IMPORTANT MEDICINAL AND AROMATIC PLANTS (MAPs) - ERITREA

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Keywords: *Allium Sativum, Aloe Camperi*, Fenugreek (*Trigonella foenum-graecum* L.), *Opuntia ficus-indica* Aromatic Plants, black seeds, Bioactivity, Ethnobotany, Herbal Medicine, Indigenous Knowledge, *Lepidium Sativum*, Medicinal Plants, *Nigella Sativa, Ruta Chalepensis, Rumex Nervosus,* Traditional Medicine, *Withania Somnifera*.

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Summary

Medicinal plants provide major source of molecules with medicinal properties due to presence of natural compounds. The World Health Organization notes that around 80% of the global population relies on traditional medicines that include plant-based treatments. This paper explores the importance of medicinal and aromatic plants (MAPs) in healthcare systems, especially in developing countries where traditional medicine is deeply ingrained and widely embraced. Its focus is on Eritrea, a nation with a rich history of practicing traditional medicine, closely tied to its cultural values and beliefs. Traditional healers in Eritrea address human and animal diseases, disease prevention, and the overall well-being of the community using traditional herbal medicine.

The chapter provides useful information about important medicinal plants in Eritrea's traditional herbal healthcare system. Each plant is discussed in terms of its botanical features, traditional medicinal uses, historical context, appearance, distribution, ecology, cultivation, harvesting practices, and medicinal significance

To offer a holistic view, the chapter begins with a brief overview of Eritrea, covering its history, social interactions, geography, and natural resources. It then delves into the unique healthcare system shaped by various cultures, both indigenous and colonial. The primary focus of the chapter is on traditional herbal medicine, its multifaceted influences from different cultures and religions, and the lasting legacy of trade facilitated through historic ports like Adulis and Massawa.

1. Introduction: History, Geography and Natural Wealth of Eritrea

1.1. Ancient Eritrea

The name "Eritrea" finds its origins in the books of ancient Greek historian Herodotus (Herodotus, 2012), who mentioned a region referred to as "Erythra Thalassa," meaning the "Red Sea" or "Red Land." This term was linked to the seas around this region, known as the Erythrean Sea or Mare Erythraeum in Latin, now called the Red Sea. The name "Eritrea" gradually developed from "Erythra Thalassa" due to the reddish color of the sea in the area possibly attributed to reddish-colored algae, which was used to describe the region. "Erythræa" was an earlier term describing the region. The name "Eritrea" was formally adopted when Eritrea became an Italian colony in the late 19th century. It is important to provide this historical context to understand the origin of the name Eritrea.

1.2. Eritrea in the Medieval Period

Eritrea's medieval period is significant in its history, with healthcare practices shaped from the infusion of traditional knowledge brought by Christian and Islamic influences. Eritrea was one of the early adopters of both Christianity and Islam, around the 4th and 7th centuries CE, respectively. The country's rich religious history is evident in ancient monasteries on its highlands and the presence of Frumentius, known as Abba Selama, who made his mark in Eritrean churches. He had been the first person to shipwreck with

his brother Aedesius on the Eritrean coast before he made his journey to the hinterland (Medin, 2017). Eritrea has numerous ancient monasteries that are significant Christian treasures. The historical significance extends to the mosque of the Al-Sahabas in Massawa. The arrival of Prophet Mohammed's followers in Eritrea, seeking refuge from persecution, serves as evidence of the Islamic presence in the region before spreading elsewhere. The Al-Sahabas, as they were called, were welcomed by the ruler of the Bahri Negasi (Ruler of the Sea). They established Al-Sahaba Mosque (Medin, 2017), built by the Prophet's disciples in 615 CE. Arabic calligraphy inscriptions on the Island of Dahlak and impressive Islamic architectural legacies throughout the country underscore the enduring influence of Islamic culture in Eritrea. While Islam was expanding in the country, the highlands were governed by "Bahri Negasi".

1.3. The Struggles and Independence

Eritrea's rich and diverse history spans millions of years, with its present-day cultural diversity originating from the cradle of human civilization, as evidenced by fossil findings (Medin, 2017). The recent history is marked by centuries of colonialism and its far-reaching impacts.

Eritrean history is a testament to enduring hardship, resistance, and solidarity, dating back to ancient times. Due to its strategic location along the Red Sea coast, Eritrea faced numerous invasions and colonization by the invaders. In the sixteenth century, large areas of present-day Eritrea along the coastal zones came under the domination of the Ottomans Empire (1557-1865). They were eventually succeeded by the Egyptians (1865-1884) and then the Italians colony (1890-1941) controlled parts of the region. Italy declared Eritrea its first African colony in 1890, but in 1941, it was defeated by Allied forces, leading to British administration (1942-1952). Eritrea was chosen by the Italian government to be the industrial center, in the year 1939, there were around 2,198 factories, which were concentrated in the areas of construction, mechanics, textiles, food processing and electricity, and agricultural reforms where primarily on farms owned by Italian colonists (exports of coffee boomed in the 1930s) and fruits. However, after World War II, many big industries, big port machineries - ship dock moved from Eritrea to other countries, the Asmara–Massawa Cableway, (dismantled by the British as war reparations in World War II) was the longest line in the world during its time (Alemseged Tesfai, (2018)). Eritrean aspirations for independence and British designs for the Horn of Africa clashed from the outset. The Eritrean people established their first anti-colonial patriotic association in 1941 and called it "Mahber Fikri Hager Eritrea" (Association for the Love of the Country of Eritrea). The association became an immediate target for the British and the Ethiopians. In 1952, despite gaining independence in the early stages alongside other Italian colonies like Libya and Somalia, Eritrea was federated with Ethiopia against the will of its people. Right from the outset, the provisions of the federation were violated by the Ethiopian emperor, eventually leading to a protracted struggle for self-determination from 1961 to 1991. Eritrea finally became independent in 1993, but the war for liberation caused severe damage to its infrastructure, economy, and environment. In 1998, a conflict with Ethiopia worsened these issues, resulting in the destruction of towns, bridges, and power plants. The combined impact of war and economic sanctions has had a negative effect on Eritrea's infrastructure. It is a historic record, where Eritreans fought against

the giant forces for more than half a century, to define their self-determination. This monumental fight represents Eritrea's resistance against significant adversity (James Firebrace et al., 1985). Nonetheless, Eritrea is committed to its unique approach to national development, with a focus on education, healthcare, agriculture, industry, finance, trade, and urban development. Traditional healthcare systems have been emphasized due to challenges in adopting modern medical practices from more advanced nations. Throughout its history, religious and political influences have significantly shaped Eritrea's traditional healthcare system to meet the needs of its people. During this period of struggle, many sought refuge in remote areas, relying on traditional healthcare practices.

2. Geography and Physical Features of Eritrea

2.1. Location

Eritrea is a country located in the Horn of Africa, with the Red Sea to the east, Sudan to the north and west, Ethiopia to the south, and Djibouti to the southeast. It is situated just north of the equator, spanning latitudes from 12°22' N and 18°02' N, and longitudes from 36°26'21" E and 43°13' E. Eritrea covers an area of 125,700 square kilometers (DOE, 2012) and is divided into six administrative regions: Anseba, Debub, Debubawi Keih Bahri, Gash Barka, Maekel, and Semenawi Keih Bahri (Figure 1).

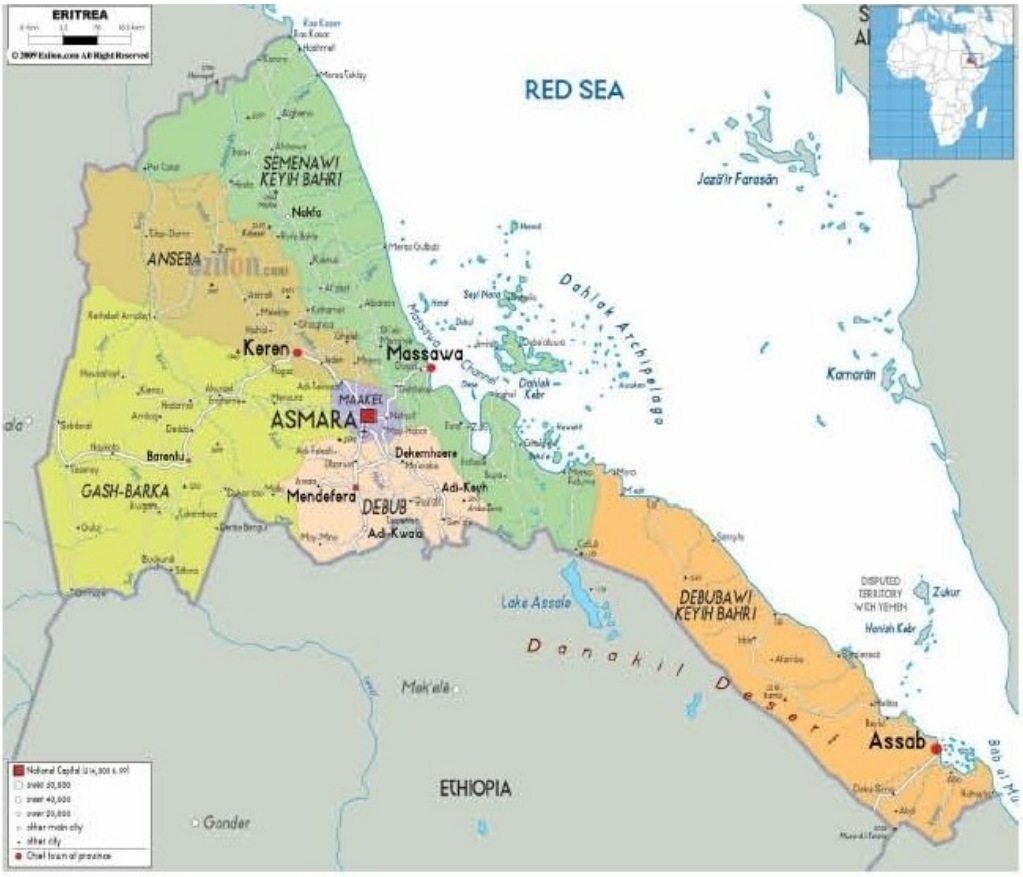

Figure 1. Map of Eritrea with six zobas (regions)

2.2. Terrain, Climatic Zones and Rainfall

Eritrea experiences a wide range of rainfall, with the Eastern Lowlands receiving less than 200 mm annually, a small pocket of the Escarpment getting about 1,000 mm, and the Highlands receiving between 450 mm to 600 mm. Rainfall in the southern part of the Western Lowlands is in the range of 600-800 mm but decreases as you move northward. This low rainfall in the Eastern Lowlands results in aridity and challenging conditions for agriculture, grazing, and industry. Eritrea has two major rainfall periods: one from June to September, covering the Western Lowlands and the Highlands, and another from October to March, primarily affecting the Eastern Lowlands.

The highlands and lowlands of Eritrea had strong economic and cultural ties to the kingdoms of Egypt and Kush (Meroë). Moreover, the place of the land of punt is situated at the crossroads of the Eritrean lowlands and part of Sudan. Egyptians were importing gold, aromatic resins, black-wood, ebony, ivory, and wild animals from this part of Eritrea and Sudan. Later on the Eritrea highlands flourished with extraordinary cities like Qohaito, Metera, Keskese, Tokonadaè…etc. (Medin, 2017). These were amongst the most prosperous ancient cities, of the Di'amat (D`mt) kingdom during the 8th and 7th centuries BC. These areas, during the 1st century AD or earlier, developed strong ties of trade of spices with Arabia, India and through the ancient port city of Adulis. Figure 2 shows the country's Agro-ecological zone (FAO, 1997).

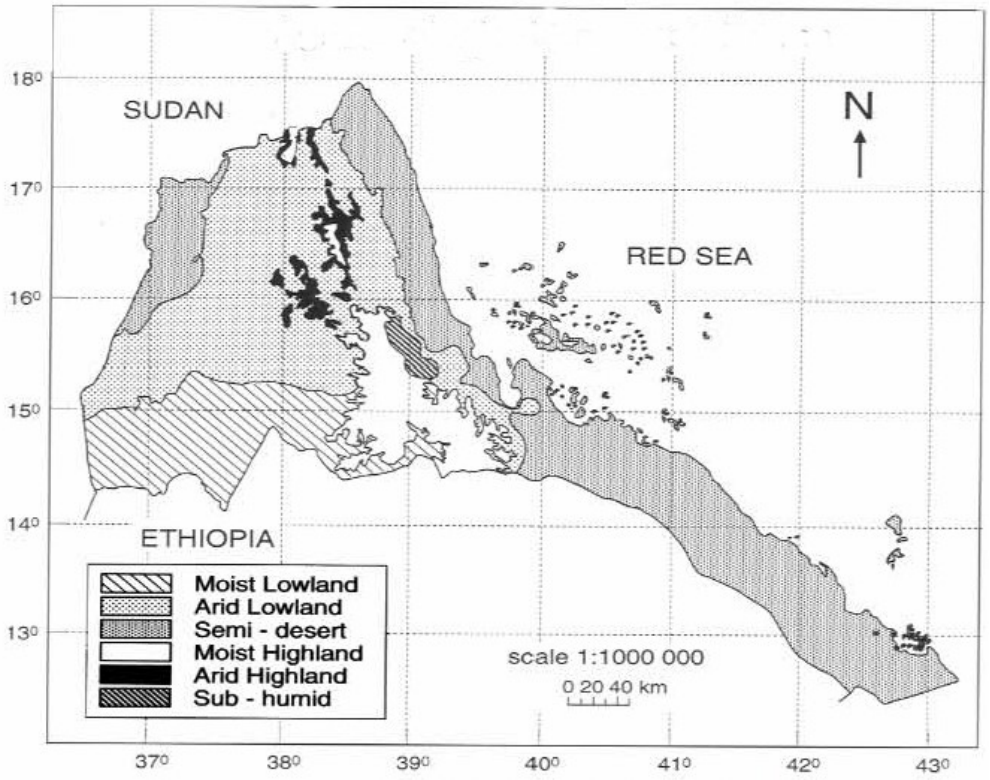

Figure 2. Agro-ecological zone of Eritrea (FAO, 1997)

3. Natural Wealth of Eritrea

3.1. Eritrean Fauna

Eritrea was endowed with a variety of natural resources that have been declining as a result of human-made and natural calamities such as deforestation, prolonged war, and drought,. Historically, the country was home to a wide range of wildlife species such as the African elephant, Hippopotamus, Buffalo, Giraffe, Greater kudu, African wild ass, Nubian ibex, Waterbuck, Lion, Leopard, Cheetah, Colobus monkey, and numerous other smaller species (Alam, Mohammad Afsar (2014)). At present, a few of these species such as African wild ass, Nubian ibex, Greater kudu, Waterbuck, Leopard, and numerous other avifauna species exist in Eritrea, but these populations are small and are considered to be under threat.

3.2. The Wealth of Plants and Crops in Eritrea

Since Eritrea's independence in 1993, significant progress has been made in the fields of agriculture, healthcare, and education. Extensive studies have been conducted to evaluate biodiversity, its status, trends, and the threats it faces. These studies have also explored the potential implications for human well-being, leading to the development of comprehensive action plans.

Traditional Eritrean Medicinal Plants have played a vital role in healthcare for centuries, benefiting both people and their livestock. However, despite their significance in traditional and folk medicine, there hasn't been a comprehensive review focused on the major plants. The process of documenting this valuable knowledge hasn't received the attention it deserves, particularly in alignment with modern standards and literature dissemination practices. Traditional knowledge has been orally passed down through generations, sometimes shrouded in secrecy. A considerable portion of the population continues to rely on traditional medicine to fulfill their primary healthcare needs. There's a pressing need to compile, organize, and document this wealth of traditional knowledge. Additionally, research programs should be implemented to transform this traditional knowledge into an evidence-based format for universal acceptance.

Diligent efforts have been directed towards documenting Eritrean Medicinal Plants, particularly at the university, to capture Traditional Medicinal Knowledge (TMK) rooted in the use of medicinal plants (Senai, 2010; Bereket Tewelde, 2006; Tesfalem Rezene, 2002; Shushan Ghirmai, 2002), ((Sirak Tesfamariam et al., 2021). The Medicinal Plants and Drug Discovery Research Centre (MPDDRC) has been actively working on a database, with a specific focus on the Eritrean highlands and lowlands. Collaboration extends to various organizations, including the Traditional Medicine Unit (TMU) in Eritrea, the Eritrean Pharma Covigilance Center, the National Medicines and Food Administration (NMFA) in Asmara, Eritrea, and Health Systems at the WHO Country Office for Eritrea. This collective effort encompasses comprehensive studies of Traditional Medicinal Knowledge (TMK).

Some very common and culturally important medicinal plants with special position in Eritrea are considered for their botanical and conservational aspects, chemical properties and pharmacological potential.

4. Medicinal Aromatic Plants of Eritrea

This chapter has its focus on a collection of a selected group of the most widely used and culturally significant medicinal and aromatic plants within Eritrea's traditional herbal medicine practices. In this chapter, ten plant species of medicinal importance are included. (Table1). They are also found growing sporadically in natural forest, hills, mountains, churches, home gardens, rivers and roadsides. Most of these medicinal plants are harvested from natural stands and also from home gardens.

No.	Species	Family	Local name	Part(s) used	Ailment(s) traditionally treated
1	*Lepidium sativum*	Brassicaceae	Shnfa'e	Seeds	Eye disease, taenia capitis, malaria, tuberculosis, hepatitis, hypertension, warts, anti-emetic
2	*Nigella sativa* (Black Seeds)	Ranunculaceae	Abosoda	Seeds	Bronchial asthma, diuretic, diarrhea
3	*Fenugreek (Trigonella foenum-graecum L.)*	Fabaceae	Abeakhe	Seeds	Multipurpose medicinal and traditional herb. - helps lower blood cholesterol, reduce cardiovascular risk, control diabetes
4	*Allium sativum*	Alliaceae	Shgurti tsaeda	Bulb	Hypertension, cold, malaria, alopecia, myalgia
5	*Aloe camperi*	Liliaceae	Sanda 'ere	Leaves	Malaria, abdominal pain, taeniacide, infectious hepatitis, diabetes mellitus, hypertension, anti-emetic, infected wounds
6	*Boswellia Papyrifera*	Burseraceae	e'tan (Luban)	Barks and Resin	Antipyretic, tranquilizer
7	*Opuntia ficus-indica*	Cactaceae	Beles	Flowers, stem	diuretic, abscess
8	*Ruta chalepensis*	Rutaceae	Chenna adam	Leaves	Myalgia, cold, whooping cough, abdominal pain, anti-emetic
9	*Rumex Nervosus*	Polygonaceae	Hihot	Leaves, stem	eye disease, taenia capitis, haemorrhoids, infected wounds, arthritis, eczema, abscess, gynecological
10	*Withania Somnifera*	Solanaceae	Agol	Root, leaves, plant	taenia capitis, arthritis, i. wound, 'gerefta', 'gonfi', sprain

Table 1. Important Medicinal and Aromatic Plants of Eritrea

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Biographical Sketches

Samrawit A. Woldai is a final-year biochemistry student at the University of Waterloo, Canada. Her academic pursuits extend beyond the classroom, as she dedicates her free time to studying the plant sources of Eritrea and its neighboring regions. Collaborating with Dr. Ezana, this endeavor serves as both a passion and a potential contribution to the development of sustainable healthcare systems in developing countries. Samrawit envisions that the rich diversity of plant sources in Eritrea holds valuable insights for addressing global health challenges

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Dawit Gebrehiwet Weldemariam is a hospital pharmacist currently contributing to healthcare at Hazhaz Hospital in Asmara, Eritrea. Having earned his degree in Pharmacy from Asmara College of Health Sciences in 2017, Dawit is not only a healthcare professional but also an accomplished medical researcher. With eight scientific research articles already published in peer-reviewed journals, he is recognized for his valuable contributions to the field. His commitment to advancing pharmaceutical practices is further underscored by his nomination as a board member of the Eritrean Pharmaceutical Association from 2023 to 2024.