

# Review of Medicinal Plants Used for the Treatment of Eye Disease in Ethiopia: Implication for Conservation and Sustainable Use

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**To cite this article:**

Fitsumbirhan Tewelde. Review of Medicinal Plants Used for the Treatment of Eye Disease in Ethiopia: Implication for Conservation and Sustainable Use. *Agriculture, Forestry and Fisheries*. Vol. 12, No. 3, 2023, pp. 91-98. doi: 10.11648/j.aff.20231203.15

**Received:** January 14, 2023; **Accepted:** June 5, 2023; **Published:** June 27, 2023

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**Abstract:** World flora serves for a living organism as a source of different uses such as for shelter, medicine food and so on. People in a different part of the globe used plant remedy to cure different illnesses such as eye sicknesses from the time memorial. A review proposed to identify medicinal plants conventionally used to cure eye infection cure implied for conservation and sustainable use was carried out. Different resource materials such as, Books, journals, online available materials, reports and other relevant published and unpublished documents were used to organize this review. 23 medicinal plants conventionally used for the treatment of eye health problem were methodologically reviewed from Ethiopia studied at different times and places. Accordingly, Lamiaceae, Solanaceae, Euphorbiaceae and Fabaceae were the leading family medicinally used for the treatment of eye disease by the local people in Ethiopia. Oral and dermal route of application were the dominant application and crushing was the principal method of traditional medicinal plant preparation for eye disease. The remedy for eye infection cure is prepared from a lone plant and or other ingredients. The most frequently used plant parts for the preparation of remedies were leaf and root. Herbs, shrubs and trees are used for eye disease treatment in their decreasing order respectively. The flora of Ethiopia is rich enough as a source of traditional therapeutic preparation intended to the treatment of disease such as eye defect. This calls for a practical measure of conservation method for sustainability use and modern medicinal extraction.

**Keywords:** Ethnobotany, Medicinal Plant, Biodiversity, Conservation

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## 1. Introduction

The ethnobotanical use of plants for medicinal purposes had a long history in the African continent [1]. Medicinal flora outlines the starting point of traditional healthcare methods for the most of the people in developing states. Traditional medicinal plants biodiversity were used to assist encounter some of their primary health care necessities by Countries in the continents of Africa, Asia, and Latin America [2–4]. The plant remedies were stated to pursue health security by about 500 million people in South Asian countries alone [5]. Ethiopians are apt to depend more on traditional medicinal plants despite of the western medicine becoming more prevalent in the country.

Traditional medicinal practitioners or traditional healers are diagnosticians as well as prescribers of herbal medicines

[6, 7] in the African continent. The frequently inadequate provision of modern medicine and growth of human population increased the demand of traditional medicinal plants use [8]. Ethiopians had long history of using medicinal plants to treat a range of different types of ailments for both human and animals [9]. As most medicinal plants species have shown very effective medicinal value for some ailments of human beings and domestic animals, Eighty percent of the human population and 90% of livestock in Ethiopia rely on traditional medicine [5]. The existence of cultural acceptability, efficacy against certain types of diseases, physical accessibility and economic affordability as compared to modern medicine [10-12] results to the extensive use of traditional medicine in Ethiopia.

Traditional medicine has been defined as health practices, approaches, knowledge, and beliefs incorporating plant,

animal and mineral-based medicines, spiritual therapies, manual techniques and exercises to treat, diagnose, and prevent illness or maintain wellbeing [13]. Indigenous knowledge on plants seemed when humans started and erudite how to use plants [14].

Over centuries, indigenous people in different region of the globe have settled their locality specific knowledge on plant use, management and conservation [15]. Medicinal plants have been roughcast dares of sustainability and continuity principally due to the forfeiture of taxa of plants used medicinally in the case of Ethiopia [16] and habitats and cultures [17]. Other findings also disclosed that the diversity of plants in Ethiopia is in the process of being eroded because of human-induced pressures [18], habitat destruction deforestation for commercial timber, encroachment by agriculture and other land uses have resulted in the loss of some thousand hectares of forest that harbor useful medicinal plants, annually over the past several decades. With the present ecological and socio-economic changes, the medicinal plants together with community-based ethnobotanical knowledge, may disappear and thus may be lost from the use by human being forever [19].

There are a few published reports on the contribution of traditional eye medicines to the development of corneal diseases in Africa, although it is commonly recognized by clinicians to be a momentous contributor to corneal ulceration, scarring and blindness [20-23]. Abundant useful ethnobotanical plants species were become disappearing in most developing countries mainly due to overexploitation, overgrazing, habitat loss and alteration, destructive harvesting techniques, unsustainable trade and deforestation [24]. The disappearances of medicinal plant species has also been aggravated by the erosion of the age-old accumulated indigenous knowledge on traditional use and management of these plants as its transfer system is extensively known to be poor [5, 25, 26]. In the present ecosystem degradations and loss of biodiversity, it was found substantial and timely to document indigenous knowledge of local communities with emphasis on the list of species, the conservation and sustainable use of practices these medicinal plants and their specific medicinal uses.

The disregarded traditional medicinal plants knowledge allied with plant resources would result in the loss of the species and the letdown of the delivery mechanism of native knowledge to new generations. There was limited research reportage that engrossed on compiling and documentation of data on the potential medicinal plants used for the treatment of eye disease, methods of remedy preparations, associated indigenous knowledge of utilization, conservation, traditional management system practiced by people in Ethiopia. These limited researches done at different times in Ethiopia are not compiled or disseminating which enable for designing conservation measure and sustainable uses.

This review is therefore intended to stodgy research gaps by giving compiled information that oblige as baseline data for extra ethnobotanical exploration to propose and gadget suitable conservation measures.

## 2. Searching Methodology

Some of the existing extensive works of literature on Ethiopian traditional medicinal plants biodiversity and their conservation policy documents were assessed for this review result. Other main sources were books, journals, online materials, reports and other relevant published and unpublished documents. Google search, Pub Med and Medline online searches were also carried out to access other relevant publications. The main words used to access online materials include traditional medicinal plants biodiversity, traditional eye medication, traditional medicinal plants used for eye diseases, and traditional healer with or without Ethiopia.

### 2.1. Selection of Relevant Kinds of Literature

Depending on the principal objective of this review the selection of the compatible works of literature were done based on the established criteria. These criteria include the properly identified and written plant scientific name, family name, habit; parts used, and stated method of preparation of the plant. More ever, a careful selection was carried out at the stages of one, two, and four to review 56, 49, 37 and 23 online available research results respectively.

Accordingly, those plants that include four of the five criteria were included in the review. However, those that fulfil only one, two and three criteria were not reviewed or included stage by stage as shown in the following figure 1 below. A properly stated plant scientific name, Habit, Parts used, family name and method of preparation are vital for further exploration of the plant use that developed by the local community for years. The field of ethnobotany also underlines that how and why human approaches, attitudes, values, memories, and sentiments become linked culturally with plant-based use; such as medicines, and other natural resources [27]. The knowledge of regional ecosystems, when examined through expressive traditions and customs of use, can revivify resource philosophies and practices [28-30]. Safeguarding biodiversity is also a fundamental goal in ethnoecological studies understandings', by "memory banking," that's Nazarea describes as "the parallel collection and documentation of Indigenous knowledge and technologies, including uses, preferences, and evaluation criteria associated with traditional varieties of crops" [30].

### 2.2. Selection of Literature

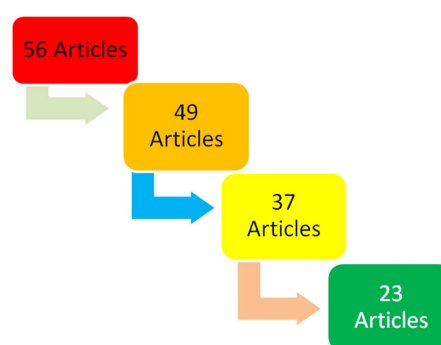


Figure 1. Stages of literature choice for review.

### 3. Result and Discussion

#### *Type of Plants Used for the healing of Eye Infection*

Twenty-three different plants conventionally used for the

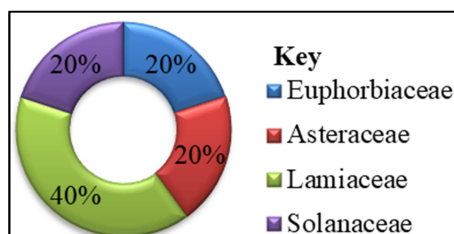
treatment of eye ailment were methodologically identified from Ethiopia studied at different times and places by different researchers. Those medicinal plants taxonomically classified in to a 23 genera and 14 families as indicated in table 1 below.

**Table 1.** Type of plants used in the medication of eye disease.

| Scientific name                              | Family Name   | Habit | Parts used | Stated Preparation method  | Citation |
|--|---------------|-------|------------|--|----------|
| <i>Barleria ventricosa</i>                   | Acanthaceae   | H     | Leaf       |  | [32]     |
| <i>Allium sativum</i>                        | Alliaceae     | H     | bulb       | Rubbing with warmed bulb   | [33]     |
| <i>Schinus molle</i>                         | Anacardiaceae | H     | Stem       | Boil leaf in water and let the patient bath himself with steam   | [33]     |
| <i>Phoenix reclinata</i>                     | Arecaceae     | T     | Leaf       | Chewing and spray  | [34, 33] |
| <i>Acacia abyssinica</i> Hochst.             | Fabaceae      | T     | leaf       | Fresh leaf is pounded, squeezed and the juice is added to the eye.                                     | [34]     |
| <i>Inula confertiflora</i>                   | Asteraceae    | Sh    | Leaf       | Powdered and mixed with water and applied on eye   | [36]     |
| <i>Cucumis ficifolius</i>                    | Cucurbitaceae | H     | Root       | Roots are chewed   | [33]     |
| <i>Acalypha volkensii</i>                    | Euphorbiaceae | H     | Leaf       |  | [32]     |
| <i>Euphorbia hirta</i>                       | Euphorbiaceae | H     | latex      |  | [32]     |
| <i>Calpurnia aurea</i>                       | Fabaceae      | Sh    | seed       | Seed powder mixed with butter is applied on infected eye.  | [37]     |
| <i>Clerodendron myricoides</i>               | Lamiaceae     | Sh    | Stem       | Crush, mix with butter & Fumigate  | [38]     |
| <i>Leonotis ocymifolia</i>                   | Lamiaceae     | H     | whole      | Fumigating oneself with smoke of plant nasal   | [33]     |
| <i>Leucas abyssinica</i>                     | Lamiaceae     | Sh    | Leaf       | Powdered and applied on affected part  | [36]     |
| <i>Premna shimperi</i>                       | Lamiaceae     | Sh    | Leaf       | Powdered, mixed in water and applied on  | [36]     |
| <i>Moringa stenopetala</i>                   | Moringaceae   | T     | Stem bark  |  | [32]     |
| <i>Olea europaea</i> subsp. <i>cuspidata</i> | Oleaceae      | T     | Leaf       | Leaf are crushed, squeezed, filtered and two to three drops are added daily into the eye for five days | [33]     |
| <i>Jasminum abyssinicum</i>                  | Oleaceae      | T/C   | Leaf       | Extract, squeeze   | [31]     |
| <i>Orobancha minor</i>                       | Orobanchaceae | H     | whole      | Burn the plant on clay dish and let the patient to fumigate himself with smoke                         | [33]     |
| <i>Solanum incanum</i>                       | Solanaceae    | H     | Root, Bark |  | [39]     |
| <i>Withania somnifera</i>                    | Solanaceae    | Sh    | Root, Leaf |  | [39]     |
| <i>Zingiber officinale</i>                   | Zingiberaceae | T     | Stem       | Grinding drop for infection of eyes  | [40]     |
| <i>Datura stramonium</i> L.                  | Solanaceae    | H     | Leaf       | Fresh or dried Leaf is squeezed and the juice is applied to the eye.                                   | [34]     |
| <i>Trianthema portulacastrum</i> L.          | Aizoaceae     | H     | leaf       |  | [41]     |

Where T=tree, Sh= shrub, H=herb

The family Lamiaceae was dominant from the methodological identified medicinal plants used for the cure of eye disease in the study country. Euphorbiaceae, Solanaceae and Asteraceae were the next three leading family medicinal used for the treatment of eye disease by the local people in Ethiopia as shown in figure 2 below. Other various studies conducted somewhere in Ethiopia [42-45] reported that the most dominant medicinal plant family is Fabaceae. Besides, other studies conducted in Ethiopia found that Asteraceae [46, 47], Lamiaceae [48] and Euphorbiaceae [49] were dominant over others.



**Figure 2.** Dominant plant family used for the treatment of eye disease.

#### **3.1. Method of Administration and Preparation**

The medicines of medicinal plant used for the cure of eye illnesses were applied through different routes of administration like oral, topical or dermal and nasal routes. Of these, oral application (54%) was the highest and most commonly used route of application followed by dermal application (29%). Those results consistent with the findings of various ethnobotanical researches conducted in different areas of Ethiopia used for different medication purpose [50-56, 90-98]. Both the prevailing means of administration (oral and dermal) routes permit rapid physiological reaction of the prepared medicines with the pathogens and increase the curative power. This current review also legitimately agrees with previous reports by [57-62, 100]. Local community healers in Ethiopia make remedies, for human and livestock ailments, either from a whole single plant, plant part or by mixing different type of plants and other additives. The results of the present review showed that most of the medicinal plant preparations involved the use of a single plant species or a single plant part corresponding to each health problem.

**Table 2.** Plants parts used for eye medication.

| Use parts of a plant | Bulb | Leaf | Stem | Whole | Root | Bark | Seed |
|----------------------|------|------|------|-------|------|------|------|
| Frequency            | 1    | 9    | 5    | 2     | 3    | 2    | 1    |
| Percent              | 4.4  | 39.1 | 21.7 | 8.7   | 13   | 8.7  | 4.4  |

### 3.2. Parts Used for Eye Medication

The most widely used medicinal plant in the making of remedies for eye treatment was leaf and root part. Another research studies done in different time and parts of Ethiopia also divulged that the leaf part of the plant biodiversity were used more recurrently than the other parts [63-66, 99]. Besides, the rich in bioactive secondary metabolites of the leaves which is secreted primarily to defend the plants against destructive entities are of medicinal values to the human body [67, 68] as some findings suggested.

Prior works conceded in the study country also shown that leaves and roots parts of the plant were the most commonly used parts in the treatment of eye diseases respectively [69-80, 88]. Further, research reports presented roots to be the most commonly used plant parts [81]. Studies have revealed that the cutting of up to 50% of a tree leaves does not suggestively affect for continuity of the plant growth [82]. However, medicinal plant harvest involving roots, rhizomes, bulbs, bark, stems or whole parts have grave consequences both from an ecological point of view and for the survival of the mother plants. Given that leaves constitute the most frequently sought plant parts in this review, the threat to the destruction of medicinal plants due to plant part extraction appears negligible. Nonetheless, the fact that roots and bark provide the next largest proportion may warrant a possible conservation threat for sustainability.

Therefore there is a need to pay special attention to determine their status and what measures should be taken to ensure their conservation for sustainability.

### 3.3. Growth from of Plants Used for Eye Disease Treatment

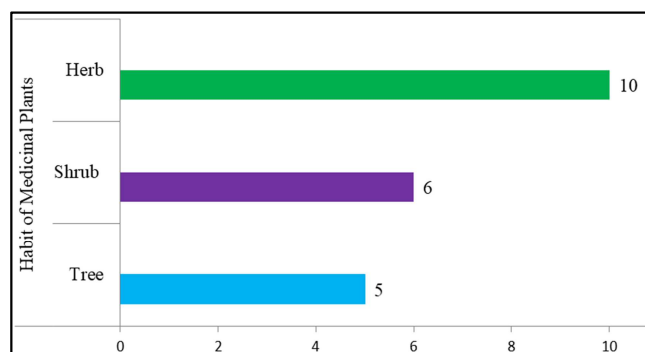


Figure 3. Growth form of plants used for eye disease treatment.

The study also showed that people in the study country use a relatively high number of herbs and shrubs. Herbs were the most widely used plant remedies followed by shrubs and trees. The wider application of herbs might be associated with their relatively higher efficacy which has been associated with their remarkably medicinal properties in the traditional medicinal system [83, 84]. However, this result is disagreeing with studies conducted elsewhere in the country [85]. In Contrast to these findings, a relatively higher number of shrubs and herbs were previously reported in another place in Ethiopia [86, 87].

### 3.4. Distribution of Medicinal Plants by Region

From a total of 23 medicinal plants used for the treatment of eye disease reviewed, the highest proportion was from the region of Tigray, South nation nationalities and peoples (SNNP), Oromia, Amhara and Afar regional national states of Ethiopia in the decreasing order as illustrated in the following figure 4 below. Although high flora diversity and vegetation coverage are found in the western, central and southeast of the country very few numbers of medicinal plants used for the treatment of eye disease was reported. Therefore, detailed consistent studies need to be conducted to have sufficient information about ethnoophthalmologically useful plants in the country. The data gather for this review result was based on the nine regional government and two city administration classification of the country.

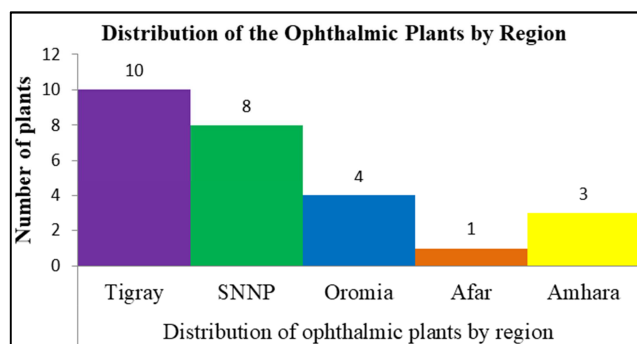


Figure 4. Distribution of ophthalmic plants in Ethiopian regions.

### Current Use Eminence and the Contribution for Biodiversity Conservation

People living in inaccessible areas around the world widely uses on traditional medicinal plants as the modern system of medication are too far from their residence [101]. The plant kingdom is a vital resource of modern medicine and there has remained a growing consciousness regarding the significance of plants used for medicinal value. The plants which have been nominated for curative practice over many of years found the right recognizable prime of probing the up-to-date search for remedially effective modern drugs [102] and antimicrobial drugs [103]. Medicinal plants are the preeminent basis to acquire multiple modern medicines as the world health organization (WHO) describes. Hence, such plants need to be explored for better understand their use [04]. Medicinal plants also contain some organic compounds such as carbohydrates which provide definite biological action on the human body [105]. The endowment of innocuous and effective traditional medicines could become a critical tool to increase admission to health care [106]. Plants based medications epitomize an essential health and economic cog of biodiversity conservation and sustainable use scenarios [107].

## 4. Conclusion and Recommendation

Studies of medicinal plants are important from the idea of

documentation and conservation of indigenous and plant-based local community knowledge, which therefore helps in the preparation of prospective raw materials in modern industry for further obtainability and utilization by human being for different purposes. The highest proportion of plant parts used for ophthalmic defect treatment are leaves which expected to have a less destructive effect on the mother plant and is also with a high bioactive secondary metabolic component. Herbs were used to treat eye disease which is easily available during the rainy season of the year. Because of continued agricultural expansion demand and increasing market ultimatum, numerous plant species are threatened with extinction. For rational and synchronized collection and conservation (in situ and ex-situ scenario), local community-based control measures are necessary. It is also essential to encourage the cultivation of these medicinal plants using different conservation scenario that would provide strong motion to sustainable use and extraction of modern medicine for eye disease treatment in particular.

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