ETHNOPHARMACOLOGICAL INVESTIGATION OF FOUR PLANTS USED AS MEDICINAL IN NGAZIDJA ISLAND

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ABSTRACT
In Comoros Islands, traditional medicine is taken an important place in sanitary system but few written information exist about that. This study aims to investigate the different uses of some plants in indigenous care system. Four plants used in Ngazidja Island were chosen. Total of 128 persons aged between 45 and 100 years were interviewed in 11 villages localized in rural areas. 80% of each was women. Results demonstrated the large use of these plants. Eighteen medicinal uses were recensed for all plants. Used to treat fifteen diseases, Cassia occidentalis was used for treatment of most diseases. However used to treat twelve diseases, Psidium guajava and Tambourissa comorensis are the least used. Euphorbia hirta is itself used against thirteen diseases. This study has been demonstrated the important use of these plants in Comorian folkloric medicine and their ability to treat several diseases.

Key words: Ethnopharmacology, Comoros, Ngazidja, Folkloric medicine, Itsandra, Hamahamet, Plants.

INTRODUCTION
The World Health Organization (WHO) estimates that 80% of the population of most developing countries relies on herbal medicines for their primary health care needs (Mukherjee and Wahil, 2006). In developed countries medicinal plants are used as alternatives to synthetic drugs (Kettner et al., 2005). So ethnopharmacological and ethnobotanical investigations take an important place for the research of pharmacological components. In deed, 74% of pharmacological components derived on plants used in modern medicine, was discovered after ethnomedicinal investigations (Farnsworth and Soejarto, 1991; Sheldon et al., 1997).

In Comoros, majority of population live in rural area. Poverty, difficult access to modern care system and lack of adequate health infrastructure were principal problems affecting this population. In fact, as many people in the world, Comorian people have formed their health system themselves based on natural products. Its blend African Bantu and Arab-Muslim gave it a traditional medicine specifically rich and well diversified (Soidrou et al., 2013).This knowledge is passed down orally from generation to the other (Kaou et al., 2008).

Medicinal plants take an important place in this health system. But few written information exist about this knowledge. The principals investigations made in Comoros were these effected by Moinjoin in 1981, Adjanohoun in 1982 and PLARM project (Monjoin, 1981; Adjanohoun et al., 1982; Gurib-Fakim and Gueho,
1999). More recently, studies of Kaou et al., and Soidrou et al., were added in this list (Kaou et al., 2008; Soidrou et al., 2013). But these studies were not complete. In their study, Adjanohoun et al., estimated that vegetal biodiversity of Comoros was more than 2000 species (Adjanohoun et al., 1982). Ngazidja, the greatest island of the archipelago, was characterized by two important forests: the Karthala forest in the center of island and the La Grille forest in the north of island.

In Comoros Islands, many diseases like malaria, fever, headaches, gynecological diseases, dermal diseases, were always treated without modern medicine. Cassia occidentalis, Euphorbia hirta, Psidium guajava and Tambourissa comorensis are four plants largely used against these diseases. In the aim to collecting informations on medicinal plants, we were interested to investigate the different use of these four plants in indigenous care system especially in rural areas of Itsandra and Hamahamet regions. The study was carried directly on local populations.

MATERIALS AND METHODS

Study area

This study was conducted in two regions from Ngazidja Island (Figure 1). The first region is the Itsandra region in the center of Island. In this region, we were interested on five villages situated near the forest. These were the villages of Bahani, Sima, Wella, Dzahani II and Dimadjou. The second region is the Hamahamet region in the North-East of Island. Six villages were chosen. These villages are Batou, Bouni, Dimadjou, Gnadombweni, Nkourani and Seleani. Because their difficult access to modern sanitary infrastructures, these populations are developed a compensative sanitary system using plants.

Plants selection and identification

Four plants largely used for various needs were chosen for this study. They were collected from the two regions used in this study. Cassia occidentalis and Tambourissa comorensis were harvested in Hamahamet region, particularly in Bouni for Cassia occidentalis and Dimadjou-Hamahamet for Tambourissa comorensis. Euphorbia hirta and Psidium guajava were harvested in Itsandra region, particularly in Dimadjou for Euphorbia hirta and Bahani for Psidium guajava. Botanical determination of each species was performed by Ms. Andiliyat Mohamed Abderehmane and Ali Mohamed Kaou from Faculty of Sciences and Technology of University of Comoros. Voucher specimens (Cassia occidentalis (P00433758); Tambourissa comorensis (P00196479); Euphorbia hirta (P00226308); Psidium guajava (P00558090)) were deposited in the herbarium of the Faculty of Sciences and Technology, University of Comoros.

Data collection

The different medicinal uses of these plants were determined on the local population. Total of 128 persons aged between 45 and 100 years were interviewed in 11 villages. 80% of each was women. Interviews were conducted in local language. Questions were based on the all diseases treated by these plants, part used, method of preparation and different precaution taken for use of each plant. Other uses like rituals practices were requested. All data were collected on questionnaire file.

RESULTS AND DISCUSSION

Percentage of use of four plants by diseases

Results demonstrated the large use of these plants. Eighteen medicinal uses were recensed for all plants. Table 1 resumed the different uses of each plant. C. occidentalis was used for treatment of most diseases. It’s treated fifteen diseases. However used to treat twelve diseases, P. guajava and T. comorensis are the least used. E. hirta is itself used against thirteen diseases.

Gynecological problems, dermal problems, diarrhea, inflammation, diabetes, malaria, intestinal worms, stomachaches, constipation are the principle diseases treated. Figure 2 showed the use percentage of each plant by diseases. The principal diseases treated by these plants were diarrhea and stomachaches. To treat diarrhea, P. guajava and E. hirta were largely used with respectively 71.09% and 63.28%. C. occidentalis was itself used up 30%. Against stomachaches, P. guajava was also largely used with a percentage of 58.59%. The other plants were used at 28.91%, 26.56% and 17.97% respectively for E. hirta, C. occidentalis and T. comorensis. C. occidentalis is principally used against eyes diseases like conjunctivitis (46.09%). For dermal diseases, T. comorensis was the principal used plant in the list (54.69%); the other plants didn’t attain 10%. This plant was also used against inflammation at 35.94%.

For gynecological problems, E. hirta was mostly used (43.75%). T. comorensis and C. occidentalis are the only plants used against constipation in our list. To treat diseases like malaria and influenza, people used C. occidentalis, P. guajava and E. hirta. As demonstrated by Soidrou’s study, treatment of malaria and influenza need the association of two or more plants. Against malaria, 5, 6 or 7 plants are often used in a mixture named “Djungu” (Soidrou et al., 2013). In this study, interviewers are declared uses these plants in association with other plants to treated malaria and influenza. They can associate with Plectranthus aromaticus or Plectranthus amboinicus, Citrus aurantifolia, Musa paradisiaca, Aphloia theiformis, Piper capens, Eucalyptus sp, and mangifera indica. The use of these plants against malaria and influenza was demonstrated in other studies (Kaou et al., 2008; Soidrou et al., 2013). In their study, Kaou et al. demonstrated the association of C. occidentalis with...
plants like Annona squamosa, Jatropha curcas, Plectranthus amboinicus and Ipomoea obscura to treat malaria (Kaou et al., 2008). Utilization of Aphloia theiformis and Piper capens to treat malaria and influenza was showed earlier. In their study, Soidrou et al., showed the utilization of these plants in Itsandra and Hamahamet region (Soidrou et al., 2013).

**Regional uses of plants**

**Psidium guajava**

*P. guajava* was principally used to treat diarrhea and stomachaches. In Itsandra, their leaves are used at 88.89 and 73.02% respectively against diarrhea and stomachaches. They also used against the same pathologies in Hamahamet but at low percentage than these observed in Itsandra. These percentages are respectively 53.85 and 44.65% for diarrhea and stomachaches. The leaves may be taken on two ways. Both after decoction or young leaves can be chewed and ingested juice. Other diseases like malaria, intestinal worms are also treated by *P. guajava* but at minor percent. To treat malaria, the plant was used at 6.15 and 1.59% respectively in Hamahamet and Itsandra region. In Hamahamet this plant was used to treat also gynecological problems, diabetes, inflammation and headaches.

As demonstrated in this study, the antidiarrhoeal effect of *P. guajava* leaves was discussed also in literature. Gutierrez et al. reported the use of this plant against diarrhoea and dysentery (Gutierrez et al., 2008). Mexican communities taken also a guava leaf decoction to treat digestive suffering associated with severe diarrhea (Gutierrez et al., 2008). Aguilar et al. showed the use of this plant in Mexico to treat gastrointestinal and respiratory disturbances and as an anti-inflammatory medicine (Aguilar et al., 1994). In the Latin America and the Caribbean traditional medicine, Guava has been used widely to treat diarrhea and stomachaches due to indigestion (Mejia and Rengifo, 2000; Mitchell and Ahmud, 2006a,b). In Chinese traditional medicine, *Psidium guajava* leaves are example of the plant commonly used as popular medicine for diarrhea which is also used as an antiseptic (Teixeira et al., 2003). In Brazil, the leaves are considered for anorexia, choler, diarrhea, digestive problems, dysentery, gastric insufficiency, inflamed mucous membranes, laryngitis, mouth (swelling), skin problems, sore throat, ulcers, vaginal discharge (Hore et al., 2002). A decoction of the leaves is used to cure cough (Gutierrez et al., 2008). The use of guava against cough observed in Hamahamet region was also reported by Gutierrez et al., in Mexico. In Uruguay, a decoction of the leaves is used as a vaginal and uterine wash, especially in leukorrhea (Conway, 2002). This observation was also observed in Hamahamet region where 3.08% of interviewers used leaves against gynecological problems. Many pharmacological studies have demonstrated the ability of this plant to exhibit antioxidant, hepatoprotection, anti-allergy, antimicrobial, antiplasmodial, cytotoxic, antiinflammatory, anticoagul, antiadipic, antinflammatory and antinoceptive activities (Gutierrez et al., 2008; Metwally et al., 2011). Phytochemical studies reported the contents of phenolics, flavonoids, carotenoids, terpenoids and triterpenes (Gutierrez et al., 2008; Metwally et al., 2011).

**Euphorbia hirta**

*E. hirta* is largely used in Comorian folkloric medicine. It’s principally used in Itsandra region to treat diarrhoea and stomachaches. In Hamahamet it’s used principally against gynecological diseases and diarrhoea. In traditional Ayurvedic medicines the whole aerial parts is used in gastrointestinal disorders (diarrhea, dysentery, intestinal parasitosis), bronchial and respiratory diseases (asthma, bronchitis, hay fever) (Mhaskar et al., 2000). In our study, we found the use of this plant to treat diarrhoea at 92.06% in Itsandra and 35.38% in Hamahamet and in the treatment of stomachaches at 47.62% and 10.77% in Itsandra and Hamahamet regions respectively. But against gynecological problems, this plant was used at 73.84% in Hamahamet and 12.69% in Itsandra regions. It’s also used as cicatrization at 11.11 % in Itsandra and 10.77% in Hamahamet. Eyes diseases like conjunctivitis were treated at 6.34% and 1.54% respectively in Itsandra and Hamahamet regions. It’s used in hamahamet to treat headaches, malaria and intestinal worms. In Itsandra, it’s used against hypertension. It’s also used to treat inflammation in both regions. All most diseases treated by *E. hirta* were usually by aerial part and by decoction. However, in certain case, people used only latex to treat conjunctivitis. This use was also reported by (Loh et al., 2009). Divers properties were attributed to this plant such as antimicrobial (Perumal et al., 2012), sedative, anxiolytic, analgesic, antiinflammatory, antimalarial and anti-hypertensive properties (Hore et al., 2006). A serine protease, designated as hirtin, with fibrinolytic activity was purified to homogeneity from the latex of *Euphorbia hirta* (Patel et al., 2011). Recently nine phenolic and flavonoid compounds were isolated from aerial part of *Euphorbia hirta* growing in China (Yi et al., 2012).

**Cassia occidentalis**

*Cassia occidentalis* is largely known in Comorian folkloric medicine. Fifteen diseases present in our survey file was treated by this plant. The most percentage was enregistrated against eyes in Itsandra region (60.32%), in Hamahamet it’s used at 32.31%. It’s also used against diarrhoea in the both regions at 42.86 and 18.46% respectively in Itsandra and Hamahamet. The C.
occidentalis effect on diarrhoea was also reported by other studies in other countries (Jain, 1991; Payne-Jackson et al., 2004). It’s principally used to treat stomachaches in Hamahamet (35.38%) and gynecological diseases (26.15%). C. occidentalis leaves are also used to treat constipation at 34.92% in Itsandra and 9.23% in Hamahamet. Other diseases like headaches, malaria, and inflammation are also treated. To treat malaria, C. occidentalis is usually associated with other plants as demonstrated by Kaou’s study (Kaou et al., 2008). Diseases like diabetes, intestinal worms and fever treated by this plant, were only in Hamahamet. To treat fever, leaves or roots are usually used. In Brazil the roots are considered to be a tonic, febrifuge and diuretic, and are used against fevers, tuberculosis, anaemia, liver complaints and as a reconstituent for general weakness and illness (Coimbra, 1994). But to treat constipation people used roots. Jain made the same observation in Nigeria where the roots were boiled with water and taken as tea for constipation (Jain, 1991). Other studies showed the use of this plant to treat gonorrhea and dysmenorrhea, two gynecological diseases (Coimbra, 1994; Di Stasi and Hiruma, 2002). Treatment of gynecological diseases was also observed in this study principally in Hamahamet region. Phytochemical studies conducted on C. occidentalis revealed the presence of several molecules structures like flavonoids and anthraquinones. Leaves contain flavonoids (Yadav et al., 2010). Roots contain anthraquinones and flavonoids (Alves, 1965; Yadav et al., 2010).

**Tambourissa comorensis**

<table>
<thead>
<tr>
<th>Family/species</th>
<th>Local name</th>
<th>Used part and mode of use</th>
<th>Popular uses</th>
<th>Scientific investigations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Myrtacea / Psidium guayava</td>
<td>Mbéra</td>
<td>Leaves (decoction)</td>
<td>Diarrhea, stomachaches, malaria, intestinal worms, malaria, gynecological diseases, diabetes, inflammation and headaches.</td>
<td>antidiarrhoecal effect, diarrhea, dysentery, digestive suffering, gastrointestinal, respiratory disturbances, anti-inflammatory, anorexia, cholera, digestive problems, dysentery, gastric insufficiency, inflamed mucous membranes, laryngitis, mouth (swelling), skin problems, sore throat, ulcers, vaginal discharge (Gutierrez et al., 2008, Aguilar et al., 1994, Mejia and Rengifo, 2000; Mitchell and Ahmad, 2006a,b, Teixeira et al,2003, Holetz et al., 2002 ).</td>
</tr>
<tr>
<td>Euphorbiaceae/Euphorbia hirta</td>
<td>Idioindzia</td>
<td>Leaves (decoction)</td>
<td>Diarrhoea, stomachaches, gynecological diseases, dysentery, intestinal worms, bronchial, respiratory diseases, malaria, worms intestinal, hypertension, inflammation,</td>
<td>sedative, anxiolytic, analgesic, antipyretic, anti-inflammatory, anti-malarial and anti-hypertensive properties, nine flavonoids and phenolic compounds were isolated from the aerial part (Perumal et al., 2012, Hore et al., 2006, Patel et al., 2011, Yi et al., 2012 ).</td>
</tr>
</tbody>
</table>

Plants of Tambourissa genoa are largely used in Comorian traditional medicine. Known locally as “mledjeza or Mbosa”, Tambourissa comorensis is used to treat several diseases. It is used to treat dermal diseases, constipation, diarrhoea, inflammation, stomachaches, and some other diseases. Used to treat twelve diseases, it’s treated principally dermal diseases, diarrhoea, constipation and inflammation. In Itsandra region, it’s largely used against dermal problems (74.6%), diarrhoea (52.38%) and inflammation (31.74%). In Hamahamet, it’s principally used to treat constipation (50.77%), inflammation (40%), diarrhoea and dermal diseases at 35.38%. Other diseases like stomachaches, headaches and cough are also treated in the both regions. Against stomachaches, asked people uses T. comorensis at 20.63% in Itsandra and 15.38% in Hamahamet. It’s used at 19.05% and 9.23% to treat headaches respectively in Itsandra and Hamahamet regions.

This plant is also used in lowest percentage as cicatrisant in the both regions. In Itsandra, it’s also used to treat diabetes and hypertension. To treat all diseases, all asked people affirmed used only fruit for their medicinal needs. It’s can use by local application mainly against dermal diseases, inflammation, headaches and as cicatrisant. But to treat diseases like constipation, diarrhoea, stomachaches, cough, diabetes, hypertension and intestinal worms it’s drinking by melaging with cold water. Our study hasn’t demonstrate any usage of this plants to treat malaria. However in their study, Kaou et al., showed the use of Tambourissa leptophylla to treat malaria (Kaou et al., 2008).
Fabaceae/ *Cassia occidentalis*  
Sanamaka  
Leaves (decoction)  

Monimiaceae / *Tambourissa comorensis*  
Mledjeza  
Leaves (decoction), Seeds (infusion, crush and drink)  
Diarrhoea, constipation, inflammation, stomach pain, headache, cough, wound healing, diabetes, hypertension, However in their study Kaou *et al.*, showed the use of *T. leptophylla* to treat malaria (Kaou *et al.*, 2008).

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**Figure 1.** Map of study area (elaborate by Ibrahim Kassim from University of Comoros)

**Figure 2.** Percentage of use of four plants by diseases (*n*= 128)

**Figure 3.** Regional uses of *Psidium guajava* by diseases

**Figure 4.** Regional uses of *Euphorbia hirta* by diseases

**Figure 5.** Regional uses of *Cassia occidentalis* by diseases

**Figure 6.** Regional uses of *Tambourissa comorensis* by diseases
CONCLUSION

Our study has demonstrated the important use of these plants in Comorian folkloric medicine and their ability to treat several diseases. The adopted approach allowed us to clearly identify all uses of these plants. In Comoros Islands the plant kingdom still holds many species which contains substance of medicinal values, yet to be discovered. So this study constituted a preliminary study and the next steps will consist of several laboratory investigations to identify biological activities and isolate chemical constituents of these plants who have a potential to be developed as high-value healthcare products.

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REFERENCES


Mojón M. Possibilités d’utiliser la médecine traditionnelle pour améliorer les soins de santé primaires aux Comores, Thèse de doctorat en médecine, Université de Bordeaux-II, France, 1981.


