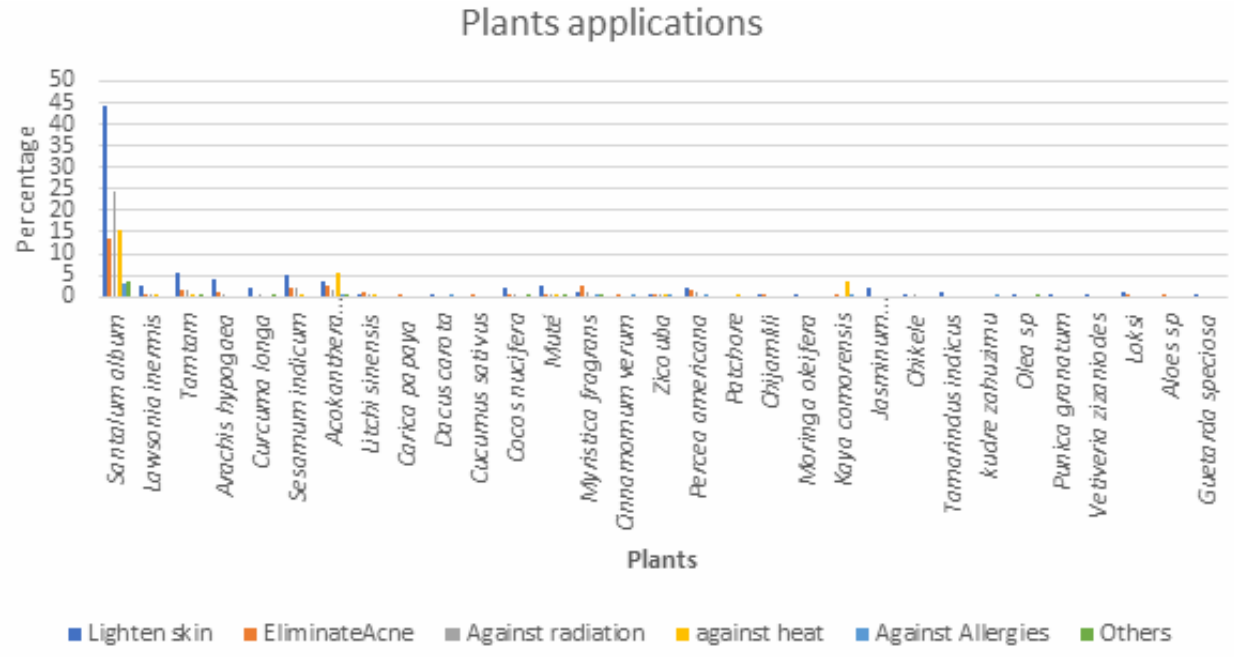

Figure 6. Applications of Msindzano in Ndzuani Island.

The applications of MsindzanO

Comorian women use Msindzano for various reasons. The common use is for cosmetic reasons, including skin lightening and softening (Figure 6). It can further be used for medical reasons in particular against acne, allergies and some skin problems such as eczema. It is sometimes used for preventive reasons, especially against heat or radiation as a sun block (Figure 6).

Most respondents use Msindzano to clear their skin. In this case, 44.17% of interviewed women in Ndzuani use *Santalum album, 5.62% Tamtam and 5.22% for*

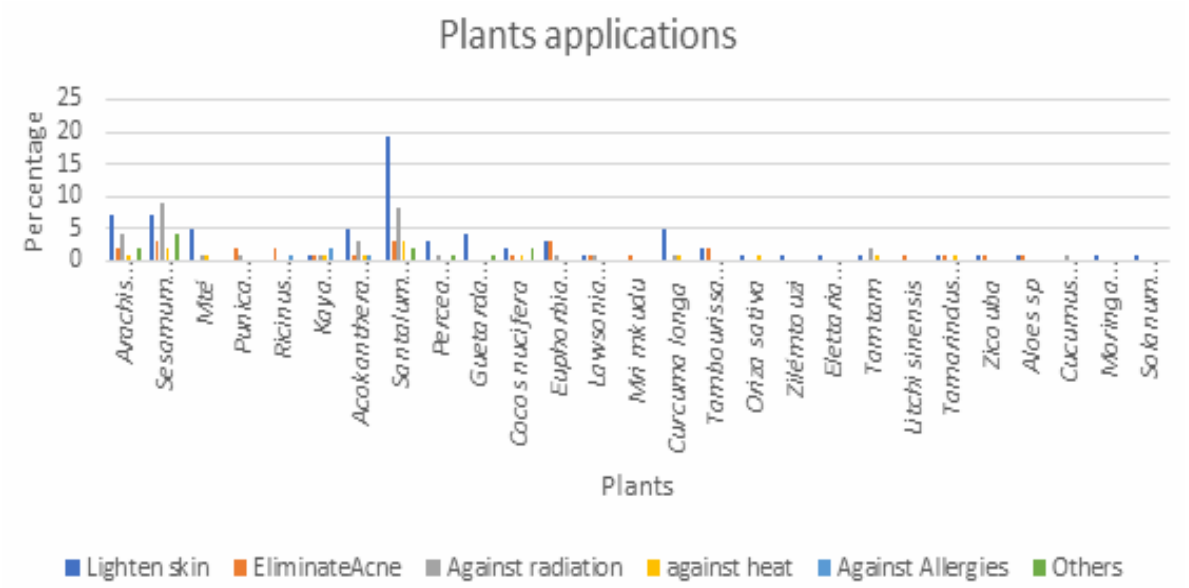

Figure 7. Applications of Msindzano in Ngazidja Islands.

Sesamum indicum (Figure 6). *S. album* is also widely used against radiation as a sun block (24.49%), heat (15.26%) and to eliminate acne (13.65%).

In Ngazidja (Figure 7), most people also use Msindzano to clear their skin. *S. album* (19.19%) is the main plant species used in this case. It is followed by *A. hypogea* and *C. indicum* (7.07% each), Mté (local name), *A. schimperi* and *C. longa* (5.05% each) and *G. speciosa* (4.04%). The main purpose of *Sesamum indicum* is application against radiation as a sun block (9.09%). *S. album* (8.08%) is also used as a sun block (radiation).

Msindzano can consist of a mixture of several plant species (Table 1). Twenty-one mixtures are only used in Ndzuani and 10 in Ngazidja. A *Tamtam* (local name) and *S. album* mixture is only used as a skin lightener. The mixture largely used in Ndzuani is composed of *K. comorensis*, *S. album* and *A. schimperi*, and used against heat and to eliminate acne. In Ngazidja, the most used mixture consists of *S. album* and *A. schimperi*, and it is used as a sun block against radiation. The mixture with the highest number of plant species contains nine species, which include *Sesamum indicum*, *Tamtam* (local name), *Jasminium mummulariae folium*, *Tamarindus indicus*, *Loksi* (local name), *M. fragrans*, *P. americana*, *S. album* and *L. inermis*.

This mixture is used to lighten the skin and as a sun block against radiation. Some mixtures are used on three or four applications. For example, a mixture composed of *S. album*, *Tamtam* and *S. indicum* is used in four applications, namely to lighten skin, to eliminate acne, as a sub block against radiation and against heat. With three applications, a mixture consisting of *S. album* and *Dacus carota* is used to lighten the skin, against allergies, and against heat. To eliminate acne only, women use six mixtures in Ndzuani and two in Ngazidja. The fight against allergies is the application that has the fewest mixtures in both islands, namely one in both islands. They are composed of *A. schimperi* and *M. fragrans* in Ndzuani and *A. schimperi*, *R. communis* and *K. comorensis* in Ngazidja.

However, in certain applications, only one plant can be used. In Ndzuani, *S. album* is largely used alone to brighten the skin, to eliminate acne and as a sun block against radiation. In Ngazidja, it is principally used as a sun block against radiation and to lighten the skin. In Ndzuani, *M. fragrans* can be only used to eliminate acne, to lighten skin and as a sun block.

Most of the plants in this survey are known for their use in traditional medicine and cosmetics in various countries. *S. album*, the principal plant used as Msindzano in Comoros, is largely discussed in the literature. Misra and Dey (2013) reported that this plant is used against skin infections, as cicatrizing and as antiseptic. The literature stipulates that this plant possesses effects like antimicrobial (Hussain et al., 2011; Sindhu et al., 2010), immunopharmacologic and antivirals (Gupta and Caphalkar, 2016), antioxidant (Misra and Dey, 2013).

A. schimperi, the second plant used in Ndzuani is known to possess antibacterial (Taye et al., 2011) and acaricidal (Owino et al., 2015) activities. *S. indicum* oil, the second plant largely used in Ngazidja, is known as an ingredient in soap, lubricants, perfumery, cosmetics, pharmaceuticals, insecticides and paints and varnishes (Chemonics International Inc., 2002; Barel et al., 2001). It forms an occlusive layer on the skin, keeping water inside upper stratum corneum layers and consequently acting as moisturizers (Barel et al., 2001).

In Southern India it is used to anoint the body

Table 1. The different mixtures and their applications.

Mixtures	Frequency	Applications
Ndzuani		
Kaya comorensis, *Santalum album, Acokanthera schimperi*	10	
Santalum album, Acokanthera schimperi	3	Against heat /Eliminate acnes
Lawsonia inermis, Mté, *Santalum album*	2	
Santalum album, Zikouba	3	
Mté, Tamtam, *Persea americana* (Seed)	2	Lighten skin/Eliminate acne
Sesamum indicum, Cocos nucifera (Coconut milk), *Santalum album*	1	
Cesamum indicum, Tamtam (local name), *Jasminium mummulariae folium,* Tamarindus indicus, Loksi (local name), *Myristica fragrans, Persea americana, Santalum album, Lawsonia inermis*	5	Lighten skin/Sun block against radiation
Jasminium mummulariae folium, Santalum album	2	
*Santalum album, Myristica fragrans,*Tamtam	1	
Santalum album, Arachis hypogea	3	Lighten skin/Against heat
Santalum album, Sesamum indicum	3	
Santalum album, Tamtam, *Sesamum indicum*	4	Lighten skin/Eliminate acne/Sun block against radiation/Against heat
Santalum album, Dacus carota	4	Lighten skin/Against allergies/Against heat
Myristica fragrans, Santalum album	2	Against heat/Sun block against radiation
Tamtam, *Santalum album*	5	
Arachis hypogea, Santalum album	3	
Santalum album, *Cocos nucifera* (Coconut milk)	2	
Cesamum indicum, *Santalum album*	2	
Dacus carota, Lawsonia inermis, Santalum album	1	
Tamarindus indicus, Chikélé, *Vetiveria zizaniodes*, Loksi, *Curcuma longa, Santalum album*	1	
Lawsonia inermis, Arachis hypogea, Persea americana	1	
Tamarindus indicus, Chikélé*, Vetiveria zizaniodes*, Loksi, *Curcuma longa, Santalum album*, Loksi	1	Lighten skin
Acokanthera schimperi, Santalum album	1	
Santalum album, Myristica fragrans, Acokanthera schimperi	1	
Jasminium mummulariae folium, Zikouba (local name), *Santalum album*	1	
Acokanthera schimperi, *Sesamum indicum*, Tamtam	1	
Litchi sinensis (Seed), *Santalum album*	1	
Lawsonia inermis, *Santalum album*	2	
Lawsonia inermis, *Curcuma longa*, Mté	1	

Table 1. Contd.

Myristica fragrans, *Santalum album*	1	
Mté, Santalum album	1	
Nkoudré za houzimou (Nkoundré mdzou, Santalum album	1	
Chijamlili, *Santalum album*	1	
Arachis hypogea, *Santalum album*	1	
Curcuma longa, *Cesamum indicum*	1	
Arachis hypogea, *Persea americana*, *Santalum album*	3	
Pelargonium asperum, *Santalum album*	1	Against heat
Santalum album, Zikouba, *Lawsonia inermis*	1	
Santalum album, *Cocos nucifera* (Coconut milk), *Curcuma longa*	1	Sun block against radiation
Arachis hypogea, *Lawsonia inermis*, *Cesamum indicum*	1	
Sesamum indicum, *Santalum album*	1	
Arachis hypogea, *Persea americana*, *Litchi sinensis* (Seed), *Santalum album*	1	
Chijamlili, *Myristica fragrans*, *Santalum album*	1	
Carica papaya, *Santalum album*	1	Eliminate acne
Cocomus sativus, *Santalum album*	1	
Santalum album, *Persea americana* (Seed)	1	
Loksi, Aloés verra	1	
Acokanthera schimperi, *Myristica fragrans*	1	Against allergies
Ngazidja		
Santalum album, *Cesamum indicum*	2	Lighten skin/Eliminate acne
Santalum album, *Acokanthera schimperi*	3	
Sesamum indicum, *Arachys hypogea*	2	
mté, *Acokanthera schimperi*	1	
Sesamum indicum, *Cucumus sativus*	1	Sun block against radiation
Euphorbiahirta, *Santalum album*	1	
Tamtam, Kaya comorensis	1	
Santalum album, *Arachys hypogea*, *Sesamum indicum*	1	
Santalum album, *Curcuma longa*	1	
Tamtam, *Arachys hypogea*, *Sesamum indicum*	1	
mté, *Santalum album*	1	Against heat

Table 1. Contd.

Sesamum indicum, *Curcuma longa*, *Cocos nucifera* (Coconut milk)	1	
Oriza sativa, *Sesamum indicum*	1	
Euphorbia hirta, *Tamarindus indicus* (Bark)	1	Eliminate acne
Ricinus communis, *Litchi sinensis* (root)	1	
Zikouba	1	
Solanum lycopersicum, Aloe vera	1	Lighten skin
mté, *Curcuma longa*	1	
Sesamum indicum, Cocos nucifera (Coconut milk), Jasminium mummulariae folium	1	
Cocos nucifera (Coconut milk), *Guetterda speciosa*, *Sesamum indicum*, *Curcuma longa*, *Cuminum cyminum*, *Arachys hypogea*, *Elettaria cardamomum*, mté	1	
Santalum album, Curcuma longa	1	
Tambourissa spp., *Acokanthera schimperi*	1	
Sesamum indicum, mté, tamtam, *Arachys hypogea*, *Santalum album*	1	
Sesamum indicum, Mté,	1	
Mté, *Sesamum indicum*, *Arachys hypogea*	1	
Acokanthera schimperi, *Ricinus communis*, *Kaya comorensis*	1	Against allergies

and hair. Indians have used sesame oil as an antibacterial mouthwash and for relieving anxiety and insomnia (Pathak et al., 2014). A clinical trial proved the effectiveness of sesame oil for treating nasal mucosa dryness rather than isotonic sodium chloride solution (Johnson et al., 2001). In addition, sesame oil contains large amounts of linoleate in triglyceride form which selectively inhibited malignant melanoma growth (Smith and Salerno, 1992).

A. hypogea, one of the most used plants in Ngazidja, is also known as a dietary source. It is capable of producing stilbene derived compounds that are considered as anti-fungal (El-Sayed et al., 2012). In addition, their stilbenoids display diverse biological activities in mammalian cells like anti-inflammatory, antioxidant activities and anti-nitric oxide production (Sobolev et al., 2011). It is also reported that their flavonoids have anti-cancer, anti-androgen, anti-Leishmania, anti-nitric oxide production, and anti-bacterial activity (Yazaki et al., 2009). Moreover, it was found that *A. hypogaea* L. exhibited anti-bacterial activity (Parekh and Chanda, 2008).

Less used plants like *C. longa*, *E. hirta* and *M. fragrans* are also known for their uses in cosmetics and therapeutics. In the literature, various studies suggest that curcuminoids, phenolic compounds of turmeric, have antioxidant effects (Dall'Acqua et al., 2016), anti-inflammatory (Cooney et al., 2016), antimicrobial (Zhang et al., 2012), antiviral (Chen et al., 2010) and radioprotective (Lopez-Jornet et al., 2016). Antioxidant and antimicrobial properties are also attributed to Turmeric essential oil (Avanço et al., 2017).

As for *E. hirta*, various properties are attributed to it. It possesses antioxidant (Sharma et al., 2014; Subramanian et al., 2011; Basma et al., 2011), antimicrobials (Perumal et al., 2012; Rajeh et al., 2010), anti-inflammatory and anticancer

activities (Sharma et al., 2014).

Studies on the essential oil and various extracts of *M. fragrans* have shown that it has antioxidant and antimicrobial properties (Gupta et al., 2013; Shafiei et al., 2012), anti-angiogenic pest control (Piaru et al., 2012), radioprotective, anticancer, antidepressant, antidiabetic and hepatoprotective (Shafiei et al., 2012).

The proven effects of these different plants as antimicrobials, antioxidants and radioprotectives can corroborate their use in the Comoros in the different applications of Msindzano.

Conclusion

Although being one of the symbols of the Comorian woman, very little scientific knowledge exists on the Msindzano. This study is therefore the first carried out in the Comoros. It is part of a project to promote Msindzano of which this study is the first phase.

Thirty-nine plants were identified in this investigation and several mixtures of plants and their applications were identified. Most of them are used to lighten skin.

This study has demonstrated the important use of Msindzano as cosmetic and as traditional medicine, especially for the treatment of certain skin diseases.

This is a preliminary study which will have to be followed by other studies, notably phytochemical and toxicological studies, as well as the effectiveness of the various mixtures mentioned earlier.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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