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Research Article

Review on Phytochemical Studies of Ethiopian Medicinal Plants from 1970's-2020, and their Potential as Source of Modern Drugs

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ABSTRACT

Ethiopia is characterized by a wide range of ecological and climate conditions that account for the wide diversity of its biological resources both in terms of flora and fauna wealth. Medicinal plants are distributed all over the country with great concentration in the south and southwestern parts of the country. The woodlands of Ethiopia are the source of most medicinal plants, followed by montane grassland or dry montane forest complex of the plateau others include the evergreen bush land and rocky. This study therefore focused on Review on Phytochemical Studies of Ethiopian Medicinal Plants from 1970's-2020, and their Potential as Source of Modern Drugs.

Key Words: Phytochemicals, Medicinal Plants, Drugs

INTRODUCTION

Background Information

Organic chemistry as it stands today has developed largely from the chemistry of natural products. With the advent of modern spectroscopic techniques such as multidirectional NMR spectroscopy, mass spectroscopy, and improved chromatographic techniques, a host of new organic substances from terrestrial and marine organism are being discovered, many of which have interesting bioactivities [1]

Natural products include pure compounds (e.g alkaloids, coumarins, flavonoids, glycosides, lignans, steroids, sugars, terpenoids, etc) isolated from plants, animals or microorganisms. In most case the term natural products refers to secondary metabolites, which are small molecules (mol wt <200 amu) produced by an organism that are not strictly necessary for the survival of the organisms [2].

The use of natural products, especially plants, for healing is an ancient and universal as medicine itself. The therapeutic use of plants certainly goes back to centuries ago. It has been recorded that Hippocrates used approximately 400 different plant species for medicinal purposes. Natural products played a prominent role in an ancient traditional medicine system, such as Chinese, Ayurveda, and Egyptian, which are still in common use today. According to the world health organization (WHO), 75% of people still rely on plant-based traditional medicine for primary health care globally [3].

Nature has been a source therapeutic agent for thousands of years, and an impressive number of modern drugs have been derived from natural sources, many of them based on their use in traditional medicine. Over the last century, a number of top-selling drugs have been developed from natural products (vincristine from vinca rosea, morphine from papaver somniferium, Taxole from Taxus brevifolia etc). In recent years a significant revival of interest in natural products as a potential source for new medicine has been observed among the academia as well as pharmaceutical companies [3].

Apart the natural product-derived modern medicines, natural products are also used directly in the "natural" pharmaceutical industry which is growing rapidly in Europe and North America, as well as in traditional medicine programs being incorporated in to the primary health care systems of Mexico, the people republic of China Nigeria and other developing countries [4].

Medicinal plants are known to provide a rich source of raw materials of natural product and have been used as traditional treatments for numerous human diseases for thousand years in Africa, Asia and other parts of developing world. Particularly those living in rural areas of the developing countries, it's continued to be used as the primary source of medicine [5].Drug discovery from medicinal plants led to the isolation of early

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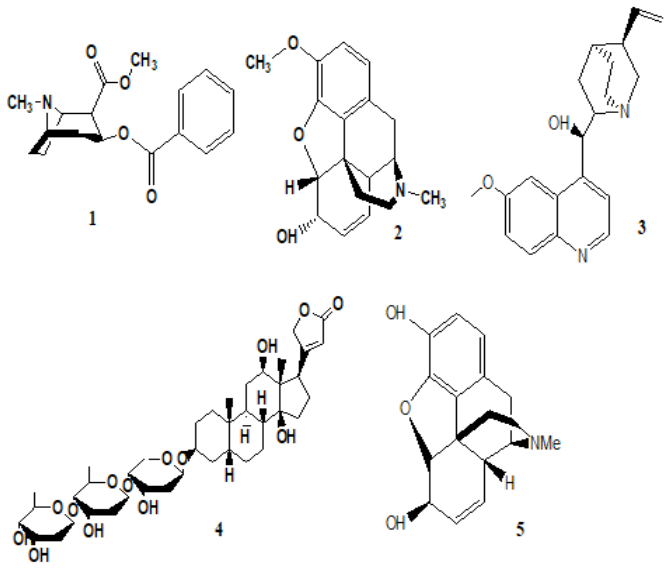
drugs such as cocaine (1), codeine (2), quinine (3) and dig toxin (4), in addition to morphine (5), of which some are still in use [6].



Ethiopians have used traditional medicines for many centuries, the use of which has become an integral part of the different cultures in Ethiopia. The indigenous peoples of different localities in the country have developed their own specific knowledge of plant resource uses, management and conservation According to Dawit the traditional medical system of Ethiopia is medico-religious systems due to close interaction the traditional medical system in the country. Ethiopian people have their own set of written and oral pharmacopoeias. However, the knowledge on medicinal plants is largely oral; however, Ethiopians ancient church practices have documented some of the knowledge inscribed in parchments which partly characterize the traditional medical system usually described as medico-religious written in Geez manuscripts of the 15th Century [8].In Ethiopia, 80% of the people use medicinal plants and plant remedies selected over centuries. Moreover, medicinal plants remain the most important and sometimes the only source of therapeutics [7].

Furthermore the expensive cost of modern medicine, to treat various infections and the acquisition of drug resistant by pathogens, particularly in third world countries necessitates the search for an alternative anti-infective agent from natural products [8]. Many previous studies conducted in Ethiopia have shown the antimicrobial activities of many indigenous plants used in traditional medicine [10].

LITERATURE REVIEW

Plants And Their Potential As Source Of Modern Drugs

Development of new drug is a complex, time-consuming, and expensive process. The time taken from discovery of a new drug to its reaching the clinic is approximately 12 years, involving more than 1 billion US$ of investments in today's context. Essentially, the new drug discovery involves the identification of new chemical entities (NCEs), having the required characteristic of drug ability and medicinal chemistry. These NCEs can be sourced either through chemical synthesis or through isolation from natural products. Initial success stories in new drug discovery came from medicinal chemistry inventions, which led to the need of development of higher number of chemical libraries through combinatorial chemistry [11] .

The use of natural products with therapeutic properties is as ancient as human civilization and, for a long time, mineral, plant and animal products were the main sources of drugs. The Industrial Revolution and the development of organic chemistry resulted in a preference for synthetic products for pharmacological treatment. The reasons for this were that pure compounds were easily obtained, structural modifications to produce potentially more active and safer drugs could be easily performed and the economic power of the pharmaceutical companies was increasing. Furthermore, throughout the development of human culture, the use of natural products has had magical-religious significance and different points of view regarding the concepts of health and disease existed within each culture [12].

Ethiopian traditional medicine is vastly complex and diverse and varies greatly among different ethnic groups Under the rule of Menelik (1895-1913) western medicine became significantly more incorporated in to the Ethiopian medicinal system. Numerous medicinal envoys from abroad, starting with the Italians and Russians, were influential in building hospitals, providing medicinal training and participating in vaccination campaigns. However, most medicinal establishments primarily served the urban elites and foreign missionaries and were concentrated in the major cities [13].

About 1000 identified medicinal plant species are reported in the Ethiopian flora; however, many others are not yet identified. About 300 of these species are frequently mentioned in many sources. In various written records of medicinal plants from central north and north eastern parts of Ethiopia are having small fractions of medicinal plants present in the country. But very recent study on the Bale mountains national park in there south east Ethiopia revealed that the area, as much as it is a biodiversity hotspot [13]

History And Current Status Of Ethiopian Medicinal Plants

History Of Phytochemical Studies Of Ethiopian Medicinal Plants

A cursory look at the history of the use of traditional medicine (especially of medicinal plants) in Ethiopia reveals that such use dates back to the time of the Axumite kingdom, if not to earlier periods. Many manuscripts attesting to this fact, and which are now in the custody of the Ethiopian National Traditional Medicine Preparation and Therapy Association, have been recovered. They mention, among other traditional practices, that a large number of medicinal plants were used. The manuscripts claim that during the era of the Axumite kingdom (7th-11th C), about 8,000 plants were used as medicinal agents.

This period was followed by the Zagwe dynasty (11th-13th C), during which time about 2,800 medicinal plants were recorded to have been used. Similarly, during the era of Gondarine kingdom (1636-1865), medicinal plants numbering some 2,900 were employed. A manuscript was also recovered from the ruins of Aba Jifar's palace in Jimma during the era of King Menelik II over 100 years ago. It included about 589 plants which were used as therapeutic agents. Close to 700 medicinal plants were also recorded to have been used during the reigns of King Hailemelekot through Emperor Haile Selassie I (1870-1974). In each of the above manuscripts, a lesser number of other medicinal agents of animal and mineral origins were also presented. It is worth noting that the number of plants may have been exaggerated, especially in the older manuscripts, considering the fact that only about 7,500 plant species are known to exist in Ethiopia today. It is also possible that many of the plants may have been counted more than once [14].

This may be true even after allowing for plant species that could have been extinct since the times of the manuscripts. In any event, it is clear that medicinal plants played a pivotal role in the treatment of various afflictions. More recently, several publications which listed currently used Ethiopian medicinal plants have appeared. In 1971, Tsehai Berhane Selassie authored an annotated paper based on an earlier manuscript by Grazmach Gebrewold Aregawi of Dega Damot, which described the uses of over 200 plants. In addition, the paper included a description of magic and rituals used in some of the healing processes. In 1973, the Polish Stephen Strelcyn produced a book listing the medical applications of 300 plants. A few years later, in 1976 a mimeograph was published by the University of Addis Ababa, based on extensive field and herbarium studies. This work listed the geographic origins of about 250 medicinal plants along with their uses. A landmark book titled Este Debdabe was published in 1989 by Gelahun Abate, with Sebsebe Demissew as the editor [14].

Current Status of Ethiopian Medicinal Plants

Presently, there are anywhere above 6500 medicinal plant species in Ethiopia, comprising about 12 percent of the entire flowering plants found in the country. However, perhaps the more commonly used medicinal plants may number in the vicinity of 200. Many of these plants have not been investigated scientifically, although they have been used by the population for a long time. A common argument advanced in favor of continuity of use of such long-used plants is that people would have dropped them if they hadn't worked, and therefore they should have been effective to be sustained for such a long time. However, that reasoning doesn't suffice to promote rational use of phytomedicines. Scientific studies encompassing chemistry, pharmacology, formulation and standardization are required not only to justify the use of botanicals , but also to produce refined, convenient, and quality-controlled products. It has been widely claimed that about 80% of Ethiopians rely on traditional medicine (predominantly medicinal plants) to treat their illnesses and maintain their health. This is more true in rural than urban areas. Even in urban areas people are inclined to use so-called home remedies to treat common illness symptoms. In such cases, accurate diagnoses of diseases, and expertise in preparing and administering herbal medications may not be usually required. In this category of conditions fall such disease states as taeniasis, stomach conditions, skin problems, and symptoms such as headache, cold, cough, and diarrhea [14].

People have treated these conditions for hundreds (maybe even thousands) of years by using traditional ways. They have been successful in most cases in alleviating their suffering by concocting various preparations derived from medicinal herbs which abounded in their environs. More serious medical problems were usually deferred to expert traditional medical practitioners, or modern physicians as the case may be. Ethiopian traditional medicine consists of various treatment modalities, but the bulk of it employs medicinal plants as part of the treatment regimens. Consistent with the prevailing thoughts of the time, many of the old treatment methods were, as can be expected, steeped in magico religious beliefs. As time went by, traditional medicine started receiving fresh perspectives. A number of medicinal plants have survived scientific scrutiny to varying degrees [14]

Medicinal plant diversity and distribution in Ethiopia

Different vegetation types that are found in the various agro ecological zones of Ethiopia accommodate various types of medicinal plants .the woodlands, montane vegetation including grasslands and forests and the evergreen scrubs and rocky areas contain more medicinal plants with higher concentrations in the woodlands and observed that the microphylous vegetation of the wood lands listed more medicinal plants species followed by the montane-grassland and riverine vegetation while the afroalpine vegetation ranked last. [15]

The number of different languages spoken in Ethiopia approaches 90 and each corresponds to its unique socio cultural population thus amounting to the high human cultural diversity. Each of these cultural domains has its own set of written and/or oral pharmacopoeias with the medicinal use of some species being restricted to that given culture .Ethiopia has rich medicinal plant lore and points out that almost all plants of the Ethiopian flora are used somewhere somehow medicinally. Other workers on the other hand estimated about 60% of the flora to be medicinal, and most sources give them for livestock ailments as well as for prevention of pests and vectors. indicated that the various parts of medicinal plants have been used such as leaves, roots and barks of the stem. However, leaves are regarded as the most cited plant parts used by healers for the preparation of traditional medicines. The various literature available show the significant role of medicinal plants in primary healthcare delivery in Ethiopia where 70% o of human and 90% of livestock population depend on traditional medicine similar to many developing countries particularly that of Sub-Saharan Africa countries.[13]

Indigenous knowledge and medicinal plants

Indigenous knowledge refers to the accumulation of knowledge, rule, standards, skills, and mental set, which are possessed by local people in a particular area. It is the result of many

generations long years experiences, careful observations and trial and error experiments. Traditional people around the world possess unique knowledge of plants resources on which they depend for food, medicine and general utility including tremendous botanical expertise. Over centuries, indigenous people of different localities have developed their own specific knowledge on plant resource use, management and conservation [16].

To preserve indigenous knowledge of plants use in general and of traditional medicine in particular, an ethnobotanical survey of lesser studied socio-cultural groups is very crucial. However, in Ethiopia research and documentation on medicinal plants has been started very recently. The documenting of medicinally important plants is mainly aimed at developing database for further studies and conservation of the plants. Ethnobotanical studies in Northern Ethiopia, Shirka district, Butajira and Addis Ababa, "Zay" people, "Shinasha, Agew-awi and Amhara peoples" in northwest, People around Debre Libanos monastery, "Dheeraa" town, Arsi Zone,people in Dek Island, and Meinit ethnic group are some among the studies, which documented some medicinal plants of Ethiopia [17].

Medicinal plant resources And Traditional Medicine in Ethiopia

Some medicinal plant species of Ethiopia are reported to have been threatened by the overuse over harvesting for marketing as medicine. A good example is Taverniera abyssinica whose slender roots are swathed and small coiled bundles presented for market. T. abssynicais a popular traditional medicine for what is known as sudden disease. The species is labeled as critically endangered in the Red List of Endemic Trees and Shrubs of Ethiopia It has been reported that Ethiopia has 40 species of Aloe where the sap of some species is used for medicinal, food and cosmetic application and is widely used internationally. Many species of Ethiopian medicinal plants have a long history of use as remedies [16].

The use of traditional medicine is still wide spread in Ethiopia, and its acceptability, availability and popularity is no doubt as about 90% of the populations use it for health care needs. In Africa up to 80% of the population uses traditional medicine to help meet their health care needs. The Ethiopian flora is estimated to contain between 6500 and 7000 species of higher plants of which about 12% are endemic. It is therefore not surprising that some of these plants have chemical compounds of therapeutic value that may be used in the treatment of major diseases such as HIV/AIDS, malaria, cancer, etc. Ethiopia is also a home of many languages, cultures and beliefs which in turn have contributed to the high diversity of traditional knowledge and practices of the people which, among others, include the use of medicinal plants. Plants have been used as a source of medicine in Ethiopia from time immemorial to treat different ailments. In 1993 it was reported that 80% of the Ethiopian population still depends on traditional medicine for their health care practices. More than 95% of traditional medical preparations are of plant origin. Ethiopians knew the use of bleeding and cupping besides various herbs as purgatives [16].

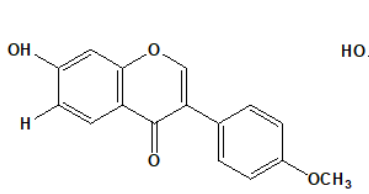
The earliest known texts are the Geez "Matshafa Faws" of mid-seventeenth century and "Matshafa Madhanit" of the early 18th century. These medical texts contain several references to plants, animal products and minerals as well as magic and superstition. A medicinal plant initially taken from Ethiopia, Hagenia abyssinica (Kosso in Amharic) was introduced into the international world of medicine as an age-old tested medicament. The root barks of another tree known locally as "Waginos" (in Geez) were used by people living in northern Ethiopia for many centuries for treating dysentery. The root barks of this plant were cleaned, dried in the sun, and ground into powder and then taken with camel's milk. The plant was later named Brucea antidysenterica [16].

Some Ethiopian Medicinal Plants and their Potential as a source of Modern drug

There are a number of Ethiopian medicinal plants which have undergone scientific investigation. These plants have been used in traditional medicine to treat various ailments. In the following section, an abridged sampling remedies is given below [14]

Dingetegna (Taverniera abyssinica)

This all-Ethiopian traditional plant has been used to treat sudden illness characterized by fever and stomachache. Both uses of the plant have been investigated scientifically, and the conclusions support them .Because of the importance of the roots of T.abyssinica in Ethiopian traditional medicine [14]. chromatographic separation of the petroleum ether as well as chloroform extracts of the roots of T.abyssinica led to the isolation of formononetin (6) and pterocarpan medicarpin (7) [19].



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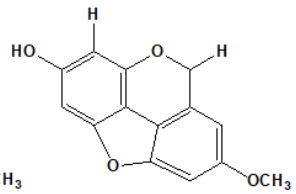

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Endod (Phytolacca dodecandra)

This plant is best known for its use in the control of schistosomiasis which claims thousands of lives in Ethiopia every year. Although various parts of the plant are used directly by humans for diseases such as ascariasis, gonorrhea, malaria, rabies, syphilis, etc., endod berries are used as a molluscicidal agent to help arrest the spread of the infection by disrupting the transmission cycle [14].

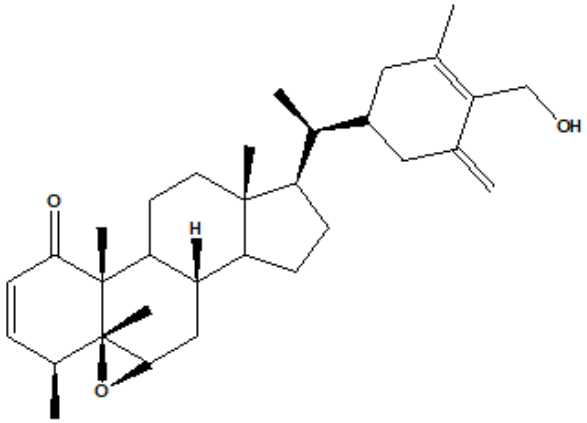
Metere (Glinus lotoides)

More than dozen of plants that are known to be used for tapeworm infestation (taeniasis), recently metereseems to have received more chemical and biological investigations. The taenicidal activity of the plant has been attributed to its saponin

constituents. The plant has also been shown to be relatively safe and effective [14].

Gizawa (Withania somnifera)

In Ethiopia, this plant is used for joint infection, arthritis, and malaria. Studies have shown that it indeed exhibits antibiotic, anti-inflammatory and antimalarial activities.These findings are in support of similar uses of the plant in Ethiopian traditional medicine [14]. The roots of Withania somnifera consist primarily of compounds known as withanolides, which are believed to account for its extraordinary medicinal properties. Withanolides are steroidal and bear a resemblance, both in their action and appearance, to the active constituents of Asian ginseng (Panax ginseng) known as ginsenosides. Much of Ashwaganda's pharmacological activity has been attributed to withanolide, withaferin A and. Further chemical analysis has shown the presence of the Withaferin A (8) [20].



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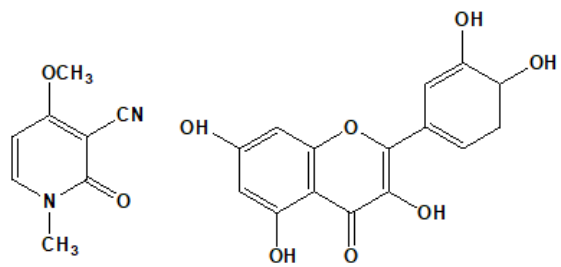
Gulo zeit (Ricinus communis)

Among other uses of the plant, the oil from the seeds is used in Ethiopia as a purgative to soften the digestive tract. Castor oil is commonly used in modern medicine to cleanse the gut prior to medical procedures. It is no wonder then that the oil from this plant is used in Ethiopian traditional medicine as a purgative [14]. The anti-inflammatory propertyof the methanol extract of R. communis roots has been reported earlier but no report was available for its active fraction/compound(s) R.communis had shown significant ($p<0.05$) anti-inflammatory activity in carrageenan induced paw edema animal model. two compounds are isolated from ricinus communis (RC-I (9) and RC-II (10) [21].



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Bahr zaf (Eucalyptus spp.)

Although there are over 55 species of Eucalyptus in Ethiopia, Eucalyptus globulus is the most abundant species. Apart from its immense economic utility, Eucalyptus is also used as a medicinal agent.The vapor obtained from boiling the leaves is inhaled as a common household remedy to treat common cold symptoms. In conventional medicine, the oil obtained from the leaves is used to make ointments and cough preparations.

The above few examples go to show clearly that the uses of a number of Ethiopian medicinal plants are supported by scientific studies, or parallel uses in modern medicine. There is also a vast botanical resource yet to be investigated for possible application in enhanced traditional medicine. In Ethiopia, as in many other countries in similar circumstances, plans for medicinal plant development must consider the following: (1) the enhancement of human life, health, and happiness,(2) the ecological, cultural, and societal sustainability of local communities, and (3) the social acceptability of economic benefits. Such considerations will enhance the role of medicinal plants in societal, cultural, and economic contexts and help build stakeholder capacity.

Side effects, Antidotes and Contraindications of Some Ethiopian medicinal plants

Ethiopian medicinal plants and their side effects, antidotes and contraindications were indicated only to some plant species. The major side effects in their decreasing order of frequency are headache, vomiting, diarrhea, gastritis, “hodnifat”, waist pain, sight problem, hearing problem and unusual mouth smell for those remedies taken orally. Sweating, exhaustion and urination were also indicated as side effect by some healers. (Table 1: Side effects, antidotes and contraindication of some Ethiopian medicinal plants) [17].

No.	Species, Family	Local name	Parts used	Uses and preparation antidotes
1.	Allium cepa Liliaceae	Key shinkurt	Bulb	For hypertension, the bulb is chopped, macerated in water, filtered and drunk
2.	Aloe sp, Liliaceae (Aloaceae)	Ret	Leaves	For gastritis, the spongy leaves are chopped and macerated in water for a night, a glass of the bitter solution is drunk every two hours

3.	Artemisia abyssinica schtz, Afra Jacq Asteraceae	Chikugn	Leaves	For evil eye. The leaves are pounded as they are fresh and mixed with powdered garlic and smelled to the patient. For common could. The fresh leaves are put in the nose and smelt regularly until quire.
4.	Avera sp.,	Engirdad	Seed	To remove any worm in/on the body. It is milled, powdered and applied on the washed wound
5.	Bersama abysinica Fresen, Melianthaceae	Abalo	Fruit	To treat chife (eczema), the fruit of 1 and root of 2 is pounded to powder and mixed with honey or butter and applied on the wound.
6.	Capsicum Sp. L, Solanaceae	Berberie	Fruit	To treat tonsillitis, the fruits are crushed and the patient is fumigated by adding the fruit on an open fire till sneezing, the tonsil moves up while sneezing
7.	Carissa spirarum, Apocynaceae	Agam	Apex	For any poisoning by insects or animalbite, seven apexes from seven different places are collected and crushed. It is applied on the affected body part as bandage.
8.	Citrus durantifolia (christm.) swingle, Rutaceae	Lemi	Latex /juice	For common cold. Areki and the juice of lemon is mixed and held in the mouth or fumigated
9.	Clematis hirsuta perr and Guill,Ranunculacea	Yeazo Areg	Stem Leaves	To treat swelling, the smooth bark is removed, and the stem is chopped and applied on the swelling To treat swelling by Nekersa. The leaves are crushed and applied on the swelling as bandage
10.	Clutia abyssinica Jaub and Spach,.Euphorbiaceae	Fiyele Feji	Leaves	To kill Nekez. The leaves are dried, ground to powder and a cup of it is added to a quintal of food grain (ehil).

11.	Commiphora sp, Bruceraceae	Nech Etan	Exudate (Gum	For hodkurtet. The latex is chopped and one or two pieces is chewed
12.	Cucumis ficifolius A.Rich,Curcurbitaceae	Yemdir embuay	Root	To treat chife (eczema), the fruit of 1and root of 2 is pounded to powder and mixed with honey or butter and applied on the wound.
13.	Cycopersicon Ecnlentum	Timatim	Fruit	For cough, heart disease (Lib Himem),the fresh tomato is eaten occasionally in the morning.
14.	Datura stramonium L, Solanaceae	Astenagir	Fruit	To prepare Abisho (Yetmihrt medhanit.) the fruit is ground and eaten with wot prepared from only garlic, berberie and shiro with teff injera by reading melka Eyesus for 7 days. (especially for children.)
15.	Dodonea angestifolia, Sapindaceae	Kitkita	Shoot apex Leaves	For chife, the apex is charred on an open fire and the powder is mixed with butter and applied on the affected area
				To treat any broken part of body, the leaves are crushed and applied as bandage being held by bamboo (Kerkeha), Shembeko and tied by a Rope
16.	Euphorbia sp. Gmel, Euphorbiaceae	Kulkual	Latex	For Diabetes, the Kulkual is cut and squeezed until enough is collected, a cup and half is drunk three times a day before food. For hemorrhoids, the atex is collected and applied on the swelling as it is fresh. To treat ascaries 7 drops of the latex is added on fresh Injera, it is swallowed in empty stomach every morning till cure

17.	Ficus spp.	Kotlebeles	Latex	To remove torn (gareta) from any part of the body even eye, the latex is added on the part wounded repeatedly till it is removed
18.	Gladious candidus (Rendle),Goldblatt,Iridaceae	Milas Golgul	Root	For Nekersa (cancer).The root is powdered and applied on the wound, or the powder is mixed with water and drunk
19.	Hagenia abyssinica (Bruce) J.F. Gmel,Rosacea	Kosso	Fruit	To treat tapeworm, the fruits are ground, mixed with milk and drunk in empty stomach in the morning
20.	Impatients tinctoria	Ensosila	Root	For abortion. The roots are chopped, crushed, mixed with water and drunk once or twice. For arthritis (Rih) the roots are chopped, boiled, crushed and drunk
21.	Kalancheo petitiana A.Rich,Crassulaceae	Andahula	Root	For ascaris, the root is cut with a knife of horn and chopped on un movable stone, and mixed with water, it is squeezed between palms, applied in the left nose, then moved the stomach.
22.	Lageniaria siceraria, Cucurbitaceae	Kil	Leaves Fruits	For nekersa and Jorow lemimegl. (pus from ear) The leaves are crushed, squeezed, and applied on the wound or in the ear in small drops.For Kurba, water is added in tehkil. The bitter liquid is drunk for 8 days.
23.	Lepidium sativum L, Apiaceae	Feto	Seed	For evil eye, megagna, mich The seed is crushed, mixed with water and sprayed on body parts.To treat dysentery, the seed is pounded, mixed with Yoghurt, shaked well and drunk
24.	Linum usitatissimum L. Linaceae	Telba	Seed	To treat Gormit(Kola Kusil), it is mixed with honey and bandaged on the wound

25.	Musa x paradisiaca L. Musaceae	Muz	Fruit	To treat cough, banana is eaten every morning in empty stomach for five days before food
26.	Phytolacca dodecandra L'Herit,Phytolaccaceae	Mekan endod	Apex	For kurba. The apex is squeezed between palms and a cup of it is drunk in the morning in e mpty stomach for seven days. One glass of aguate is drunk immediately.
27.	Plantago lanceolata L, Plantaginaceae	Gorteb	Leaves Seed	To treat Gormit (yekola kusil), the fresh leaves are pounded, to powder, the wound is washed and the powder is applied on the wound For snake or scorpion bite. The seed is ground and eaten with teff injera or mixed with water, filtered and eaten
28.	Ranunculus mulifidus Forssk,Ranunculaceae	Etsesyol	Leaves	The leaves are pounded to powder and mixed with honey (to attach) and applied on the wounds.
29.	Rehamnus prinoides L. Herit,Rhamnaceae	Gesho	Leaves	The leaves are crushed into powder and applied as bandage on the wounds
30.	Rumex abyssinicus Jacq, Polygonaceae	Mekmeko	Root	To treat hepatitis (yewofitu). The roots are crushed, powdered, and mixed with the dried and powered meat of a bat and eaten once or twice
31.	Rumex nervosus Vahl, Polygonaceae	Ambacho	Leaves	To treat wound during male circumcision. The leaves are crushed squeezed between palms and applied on the wound.
32.	Solanum sp. L, Solanaceae	Embuay	Fruit Fruit latex	For TB and cough, the fruit is washed, dried and crushed. It is boiled, and drunk with butter every morning till Cured To treat Gormit, chife. The wound is washed with water, the embuay is squeezed between palms and

				the latex is applied on the wound
33.	Trichodesma zeylanicum	Yewusha milas	Roots	For abdominal colic (Kurtet) and hod Nifat. The roots are chopped mixed with water, filtered and a glass of it is drunk for three days in the morning
34.	Trigonella foenum-graecum L,Fabaceae	Abish	Seed	To treat jimatu yetasere (yekerere). The seed is ground, mixed with honey and shaked well. It is eaten regularly
35.	Vernonia amygdalina Del., Asteraceae	Girawa	Leaves	To expel placenta). The leaves are pounded mixed with honey, chewed and only the liquid is swallowed. For figna wudgat , the leaves are crushed and ground. Fresh honey is prepared and one glass is dunk from each at the same time.
36.	Zehneria scabra (L.F), Cucurbitacea	Areg resa	Leaves	For mich; the leaves are boiled in water and the patient is fumigated or the leaves are squeezed between palms and the juice is applied on the skin
37.	Zingiber officinale Roscoe, Zingiberacea e	Ginger	Rhizome	For hod kurtet. The bark is removed, chopped, chewed and the liquid is swallowed

Overview of medicinal plant industry and relevant experience for the promotion of the Modern drug in Ethiopia

The traditional medicinal plant industry is one of the few industries that have escaped large scale commercialization by both foreign and domestic interests, and consequently it remained as a largely informal industry with virtually no official trade industries in Ethiopia. Even in developed countries it is only recently that tremendous interest in bioprospecting, with pharmaceutical companies and universities is moving forward. Most of the research has been seeking commercially useful chemicals, with little investment in the development of existing industry. Most of the demand for medicinal plants is for the production of the following three groups of pharmaceutical products [15].

- Modern allopathic medicines
- Herbal remedies
- Processed traditional medicines

China is a major source country with India , Chile and Egypt playing a big role. Hong Kong is a leading consumer probably due to majority of the botanical drug being processed in Hong Kong's large pharmaceutical industry. Japan and Korea are also major consumer countries with large manufacturing industries. The products are either sold in country or exported. Both USA and Germany are important importers and exporters as well as consumers with large processing industries. No developing country is a major importer [15].

Strengths, weaknesses, opportunities, and threats in the medicinal plant sector of Ethiopia (SWOT analysis)

While the medicinal plant sector in Ethiopia has many strengths and opportunities to enhance productivity and improve

livelihoods, many weaknesses and threats remain to be overcome. These positive and negative aspects are summarized below [22].

Strengths of medicinal plant sector in Ethiopia

- Rich biological diversity of medicinal plants, allowing for selection of promising species suitable for cultivation
- Untapped, valuable indigenous knowledge on medicinal plants
- Availability for home consumption of easily accessible medicinal plants
- Well-established traditions of medicinal plant cultivation and methods for adapting plants to local environments
- Numerous traditional healers who can aid in the development of medicinal plants
- Large numbers of religious institutions and healers to collaborate in promoting the medicinal plant sector
- Farmers eager to cultivate medicinal plants, if developed
- High demand for medicinal plants due to the emergence or re-emergence of certain diseases, high costs and limitations of modern medicines, desire for the environmentally friendly properties of medicinal plants, and chance to discover new medicines Biomedical benefits provided by medicinal plants, which are a product of knowledge accumulated over centuries

Weaknesses of medicinal plant sector in Ethiopia

- Efforts to conserve biodiversity are not producing desired results.
- Indigenous medical knowledge is enigmatic, and such secrecy prevents free knowledge sharing.
- Isolation of the active properties of medicinal plants is deterred by low scientific capacity.
- Poor mode of presentation of medicinal plants to patients
- Lack of a marketing infrastructure
- Underdeveloped system of marketing information
- Excessive dependence on the trade of medicinal plants may constrain conservation efforts.

Opportunities of medicinal plant sector in Ethiopia

- Further enhancement of economic benefits
- Further development of employment opportunities
- Possible motive for conserving biodiversity in natural and human-made ecosystems
- Active use of medicinal plants will contribute to the preservation of indigenous botanical and medical knowledge.
- The conservation of cultural and spiritual values will be passed on to future generations and contribute to the maintenance of cultural and natural assets of communities.
- Optimum utilization of rich indigenous knowledge on medicinal plants
- Development of the medicinal plant sector as an industry to generate income for poor households
- Tapping into external markets
- Plant species of high international value, including Prunus africana, aloes, Walburgia ugandensis, and Mystenus species, might be marketable.
- Helping Ethiopia in its efforts to gain a high share in the international market for medicinal plants

Threats of medicinal plant sector in Ethiopia

- Ecological degradation
- Loss of indigenous knowledge
- Loss of cultural assets
- Threat of illegal smuggling and misuse of resources to medicinal plant conservation
- Lack of a suitable scheme for equitable sharing of benefits arising from biological resources
- An underdeveloped market may prevent cultivators from producing medicinal plants for the market.
- Traditional healers may not participate and fully collaborate [22].

Future Prospects

It is obvious that Ethiopian medicinal plants are a rich source of many remedies. In a country where modern drugs services are out of reach for about 80% of the population, these plants provide an alternative ammunition to fight a number of diseases.it is quite conceivable that, if properly harnessed, botanical remedies can provide a complementary source to modern medication supply. In order to ensure their sustainability, Ethiopian medicinal plants need to be conserved, lest they be endangered and eventually be extinct as a result of unbridled deforestation and natural calamities [14]. Integration of traditional and modern medicine in Ethiopia, following either the Chinese, Japanese or Indian pattern or a combination of these, would help the promotion and development of local traditional medicine, which has be significantly contributing and is expected to contribute to the health care system and economic development of the country [15].

CONCLUSION

Even though, Ethiopia is considered as the home of most diverse plant species that could serve as sources of many traditional medicinal plants, scientific screening and the development of their therapeutic products is still limited. Most of the plant species have medicinal values, and greater concentration of these medicinal plants is found in the South and south western Ethiopian parts of the country following the concentration of biological and cultural diversity. Reports also show that are found in small proportion in central, north and northwestern part of Ethiopia Even though, Ethiopia is considered as the home of most diverse plant species that could serve as sources of many traditional medicinal plants, scientific screening and the development of their therapeutic products is still limited. No single modern drug available in market from Ethiopian medicinal plants. Thus, it is important to investigate medicinal plants of Ethiopia to get drugs or identify compounds responsible for their medicinal uses.

In Ethiopia research and documentation on medicinal plants has been started very recently. The documenting of medicinally important plants is mainly aimed at developing database for further studies and conservation of the plants. Documentation of Ethiopian medicinal was started in 1971 by Tsehai Berhane Selassie authored an annotated paper based on an earlier manuscript by Grazmach Gebrewold Aregawi which described

the uses of over 200 plants .In addition, the paper included a description of magic and rituals used in some of the healing processes and also another work was done by the Polish Stephen Strelcyn In 1973,he produced a book listing the medical applications of 300 plants. in 1976 a mimeograph was published by the University of Addis Ababa, based on extensive field and herbarium studies. This work listed the geographic origins of about 250 medicinal plants along with their uses. A landmark book titled Este Debdabe was published in 1989 by Gelahun Abate, with Sebsebe Demissew as the editor. Many of these plants have not been investigated scientifically, although they have been used by the population for a long time.

Currently there are many institutions give a great care for medicinal plants also many phytochemical studies are performed by different researchers in many Ethiopian universities but due to the expensiveness of laboratory equipments and lack of some chemicals the researcher can not go the above level.

RECOMMENDATIONS

- The local communities need to involve in conservation and management of plants in general and medicinal plants in particular
- the studies,on medicinal plants of Ethiopia must be documented that is used as a base line for an another researcher .
- The traditional medicinal plant industry must be constructed that is used to promote many medicinal plants.
- The administration must involve in medicinal plant sector by importing instruments.
- Integration of traditional and modern medicine in Ethiopia, must follow either the Chinese, Japanese or Indian pattern or a combination of these, would help the promotion and development of local traditional medicine
- which has bee significantly contributing and is expected to contribute to the health care system and economic development of the country.
- Local people harvest plants from the forest for different purposes with little awareness of its threat, so awareness creation among the society must be done by agricultural workers to ensure sustainable harvesting be practiced.
- The local communities need to involve in conservation and management of plants in general and medicinal plants in particular.
- The administration must involve in awareness creations on traditional healers to transfer their knowledge to the next generation without secrecy.
- There is needed coordination of traditional healers that popularize their indigenous knowledge on medicinal plants and creat awareness on conservation.
- Deforestation of natural forests still takes place. So, the administrative body must take care.

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