

Trends of Research on Traditional Medicinal Plants in Ethiopia: A Preliminary Review

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Abstract

Background: In Ethiopia, there are more than 6,500 plant species of which an estimated 12% are endemic and about 887 species are used as medicinal plants. Considerable efforts have been exerted on research and development of medicinal plant products in the country. However, the research trend is largely unknown.

Objective: To examine and update the trends of research and development efforts on Ethiopian traditional medicinal plants.

Methods: Data for this survey were generated from research findings on Ethiopian traditional medicinal plants that appeared indifferent peer reviewed journals and proceedings during the last 30 years (1985-2014) using search words of Ethiopian medicinal plants, traditional medicine, formulation, toxicity, standardization, and phytochemistry. Descriptive analysis was conducted using excel spreadsheets and the number of research findings were categorized in each disease category.

Results: A total of 454 abstracts were published in peer reviewed journals and proceedings. The most researched areas were the antimicrobial drugs, ethnomedicinal, antiprotozoal phytochemistry and Knowledge, Attitude and Practice about traditional medicine study. The study also revealed that much research is yet to be done in other areas such as formulation, anticancer, diabetics, hypertension and mental disorder. Over 170 medicinal plants were screened for biological activity of which *Moringa stenopetala*, *Glinus lotoides*, *Lippia adoensis*, *Phytolacca dodecandra*, *Albizia gummifera*, *Artemisia afra*, *Croton macrostachys*, *Rumex abyssinicus* were the most researched medicinal plants for their phytochemistry, and pharmacological activity.

Conclusions: This preliminary review set out the trends of medicinal plant research in Ethiopia. The research and development should be intensified in the least-researched areas. It is recommended that medicinal plant research and development should be strengthened and linked to manufacturing investment if Ethiopia intends to meet the health sustainable development goals.

Key words: Research, development, commercialization, natural medicinal products, Ethiopian traditional medicine

Introduction

Plants have been used as medicinal sources since ancient times, and even today plant based pharmacopoeias continue to play an essential role in world health care. The use of biological resources for various therapies has been documented in different parts of the world, especially in developed regions where traditional medicines provide an alternative to modern health care system. This perhaps may be sequel to the inability of modern medicine to comprehensively address most disease conditions plaguing humankind (Kang and Phipps 2003).

The World Health Organization (WHO) estimated that 80% of the world population relies on traditional medicine prepared mainly by using natural products (animals and plants) to meet their daily health requirements (Aschwanden 2001). WHO estimates that 35, 000 to 70, 000 species of plants are being used for medicinal purposes around the world (Demissew and Dagne 2001). Herbal medicine refers to medicine or drug made from plants. It is synonyms with phytomedicine, plant medicine, green medicine, traditional remedy, plant drug and forest health

product among others (Elujoba et al. 2005). The WHO also defined herbal medicine as finished and labeled medicinal product that contains active ingredient(s) of aerial or underground parts of plants or combinations thereof whether in crude juices, gums and fatty oils and other substances of this natural origin (WHO 1996).

Ethiopia is endowed with diverse flora and fauna. The country has more than 6,500 plant species out of which an estimated 12% are endemic and about 887 (13.6%) species are used for medicine. The majority (80%) of Ethiopian people depends on traditional medicine for their health care, and more than 95% of traditional medicinal preparations are herbal origin (Giday et al. 2003; Demissew and Dagne 2001). Ethiopia is also home for many languages, cultures and beliefs that have in turn contributed to the high diversity of traditional knowledge and practice of the people (Abebe 1996). Far East Asian countries such as China, South Korea and India have been able to meet 75% of their health care needs through research, development and utilization of herbal medicines, traditional medicine practices and creating high market demand for their herbal products.

The output of Chinese materia-medica was estimated to value US\$83.1 billion in 2012; Republic of Korea, US\$7.4 billion in 2009; United States of America, US\$14.8 billion in 2008 (Nahin et al. 2009; WHO 2013). Hence, developing countries should invigorate their efforts to develop and utilize local medicines that are most appropriate to their local circumstances especially for use in the Primary Health Care and cut down huge cost associated with incessant drug importation (WHO 1996). In Ethiopia, there are efforts on research and development of herbal medicines conducted by universities and research institutions. However, its trend is not as such recognized. Therefore, the aim of this review was to chronicle and update the trend of research results in herbal medicine.

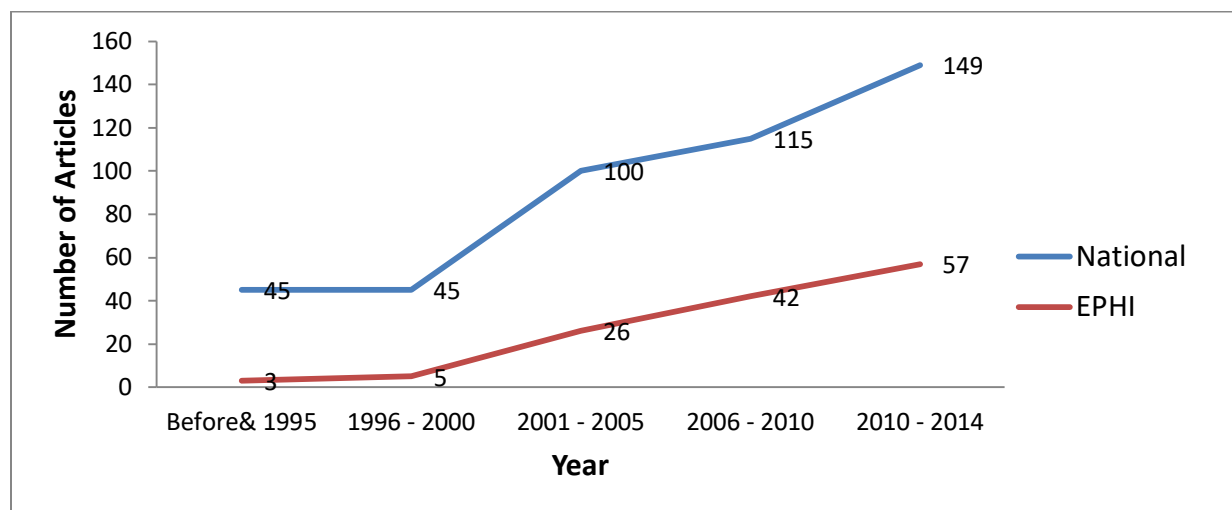
Materials and Methods

Data for this survey were generated from the published research findings on Ethiopian traditional medicinal plants from different peer reviewed

journals and proceedings, which were published during the past 30 years (1985-2014). The data were then categorized based on disease categories where the efficacies of the herbal preparations were described. The number of research findings in each disease category was later determined and computed as a percentage of all research outputs for the period under review.

Results

Researchers over the years have been conducting studies on efficacy, safety, phytochemistry of Ethiopian medicinal plants. About 454 published articles on Ethiopian medicinal plants in peer reviewed journals were recorded among which 75.4% were on biological activities. The trend in publication shows increment in the recent years. Figure 1 shows increasing trend in the number of published articles on Ethiopian traditional medicinal plants in Ethiopia. Trend of publication by Ethiopian Public Health Institute (EPHI) is also presented.



Note: EPHI- Ethiopian Public Health Institute

Figure 1: Number of Publications of Ethiopian medicinal plants in peer reviewed journal (1985-2014)

As shown in Table 1, the most research activities done in medicinal plants within the specified period were on anti-microbial activities (19.17%), ethnomedicinal study (9.76%) and anti-malarial activity (8.50%). Other areas where research activities moderately undertaken were on formulation (2.35%), antidiabetic (2%), larvicidal (2%), mental illness (2%) and antimycobacterial (1.8%).

The most researched medicinal plants were *Moringa stenopetala*, *Glinus lotoides*, *Lippiaa doensis* and *Phytolacca dodecandra* for their pharmacological activity (efficacy and safety) and phytochemical analysis (Table 2). Parts of the medicinal plants used in the research were leaves (42.0%) followed by Roots (15.4%) (Table 3).

Table 1: Categorization of scientific research on Ethiopia traditional medicine from 1985-2014

Se No.	Category	Number of publications	%
1	Knowledge, Attitude and Practice	42	7.6
2	Phytochemistry	36	6.5
3	Formulation (solid, semi-solid and liquid)	17	3.1
4	Ethnomedicinal study of medicinal plants (Human and Veterinary)	54	9.7
5	Toxicity (chronic/sub chronic, dermal)	19	3.4
6	<i>For agents causing Communicable diseases (Human)</i>		
6.1	Antimicrobial activity (Antibacterial, Antiviral, antifungal activity)	115	20.8
6.2	Antiprotozoal activity	76	13.7
6.3	Antimycobacterial activity	10	1.8
6.4	Wound healing activity	5	0.9
7	<i>Non-communicable diseases (Human)</i>		
7.1	Mental illness /anxiolytic	11	2.0
7.2	Ant diabetic activity	11	2.0
7.3	Diuretic effect	6	1.1
7.4	Anti-asthmatic effect	6	1.1
7.5	Antihypertensive activity	5	0.9
7.6	Anticancer activity	2	0.4
8	<i>Insecticidal/repellant activity</i>		
8.1	Repellent activity	10	1.8
8.2	Insecticidal activity	17	3.1
8.3	Larvicidal activity	11	2.0
9	<i>Others</i>		
9.1	Anthelmintic activity	18	3.2
9.2	Anti-inflammatory, analgesic and antipyretic activity	42	7.6
9.3	Antioxidant and Hepatoprotective	25	4.5
9.4	Gastrointestinal activity	10	1.8
9.5	Antifertility activity	5	0.9
9.6	Antirabies	1	0.2

Table 2: Medicinal plants most researched on Ethiopia traditional medicine from 1985-2014

Number	Medicinal Plant species	Number of publications	%
1	<i>Moringa stenopetala</i>	15	4.2
2	<i>Glinus lotoides</i>	8	2.2
3	<i>Lippia adoensis</i>	8	2.2
4	<i>Phytolacca dodecandra</i>	7	1.9
5	<i>Albizia gummifera</i>	6	1.7
6	<i>Artemisia afra</i>	6	1.7
7	<i>Croton macrostachyus</i>	6	1.7
8	<i>Rumex abyssinicus</i>	6	1.7
9	<i>Ajugaremot</i>	5	1.4
10	<i>Artemisia abyssinica</i>	5	1.4
11	<i>Bersama abyssinica</i>	5	1.4
12	<i>Calpurnia aurea</i>	5	1.4
13	<i>Milletia ferruginea</i>	5	1.4
14	<i>Ocimum basilicum</i>	5	1.4
15	<i>Ocimum lamiifolium</i>	5	1.4
16	<i>Ocimum suave</i>	5	1.4
17	<i>Plumbago zeylanica</i>	5	1.4
18	<i>Thymus schimperi</i>	5	1.4
19	<i>Artemisia rehan</i>	4	1.1
20	<i>Asparagus africanus</i>	4	1.1
21	<i>Clerodendrum myricoides</i>	4	1.1
22	<i>Cymbopogon citratus</i>	4	1.1
23	<i>Echinops kebericho</i>	4	1.1
24	<i>Foeniculum vulgare</i>	4	1.1
25	<i>Syzigium guineense</i>	4	1.1
26	<i>Verbascum sinaiticum</i>	4	1.1
27	<i>Warburgia ugandensis</i>	4	1.1

Table 3: Plant parts used for research in Ethiopian traditional medicine from 1985-2014

Plant Parts	Number	%
Leaf	87	41.8
Root	37	17.8
Aerial parts	17	8.2
Seed	15	7.2
Steam bark	14	6.7
Fruits	8	3.8
Flowers	2	1.0
Essential oil	16	7.7
Hydrosol	6	2.9
Latex	2	1.0
Others (Oleoresin, Berry, Scented myrrh etc)	4	2.0

Discussion

The pattern of research output is skewed towards anti-microbial, antiprotozoal, ethnomedicinal and phytochemistry, while medicinal plants for non-communicable diseases such as hypertension, diabetes, cancer and mental illness are still growing. This may be due to many reasons. The first could be the magnitude of the problems in the country. For example malaria is a common public health problem

in Ethiopia affecting about 68% of the population (FMoH 2011), Ethiopia is also one of the 22 high TB burden countries in the world (Kebede et al. 2014; WHO 2011) and non-communicable diseases are also emerging in Ethiopia accounts for 30 percent of total deaths (WHO 2014).

The second reason may be due to the emergence of antimicrobial and antimalarial drug resistances. Antimicrobial drug resistance has increasingly been recognized as a growing global health threat (WHO 2012). The resistance encompasses a range of pathogens including bacteria, mycobacteria, viruses, fungi and parasites (Gebre-Yohannes and Limenih 1980; Roma et al. 2000; Drug Administration and Control Authority of Ethiopia 2009; Falagas and Karveli 2006; Lamboro et al. 2016). This may also have triggered a plethora of research interests in such areas with the hope of finding new and improved method of treatment. The third reason may be due to inadequate facilities, funds, and limited technical know-how to conduct researches in threats like tuberculosis, cancer and HIV/AIDS.

The second most important research area in Ethiopian traditional medicine as per this review was ethnobotanical documentation. Conveyance of the knowledge on traditional medicine from person to person based on cultural rules of age, gender, lineage or religious disciple leads, to the fast disappearance of ethnopharmacological information even though mostly tacit in nature (Abebe 1996; Nolan 1998). In view of the rapid loss of the knowledge, its documentation as well as better understanding of its botanico-historical roots has become an essential task of ethno-allied disciplines (Leonti et al. 2003; Hue et al. 1998). This review showed that Ethiopia is in a good start for documenting the indigenous knowledge and of sustainable medicinal plant biodiversity conservation even if a lot more is expected.

Isolation and characterization of natural products yielded several compounds for the development of new drugs where research has not been adequately carried out to maintain the health of human beings (Odukoya 1998; Sasidharan et al. 2011). Research activities in similar fields are relatively meager in Ethiopia. Several studies showed that leaves are the predominant plant parts that healers and the community commonly utilize (Giday et al. 2009; Osemene et al. 2011; Tekle 2014). Utilization of leaves and seeds has less negative impact on sustainable utilization of the plants. This is in line with a study conducted in different African countries (Mosihuzzaman and Choudhary 2008; Thillaivanan and Samraj 2014).

Conclusion and recommendations

Understanding of the trend in traditional medicinal plant use is critical for the design of directions for research and development. There is need for rapid enhancement of research, development and

commercialization of Ethiopian herbal based medicinal products. Government support can play a vital role in establishment of traditional medicine council, execution of policies and workable strategies which involves the traditional healers, universities, research institutions local manufacturing industries and other stakeholders. There is need for further study especially in important areas that have recorded less research outputs.

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